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ARISTOTLE ON THE ORIGIN OF THEORETICAL SCIENCES (*MET.* A 1–2)*

For Georg Wöhrle

1. The problem

Aristotle's brief reasoning that the emergence of theoretical sciences in Egypt was due to the appearance of leisure is often cited in books on the history of ancient philosophy and science. Nevertheless, over the last century, contemporary scholars have substantially changed their attitude toward the correctness of Aristotle's explanation. Thus, T. Gomperz expressed a considerable measure of agreement with Aristotle, arguing that the castes of priests played the decisive role everywhere in the emergence of theoretical knowledge, but that the first steps of science in most countries were at the same time the last ones, since the priests were inclined to identify scientific doctrines with religious teaching and to transform them into dogma. The Greeks were happy that they had predecessors who possessed an organized priestly caste but did not possess such a caste of their own.[1] Somewhat later, an expert on the history of ancient mathematics, T. Heath, cited Gomperz as having shed light on Aristotle's statement: the priestly caste in Egypt, as well as in Babylon, was a necessary precondition for the emergence of systematic scientific studies, *inter alia* in mathematics. Heath, however, corrected this theory, in view of contemporary progress in the study of Egyptian mathematics, most of all of the Rhind papyrus, pointing out that mathematics in Egypt was not theoretical: geometry in Egypt did not advance beyond the practical art of mensuration.[2] Heath believed that Proclus (*in Eucl*. 65. 7–11) provides better evidence than Aristotle does that only with Thales did geometry become a deductive science founded on the axiomatic principles, i.e. that Proclus was aware of the difference between Greek and Egyptian

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[1] Gomperz 1922, 37 (first edition: 1895).

[2] Heath 1921, 8–9; 122; 128; cf. Ross 1953, I, 118.

mathematics that Aristotle failed to notice.[3] Somewhat later, again due to growing knowledge of Near Eastern mathematics, Aristotle's view that the caste of priests played the decisive role in the origin of mathematics came under fire, too. In his posthumously edited *Mathematics in Aristotle*, Heath noted against Gomperz's explanation (and, implicitly, Aristotle's, too): "there is no particle of evidence that in early times Egyptian mathematics were in any sense in the hands of the priests, whatever may be the case in Aristotle's days"; however, he admitted that "the orientation of temples, which would involve some geometry, no doubt rested with priests, as also astronomical observations". With his statement "Egyptian mathematics arose simply out of the necessities of administration and of daily life", Heath again rebutted Aristotle's claim that Egyptian mathematics emerged as a theoretical science.[4]

Since that time, the attitude of scholarship to Aristotle's explanation seems to be unanimous. It is usually understood as the statement that leisure is a necessary precondition for the development of theoretical knowledge. This is regarded as a considerable achievement of Aristotle, the product of his analysis of the development of knowledge in Greece. Modern scholars agree that the appearance of leisure in Greece was an important, although not a sufficient condition for the emergence of theoretical knowledge and its rapid progress. They agree at the same time that Aristotle not only errs when he finds in Egypt a form of mathematics (or geometry, at least) whose deductive character and theoretical purposes resembles geometry in Athens, but also that he ignores Herodotus' correct view that Egyptian geometry was purely practical. Accordingly, the scholars believe that the role he ascribes to priests' leisure in the emergence of theoretical mathematics is an inaccurate extrapolation onto Egypt of the important condition for theoretical knowledge that the Greeks possessed.[5]

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[3] Heath 1921, 128; approximately at the same time, Burnet 1930, 19, referring also to the Rhind papyrus, came to the view that Egyptian mathematics was merely practical; he believed that he found evidence for this in Plato's description of the learning of calculation in Egypt in the *Laws* 819 b 4 ff.: according to Burnet, the passage implies that the Egyptians had the science that the Greeks called λογιστική, the practical art of calculation, and that they did not have the science that the Greeks called ἀριθμητική, the scientific study of numbers: "The geometry of the Rhind papyrus is of a similar character; and Herodotus, who tells us that Egyptian geometry arose from the necessity of measuring the land afresh after the inundations, is clearly far nearer the mark than Aristotle, who says it grew out of leisure enjoyed by the priestly class".

[4] Heath 1949, 194 f.; he referred to the authority of T. E. Peet, the editor of the Rhind Mathematical Papyrus (1923), and to O. Neugebauer.

[5] Apart from the works cited in previous notes, see Guthrie 1962, 35, who is most explicit; cf. also Wehrli 1969, 114 f.; Lloyd 1979, 230 n. 13.

Of course this assessment is basically correct, and nobody will today deny that Egyptian mathematics lacked an axiomatic-deductive structure; equally, Aristotle certainly overstates the role of priests in the development of mathematics in Egypt.[6] However, while rightly criticising Aristotle's explanation, the scholars too readily ascribe to him concepts of their own that he and his predecessors and contemporaries did not in fact share. The purpose of my paper is to put Aristotle's explanation of the origin of theoretical knowledge in the context of his *Metaphysics* and of his thought about the development of knowledge and civilisation in general. I hope to show that Aristotle's explanation is more complex than is usually presented, that, in spite of its shortcomings and mistakes, it is less opposed to the views current in his time (it is not in conflict with Herodotus and the tradition that stems from him), and that he counterposes the social preconditions for the beginning of theoretical knowledge in Greece and Egypt rather than foisting the former on the latter. In a word, we shall see that Aristotle made statements that today are known to be false, but he did not make a biased misinterpretation of the data his contemporaries possessed.

2. The development of τέχναι and the invention of mathematics

The passage on the origin of theoretical sciences is part of a long and a complex argument that occupies chapters 1–2 of the *Metaphysics*. Aristotle presents the scale of human cognitive capacities: perception – experience – productive knowledge (τέχνη) – theoretical knowledge (ἐπιστήμη).[7] The very next higher capacity on this scale supersedes the lower, previous one in terms of knowing causes and other qualities, such as universality or remoteness from practical use, and just for this reason the *opinio communis* (of course, the implicit one) regards it as wiser than the lower one. This indicates (see 1. 981 b 27 – 982 a 3) that wisdom is associated with the knowledge of *certain* causes and principles (not of

[6] In today's view, practical geometry, most of all land surveying, was not in the hands of priests, but in the hands of ἁρπεδονάπται, who were secular specialists (Zhmud 2006, 39). The priests, at least at a later time, were preoccupied with astronomical observations, see Clagett 1995, 310 f. on the astronomic records of Egyptian priests of Hellenistic times, which go back to a much more remote age; *ibid*., 489 f. on the Hellenistic statue of the stargazer who was at the same time the priest; cf. Zhmud 2006, 39: "In late Egypt (i.e. in the time of Herodotus), calendar astronomy was in the hands of priests".

[7] Apart from the standard commentaries (Bonitz, Ross), see now Cambiano 2012 on ch. 1 and Broadie 2012 on ch. 2.

facts like perception and experience). In the next step (ch. 2) Aristotle argues that the features that, again, *opinio communis* associates with wisdom, taken all together, point to the single science of the first causes and principles (see 982 b 7–10), and this is the science whose pursuit is the object of the whole project of Aristotle's *Metaphysics*, viz. the 'first philosophy' (983 a 21–23). But, together with this declared purpose, his argument also has another, no less important one: it is a demonstration that human development, both individual and collective, starts from knowledge that is at first glance entirely particular and utilitarian, but in fact contains the germs of future theoretical knowledge, and that this knowledge grows more universal and less utilitarian with every next stage, until it attains the stage of theoretical sciences and their crown, metaphysical knowledge.

Let us now look at the statement on the origin of mathematics in Egypt in its immediate context (*Met*. A 1. 981 b 13 – 982 a 3):

> τὸ μὲν οὖν πρῶτον εἰκὸς τὸν ὁποιανοῦν εὑρόντα τέχνην παρὰ τὰς κοινὰς αἰσθήσεις θαυμάζεσθαι ὑπὸ τῶν ἀνθρώπων μὴ μόνον διὰ τὸ χρήσιμον εἶναί τι τῶν εὑρεθέντων ἀλλ᾽ ὡς σοφὸν καὶ διαφέροντα τῶν ἄλλων· πλειόνων δ᾽ εὑρισκομένων τεχνῶν καὶ τῶν μὲν πρὸς τἀναγ-καῖα τῶν δὲ πρὸς διαγωγὴν οὐσῶν, ἀεὶ σοφωτέρους τοὺς τοιούτους ἐκείνων ὑπολαμβάνεσθαι διὰ τὸ μὴ πρὸς χρῆσιν εἶναι τὰς ἐπιστή-μας αὐτῶν. ὅθεν ἤδη πάντων τῶν τοιούτων κατεσκευασμένων αἱ μὴ πρὸς ἡδονὴν μηδὲ πρὸς ἀναγκαῖα τῶν ἐπιστημῶν εὑρέθησαν, καὶ πρῶτον ἐν τούτοις τοῖς τόποις οὗπερ[8] ἐσχόλασαν· διὸ περὶ Αἴγυπτον αἱ μαθηματικαὶ πρῶτον τέχναι συνέστησαν, ἐκεῖ γὰρ ἀφείθη σχολά-ζειν τὸ τῶν ἱερέων ἔθνος.
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> At first he who invented any art whatever that went beyond the common perceptions of man was naturally admired by men, not only because there was something useful in the inventions, but because he was thought wise and superior to the rest. But as more arts were invented, and some were directed to the necessities of life, others to recreation, the inventors of the latter were naturally always regarded as wiser than the inventors of the former, because their branches of knowledge did not aim at utility.
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> Hence when all such things had been already provided, the sciences which do not aim at giving pleasure or at the necessities of life were discovered, and first in the places where man first began to have leisure. This is why the mathematical sciences were first founded in Egypt; for there the priestly caste was allowed to be at leisure.[9]

[8] οὗπερ α (Jaeger, Primavesi); οὗ πρῶτον β (Ross).
[9] Tr. by Ross 1928, modified.

The primary purpose of Aristotle's argument in the cited passage is clear: he attempts to prove that the repute of knowledge as wisdom increases as utility diminishes. The inventor of τέχνη, practical knowledge, in medicine for instance, was admired not only because his invention was useful, but also because he himself was regarded as wiser than the empirical practitioners in the same field. Later, in the process of discovering further τέχναι, both those that produce necessary things and those that produce the things that are pertinent to recreation, the inventors of the latter were in every case esteemed wiser than the inventors of the former, because the knowledge that constitutes these arts was not "for the sake of utility". Afterwards, when the crafts of both kinds had produced all things that were necessary and that were pertinent to pleasures (viz. of recreation), the sciences were invented that did not serve either utility or pleasure, viz. theoretical sciences (cf. the similar statement A 2. 982 b 22). This happened the earliest in the lands where people had leisure. Accordingly, mathematical sciences were discovered earliest in Egypt, because there leisure was granted to the class of priests.

Aristotle's reasoning on the gradual diminishing of the utility of knowledge in the course of its historical development and the simultaneous growth of its repute as wisdom is clear to this extent. It is far less obvious what he wants to say when he uses the causal term ὅθεν to connect the sentence on the invention of theoretical sciences with the previous sentence on the development of both kinds of τέχναι, those of necessary and of pleasurable things, and the repute of the latter superseding the repute of the former. Although Aristotle's commentators correctly understand the causal meaning of ὅθεν, they usually do not stop to comment on it.[10] Bonitz,[11] for instance, paraphrases Aristotle as if it is only about the temporal sequence of three kinds of knowledge and notes only the temporal posteriority of less utilitarian types of knowledge and their priority in repute. This is correct in respect to the main thrust of Aristotle's argument, but ignores the causal ὅθεν, and thus creates the impression that Aristotle takes the progress from utilitarian to pure knowledge to be natural.[12] Bonitz, however, further points out that *after* the τέχναι of both kinds have been invented,[13]

[10] See Bonitz, Ross and Reale in their translations.

[11] Bonitz 1849, 36; 44–46 ad 981 b 13.

[12] Cf. recently Mansfeld 2017, 116: "In Book A of the *Metaphysics*, physics and the first attempts at first philosophy develop in an entirely natural way out of the necessary and luxury arts that preceded them". We shall see that Aristotle's view is more complicated.

[13] Bonitz understood ἤδη πάντων τῶν τοιούτων κατεσκευασμένων as the invention of the τέχναι of both kinds (see further).

theoretical sciences originated due to leisure, like that of Egyptian priests (p. 45). He thus seems to have believed that, apart from the natural progress of knowledge, Aristotle treats the appearance of leisure for scholars as an additional or probably the decisive condition for the emergence of theoretical science. Although Bonitz was surely right in taking the development of both τέχναι and leisure as parts of Aristotle's explanation, his understanding of the roles of both is not clear enough, and is certainly partially incorrect. The other commentators of the *Metaphysics* are even less explicit on this point.

To the best of my knowledge, only W. Spoerri questioned this traditional interpretation.[14] He pointed out the significance of ὅθεν, which introduces the final stage, that of theoretical sciences (p. 62 with n. 33); this word has the causal force, but it is not clear how the invention of theoretical sciences follows from the immediately preceding statement on the gradual invention of crafts that produce necessary things and things of refinement and on the higher esteem for the inventors of the latter than of the former. Precisely for this reason, Spoerri diagnosed the distortion of Aristotle's genuine view. According to him, Aristotle's explanation of the origin of theoretical sciences has nothing to do with leisure: the real explanation is just the evolution of society, which goes through three stages: (1) securing necessary things; (2) securing the things that furnish refined pleasures; (3) after that, when all necessary things and things of comfort have been provided, people are able to devote themselves to the pursuit of non-utilitarian, theoretical knowledge. Spoerri calls this scheme (A): according to him it is contained in the condensed form in the sentence ὅθεν ἤδη πάντων τῶν τοιούτων κατεσκευασμένων αἱ μὴ πρὸς ἡδονὴν μηδὲ πρὸς ἀναγκαῖα τῶν ἐπιστημῶν εὑρέθησαν; the same concept of historical development underlies the statement at A 2. 982 b 22–25: σχεδὸν γὰρ πάντων ὑπαρχόντων τῶν ἀναγκαίων καὶ πρὸς ῥᾳστώνην καὶ διαγωγὴν ἡ τοιαύτη φρόνησις ἤρξατο ζητεῖσθαι.[15] Spoerri argued

[14] Spoerri 1985, 45–68. I use this occasion to acknowledge my debt to the learning and acumen of Walter Spoerri in this and other studies devoted to *Kulturentstehungslehren*; although I cannot agree with the extremities of his analytical approach (in the spirit of the 'analysis' as applied to Homer by the school to which Spoerri belonged), none of his painstaking studies can be neglected.

[15] Spoerri also rightly noticed that given the parallel of 982 b 22–25, τῶν τοιούτων at 981 b 21 refers not to the crafts that produced necessary things and those that produced refinement (as Bonitz and most other commentators understood this), but these two kinds of things themselves. In fact, Aristotle normally uses κατασκεάζειν for equipping with something (Bonitz 1870, 374 f.), not for inventing something (Ross' "Hence when all such inventions were already established" is an unhappy compromise between these two options; Cambiano 2012 follows Ross).

that this scheme was inserted in the *Met*. A 1–2 from another context, probably from a different treatise by Aristotle;[16] ὅθεν accordingly lost its antecedent, and it now refers meaninglessly back to the idea that the people esteemed the inventors of the crafts of embellishment more than of those that produced vitally useful things. The latter corresponds to the genuine purpose of Aristotle's reasoning in A 1–2, viz. to demonstrate the gradual development of the concept of wisdom in the history of humanity, in order to prove that all people, without being aware of this, associate wisdom with the science of first causes. For this purpose, Aristotle built his scheme A: as the σοφοί were regarded (1) the inventor of the τέχνη as compared with perceptual knowledge; (2) the inventors of the crafts of embellishment as compared with the crafts of necessary things; (3) the inventors of theoretical knowledge. However, instead of introducing this third stage – now the inventors of theoretical sciences are admired as wise – Aristotle or a redactor of his text substituted it with the third stage of the scheme B – when all necessary things and things of comfort have been provided, people are able to devote themselves to the pursuit of non-utilitarian theoretical knowledge.[17] According to Spoerri, there are further signs of awkward compilation in that passage. Thus, the mention of leisure is superfluous, because providing necessary things and things of comfort is sufficient for the development of theoretical knowledge.

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[16] Throughout his paper, Spoerri treats *Met*. A 1–2 as non-homogenous text, but leaves the question open whether this is a feature of Aristotle's original version or a result of later editorial additions (see p. 67 f.); at p. 54 n. 19, he cites the scholars who believed that Aristotle draws on one of his published treatises, the *Protrepticus* or *On Philosophy*, for the Kulturentstehunglehre of the *Met*. A 1–2, but does endorse such views.

[17] According to Spoerri 1985, 53–62, the whole section 981 b 13–25 is something alien to the preceding reasoning, since it changes the perspective: up to this point, Aristotle depicted the scale of mental activities in a systematic way, and now he switched to a historical treatment of human knowledge under the aspect of its growing autotelic feature ('Selbstzweckhaftigkeit'), as is reflected in the change of meaning of the σοφός; the gradation of knowledge according to apprehension of the higher causes that dominated previously now disappears. In fact, the alleged change of perspective at 981 b 13 is illusory. Already at 981 a 5–12, the difference between ἐμπειρία and τέχνη was treated from the historical point of view. Further, according to 981 b 13–16 (the beginning of allegedly different treatment), the first inventor of τέχνη was esteemed higher ("more wise") than representatives of experience in the same field, in accordance with the preceding reasoning, viz. not only because his achievement superseded the previous empirical stage in utility, but also since it entailed the cognition of causes (cf. 981 a 24–30): οὖν at 981 b 13 clearly has both resumptive and inferential force; it connects this piece with the preceding reasoning, interrupted by the parenthesis 981 a 30 – b 13, and introduces the inference.

This attempt to reappraise the classic text is interesting in its diagnosis of difficulties, but the proposed solution – its dissolving into heterogeneous pieces – does not hold up to examination. In order to see what is wrong with charging Aristotle or his redactor with such a contamination of heterogeneous concepts, let us see why it is not reasonable to ascribe to Aristotle Spoerri's 'scheme A', viz. the idea that theoretical sciences owe their origin to the satisfaction of material needs both necessary and luxurious. Let us look first at the theories that, according to Spoerri, anticipate Aristotle's explanation. Thus, Democritus claimed that the arts like music were invented at a later stage of development, because they do not arise from necessity, but from superfluity.[18] In the *Republic* (2. 372 e – 373 e), Plato assigns the origin of the 'fine arts' to that stage of development when the vital material needs (vegetarian food, primitive clothes and shoes, undecorated houses) have been satisfied due to the appearance of the corresponding skills and division of labour (the 'city of pigs'); one only entertainment of leisure at this stage are non-professional hymns to the gods; but desires for more expensive things now begin to develop in some people who now wish more luxury furniture, food, clothes and shoes, and also painting, sculptures and embroidery to decorate their houses, and further arts that are pertinent to luxurious and refined life – hunting, dancing, music, poetry with its performers, rhapsodes and actors etc. In a less moralistic vein, in the later *Critias* (110 a), Plato related the origin of the fine arts to the stage at which the elementary material needs have already been satisfied: after the destruction of civilisation by the recurrent cataclysm, development always starts from scratch; over the course of many generations, people are motivated to engage in occupations that are indispensable for survival, and only much later, together with attaining leisure, do the myths, viz. epic poetry, appear together with interest in the events of the past.[19]

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[18] See 68 B 144 DK (from Philodemus, *On Music*), with improvements on Philodemus' text as proposed by Delattre–Morel 1998, 21–24, and further by Hammerstaedt 1998, cf. Menn 2015, 17. Note that Democritus' theory does not necessarily imply a flourishing society with its leisure class as a precondition for the development of fine arts; his statement may concern only the origin of music and similar arts at the stage when the most urgent needs are satisfied by already invented primitive agriculture and husbandry and when people have pauses for recreation; this stimulates the invention of skills for entertainment, as according to Plato's earliest 'city of pigs' and Epicurean theory in Lucr. 5. 1379–1411.

[19] The primary purpose of this note of Plato's is to explain why there is no reliable tradition about earlier events than those depicted in epic poetry, viz. about the previous, pre-cataclysmic civilisation and the cataclysm that destroyed it. I return later to this piece's alleged relevance to Aristotle' concept of leisure in *Met*. A 1.

Both Democritus and, more definitely, Plato thus formulate the general pattern that civilisations follow in their development: there are kinds of knowledge and skills that are not related to elementary material needs (the fine arts among them); they emerge at a certain stage of the development of civilisation, namely when the most stringent material needs have already been satisfied. Democritus could already imply (as is assumed by the Epicurean theory that followed him) and Plato states overtly in the *Critias* that prosperity contributes to the origin of non-utilitarian skills via the appearance of leisure for non-utilitarian preoccupations, in the sense that the general level of prosperity allows people to devote time to non-profitable activities. Desires for more refined things and for more refined entertainments are taken to be inherent in human nature; they are either suppressed until the more basic material needs are satisfied or appear at the moment of their satisfaction. The internal reasons for the rise of crafts that satisfy these growing desires are not discussed: it is taken for granted that capacities to carry them out are inherent in some representatives of humankind and that these abilities develop in response to the new appetites of society.

There is also some difference between Democritus' and Plato's views on the social aspect of the origin of non-utilitarian preoccupations: Plato (less explicitly in the *Critias*, more openly in the *Republic*) treats the development of professional arts in response to the growing appetites of the elite; Democritus, to the degree that later Epicurean theory helps to restore his thought, had in view rather the origin of non-professional arts like music, singing and dancing as a means of self-delectation by a more primitive human society that has no elite yet. Aristotle duly acknowledges the inherent human capacity for artistic imitation by means of rhythm and melody in the origin of arts (*Poet*. 4) and the inherent cognitive abilities in the origin of crafts and sciences, as well as different individual gifts in all these fields. However, in the part of his theory that we are now discussing, he is more concerned with the development of professional arts, crafts and sciences, those that already overstep the level of experience, and thus is closer to Plato, having in view primarily the role of social approval in their development.

One more Platonic notion appears to be helpful for understanding Aristotle's concept: in the *Republic*, Plato points to a definite limit to what is necessary for human beings and to the group of crafts that satisfy such needs. In spite of apparent sympathy with the moderate and peaceful life that is constituted by such modest desires, Plato demonstrates his awareness that people would be never satisfied with the level of prosperity that such crafts provide and will crave luxury and refinement and the corresponding crafts and arts that produce them. The notion of limit, how-

ever, is helpful in demarcating which desires go beyond necessity, which are the crafts and arts that satisfy these excessive desires and what kind of state corresponds to these occupations and corresponding representatives of them (the 'feverish city' versus the primitive 'city of pigs').[20]

Aristotle himself takes recourse to this kind of historical pattern when explaining the general tendencies of historical development, both of human needs and of the discoveries that satisfy them (*Pol.* 7. 10. 1329 b 25–31):

> σχεδὸν μὲν οὖν καὶ τὰ ἄλλα δεῖ νομίζειν εὑρῆσθαι πολλάκις ἐν τῷ πολλῷ χρόνῳ, μᾶλλον δ᾽ ἀπειράκις. τὰ μὲν γὰρ ἀναγκαῖα τὴν χρείαν διδάσκειν εἰκὸς αὐτήν, τὰ δ᾽ εἰς εὐσχημοσύνην καὶ περιουσίαν ὑπαρχόντων ἤδη τούτων εὔλογον λαμβάνειν τὴν αὔξησιν· ὥστε καὶ τὰ περὶ τὰς πολιτείας οἴεσθαι δεῖ τὸν αὐτὸν ἔχειν τρόπον.

Like Plato, he takes it for granted here that society's primary needs are limited and that, when they are satisfied, both society's desires and its intellectual efforts would turn to the pursuit of what is "pertinent to decorum and abundance" in the new direction of the constituents of a refined mode of life.

To sum up, neither Democritus (at least as far as Philodemus' citation implies) nor, more definitely, Plato or Aristotle take recourse to the satisfaction of material needs to explain the origin of theoretical knowledge. Their statements are plausible in that they rely on the observation that the society cannot allow itself more refined entertainments while it is badly in need of urgently needed things like food, protection from the cold, safety etc. Nevertheless, a theory like this cannot explain why the society that is fully equipped both with products that are vitally necessary and those that make human life refined now turns to the pursuit of theoretical knowledge. As far as I can see, Democritus[21]

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[20] More complicated is the problem of the extent to which the ideal state should return to the mode of life of the city of pigs. The project of the Kallipolis does not present an attempt to arrest this development, but rather a proposal for the reform of the advanced society by means of restrictions placed mainly upon the ruling class; but even the life of the highest class, that of the rulers and their auxiliaries, is not meant to be reduced to the minimal desires of the 'first city'; the fine arts that were absent in the latter should be reformed but remain in the Kallipolis (401 a – 403 c) and used to educate rulers; the desires of the 'third class' would be restricted in the ideal state, but presumably it would enjoy many of luxuries of the 'feverish city'.

[21] Menn 2015, 17–22, ascribes to Democritus the idea of the third stage of development, that of discoveries of causes "that explain the practices of both necessary and superfluous arts", and connects this with Aristotle's three stages in *Met*. A 1. Such discoveries correspond to what Democritus actually did, according to Menn's penetrating analysis, like his optics-based explanation of the illusion of three-dimen-

and Plato[22] did not attempt to give an explanation of the origin of theoretical knowledge in historical terms.

Thus the omission of 'scheme A', which Spoerri regarded as a sign of contamination, seems to be, on the contrary, a part of Aristotle's explanatory strategy: he is well aware of the validity of the principle "first necessity, then pleasure", but he does not make the next step to argue that the satisfaction of desires pertinent both to necessary needs and to refinement leads to pursuit of theoretical knowledge.[23]

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sionality as it was achieved in practice and described in treatise by Agatharchus. Nevertheless, the question remains open whether Democritus gave such activity a place in his philosophy of history and provided explanations for its origin, as Aristotle did for theoretical sciences. That according to Menn Aristotle, like Democritus, believed "that investigating the causes of the arts also leads to causes of natural things, and in some cases we would not discover these causes apart from the arts" (p. 20), is in my view quite probable. But when he speaks about knowing the causes of what is done by crafts (980 a 30 – 981 b 6, Menn refers to this statement), he has in view only the distinction between 'architectonic' art and handicrafts in terms of the aim and general plan of doing (like that of the architect vs. that of the carpenter or mason), not the investigation of the causes of natural things as the primary purpose of theoretical knowledge.

[22] Philosophy, mathematics and other sciences are notoriously absent from the account of the growth of the feverish city in the *Republic*; nor is there any indication that their appearance somehow corresponds to inborn human desires. Notice the uncertainty in the *Statesman* (272 b–d) whether philosophy existed in the era of the rule of the god in the myth, when humankind enjoyed an extraordinary natural environment, peace and the absence of any manual labour: it implies that lack of material need and leisure all day are neither sufficient nor probably the optimal condition for the emergence of theoretical knowledge. On the other hand, unlike the useful crafts, its existence is not denied – utilitarian knowledge is thus not necessary for the development of philosophy.

[23] The *Kulturentstehungslehre* in Iamblichus, *De comm. math. sc*. p. 83. 6 = fr. 8 Ross, which refers to the same three stages of development as *Met*. A 1–2, was often regarded as s return to Aristotle's *Protrepticus* or *On Philosophy* and regarded as a sort of auto-citation in the *Metaphysics* (see Spoerri 1985, 57 n. 26; Zhmud 2006, 52 n. 34 on scholarship; Zhmud himself regards the piece as Aristotelian, 35 n. 59, 211 nn. 214, 218; 212 n. 225, and Menn 2015, 21 n. 26; see also Primavesi 473 ad *Met*. A 2. 982 b 23; Spoerri is more cautious): Νεώτατον οὖν ὁμολογουμένως ἐστὶ τῶν ἐπιτηδευμάτων ἡ περὶ τὴν ἀλήθειαν ἀκριβολογία. μετὰ γὰρ τὴν φθορὰν καὶ τὸν κατακλυσμὸν τὰ περὶ τὴν τροφὴν καὶ τὸ ζῆν πρῶτον ἠναγκάζοντο φιλοσοφεῖν, εὐπορώτεροι δὲ γενομένοι τὰς πρὸς ἡδονὴν ἐξειργάσαντο τέχνας, οἷον μουσικὴν καὶ τὰς τοιαύτας, πλεονάσαντες δὲ τῶν ἀναγκαίων οὕτως ἐπεχείρησαν φιλοσοφεῖν. Since Iamblichus does not mention leisure in this context, he creates the impression that, in *Met*. A 1, leisure is either equivalent to Iamblichus' state of prosperity, which is wrong, or even alien to the context (Spoerri). But of course, even if this passage went back to Aristotle, it would be no guarantee that leisure did not play a role in the treatise by Aristotle that Iamblichus draws on. However, I hope to show elsewhere that evidence for ascribing

Now, Spoerri is surely right to stress the causal force of ὅθεν at 981 b 20, which was usually neglected, but is mistaken when he treats it as a sign of a distortion of the original context. Cambiano's recent attempt to deal with this problem is also not acceptable: he supposes that according to Aristotle, τέχναι provided the necessary conditions of leisure having satisfied necessary needs.[24] This ignores that πάντων τῶν

Iamblichus' piece to Aristotle is weak and that it rather looks like a contaminated paraphrase of Plato's and Aristotle's passages on cataclysms and the development of civilisation, including those in *Met*. A 1–2 (for the similar origin of reasoning on five kinds of wisdom in Philoponus' *In Nicom. Isag*. 1. 1, which was also treated as Aristotle's fragment, *De philos*. fr. 10 Ross, and other similar 'developmental' accounts in Aristotle's commentator see Haase 1965; Hutchinson–Johnson 2005, 201 f. rightly exclude chapters 26–27 of *De comm. math. sc.* from their reconstruction of Aristotle's *Protrepticus*). For the present purpose, I content myself with a possible indication that Iamblichus' passage is a paraphrase of *Met*. A 1–2. Although Iamblichus assigns to the first stage the acquisition of necessary things and to the second the development of arts aiming at pleasure, he unexpectedly connects the appearance of theoretical knowledge with an abundance of necessary things, not with an abundance of both necessary and pleasurable ones. This awkwardness can be explained by the text of *Met*. A 2. 982 b 22–24, as transmitted by the manuscripts: σχεδὸν γὰρ πάντων ὑπαρχόντων τῶν ἀναγκαίων καὶ πρὸς ῥᾳστώνην καὶ διαγωγήν ἡ τοιαύτη φρόνησις ἥρξατο ζητεῖσθαι. Although the text certainly implies two categories of goods – τὰ ἀναγκαῖα and τὰ πρὸς ῥᾳστώνην καὶ διαγωγήν (cf. *Met*. A 1. 981 b 17–25) – it can also be taken as relating to τὰ ἀναγκαῖα to πρὸς ῥᾳστώνην καὶ διαγωγήν. It thus appears that Iamblichus understood the syntax according to the latter option and employed τὰ ἀναγκαῖα in the wider meaning of things useful both for survival and for leisure entertainments. Proclus, *in Eucl*. p. 29. 1–3 Friedlein, too, associates the invention of mathematics with the provision of necessary things, apparently following here Iamblichus (on Proclus' drawing on Iamblichus' *CMS* in his *Commentary*, see Mueller 1987, esp. 335–338). Jaeger emended the text, adding τῶν before πρός (Jaeger 1917, 495; 1960, 488; 1957; see also Spoerri 1985, 56 n. 25, who approves this emendation; Primavesi 2012, 473 follows Jaeger). Although Jaeger's emendation is correct to the sense, there is some doubt that it is necessary, because Aristotle sometimes omits the article with the second member (Bonitz 1870, 109 b 44–56). Jaeger pointed in favour of his emendation to Alexander (*in Met*. p. 16. 21 ff. Hayduck), who in his paraphrase opposes τὰ ἀναγκαῖα and τὰ πρὸς ῥᾳστώνην. However, immediately afterwards, Alexander uses τὰ ἀναγκαῖα in a relative sense and connects it with πρὸς διαγωγὴν (apparently in a general sense of 'life course'): δῆλον ὡς ἐπ᾽ οὐδενὸς ἀναγκαίου τῶν πρὸς διαγωγὴν τοῦ βίου συντελούντων εὑρέσει τὴν ζήτησιν ἐποιοῦντο. Asclepius (*in Met*. p. 20. 17–19 Hayduck) cites Aristotle's text with τῶν before πρός, but this does not necessarily mean that he had the corresponding version of the text. Thus, against Jaeger, who used Iamblichus' passage as evidence in favour of his emendation, it rather serves as a testimony of the text as transmitted by the manuscript tradition.

[24] Cambiano 2012, 35 n. 65: ὅθεν "has primarily a temporal sense, but means also that *technai* were necessary conditions for the development of sciences, inasmuch as the acquiring of *schole*… requires that almost [all?] the primary needs have been met

τοιούτων κατεσκευασμένων refers to satisfaction with products of both kinds of τέχναι, those of necessary things and of pleasurable ones (this is further confirmed by *Met*. A 2, σχεδὸν γὰρ πάντων ὑπαρχόντων τῶν ἀναγκαίων καὶ πρὸς ῥᾳστώνην καὶ διαγωγὴν ἡ τοιαύτη φρόνησις ἤρξατο ζητεῖσθαι). It is also not correct to treat the leisure of priests simply as the result of economic prosperity, as we shall see.[25]

The causal connection between Aristotle's two statements is in fact plain enough. He points to the *social* precondition for the emergence of theoretical knowledge – the gradual growth of appreciation of less and less utilitarian kinds of knowledge in the course of social development. The first inventor of τέχνη (apparently of the craft that produces something of vital necessity for humankind) was admired not only for the utility of this invention, but also for the intrinsic value, the 'wisdom' of this achievement. Aristotle's point is that even at the stage when the pursuit of knowledge was inevitably utilitarian, the knowledge was nevertheless appreciated, in part for its intrinsic value. As the example from medicine shows, while experience collects the multitude of instances of successful cases of medical treatment (and, presumably, unsuccessful cases, too), the progress from experience to τέχνη consists in grasping those universals that explain why a particular medicine helped a number of patients who suffered from a certain disease: they all belong to the types with the prevalence of phlegm or black bile, who suffer from καῦσος, a kind of fever (981 a 7–12). The invention of τέχνη entails the discovery of a number of such causal explanations, and, although some of them could be useful, the inventor was admired also because the set of knowledge he discovered superseded in value the earlier experience: this was the case because people esteem knowledge of causes as wiser than knowledge of

by means of useful *technai*". In fact, the primary meaning of ὅθεν is not temporal, but local, pointing to the origin – 'whence', 'from which' or 'from whom'; the causal meaning develops most naturally locally, as in English 'whence' (see LSJ, s. v. II); the employment of ὅθεν in both local and causal meanings is well attested in Aristotle's treatises.

[25] It appears that Cambiano takes the main sentence (ὅθεν αἱ μὴ πρὸς ἡδονὴν μηδὲ πρὸς τἀναγκαῖα τῶν ἐπιστημῶν εὑρέθησαν) as describing the effect of the *genetivus absolutus* sentence (ἤδη πάντων τῶν τοιούτων κατεσκευασμένων). It would be possible, if it were not anaphoric ὅθεν in the beginning of the main sentence, which refers primarily to the effect of what is described by the preceding sentence; the *gen. abs.* sentence should be taken only as a subsidiary condition or as a temporal reference. The rise of theoretical sciences is thus primarily the result of the appearance of crafts of two kinds, crafts that provide necessary things and those that provide pleasures, and the greater repute of the inventors of the latter crafts. The *gen. abs*. sentence refers, accordingly, only to the additional cause.

facts, and also because τέχνη can be transmitted by way of teaching, while experience cannot.[26]

After that, more and more crafts were invented, those that are 'for necessary things' (πρὸς τἀναγκαῖα) and those that are πρὸς διαγωγήν. The inventors of the latter kind of crafts were invariably esteemed as 'wiser' than those of the crafts for necessary things, because knowledge of crafts for luxuries was less utilitarian (981 b 17–20). Scholars understood this statement in two different ways, although the difference was not explicitly articulated: either Aristotle opposes to the crafts producing things that satisfy absolutely urgent needs those that discriminately furnish all that is pertinent to civilised and flourishing life, i.e. arts that produce refined food, wine, furniture, houses and those that serve for amusement, like painting, sculpture, music and literature,[27] or alternatively he opposes to the crafts of the first kind more narrowly only the last mentioned crafts that are pertinent for entertainments of leisure, the 'fine arts'.[28] In favour

[26] Aristotle assumes that the evaluation of the intrinsic merits of τέχνη in his time was valid also in the time of its origin. The ground for this belief is not only the implied constancy of human nature, but may be even more his explicit statement that the bearers of causal knowledge are not necessarily more practically successful than purely empirical practitioners (981 a 12–24): medical craft in his time often appears not to supersede experience in practice, because it is possible to know the universal rules of craft but to commit mistakes due to lack of experience, viz. because one does not recognize in individual patients or individual symptoms the general types as grasped by the craft. On the contrary, the experienced practitioner is successful because, without knowing universals, he possesses in memory a great number of successful treatments of certain individuals: I take it that he keeps in memory (or in written form) the individual cases with the individual features of cured patients and the symptoms of their diseases and thus can recognise the next patient with those features and symptoms, to whom a given medicine will be helpful or not. Of course, the first inventor of the craft, unlike its later "school" connoisseurs, was himself a very experienced person. Nevertheless, the first generalizations of the craft he invented were obviously few (see below Aristotle's statement on the difficulty of the initial phase in every τέχνη and on its modest character), and thus could not change considerably the character of medical treatment and could not change seriously the character of treating patients. Thus, as he saw it, the fact of progress in explanatory knowledge itself, in spite of the originally insignificant practical results it provided, especially in the beginning, pointed to its acknowledgement and encouragement by other people.

[27] This understanding of πρὸς διαγωγήν definitely prevailed, see Bonitz 1849, 45 ("vitae cultu[s] and quaecumque ad voluptatem et oblectationem…pertinent"); 1890 "für den Genuß des Lebens"; Taylor 1907, 71 ("social refinements"), Spoerri 1985, 55 ("die einen verfeinertem Lebensgenuss dienenden [*technai*]", Cambiano 2012, 34: "dimensions of human life that develop beyond mere survival".

[28] Ross 1953, I, 118: "almost = fine arts"; "arts… directed… to recreation", in his translation; see also Zhmud 2006, 211.

of the first understanding is the description of the same crafts in the next sentence as those 'for pleasure' (ὅθεν ἤδη πάντων τῶν τοιούτων κατεσκευασμένων αἱ μὴ πρὸς ἡδονὴν μηδὲ πρὸς ἀναγκαῖα τῶν ἐπιστημῶν εὑρέθησαν), and the already cited passage from the *Politics* with the opposition of the necessary inventions and those that furnish all that constitute 'decorum and abundance'.[29] It would also be in accord with Plato in the *Republic*, who opposes the earlier developed skills that satisfy the most urgent needs to the crafts, both of luxury and fine arts, that appeared together with the grown desires (see above).

But these considerations do not outweigh the decisive one: the word διαγωγή by itself in Aristotle's works never refers directly to something like 'luxurious or civilised life' or the pleasures of such life. Aristotle uses this word sometimes in the neutral meaning of 'a way of life', 'spending time' (*HA* 534 a 10 f.; 589 a 16 f., on ways of life and habitats of animals); but more often, even when the word is modified by an adjective, participle or adverbial expression, it is used in contexts in which it refers to time free of necessary activities.[30] The absolute employment of διαγωγή, as in *Met*. A 1. 981 a 18 and 2. 982 b 23, occurs elsewhere only in the *Politics*, and here it refers invariably to 'time free of political duties or private business' or 'activities that fulfil such a time'.[31] The importance of this

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[29] *Pol*. 7. 10. 1329 b 27–28: τὰ μὲν γὰρ ἀναγκαῖα τὴν χρείαν διδάσκειν εἰκὸς αὐτήν, τὰ δ᾽ εἰς εὐσχημοσύνην καὶ περιουσίαν ὑπαρχόντων ἤδη τούτων εὔλογον λαμβάνειν τὴν αὔξησιν, cited by Spoerri 1985, 57 as the direct parallel. Cf. also *Pol*. 4. 4. 1291 a 2–4 on two kinds of crafts that are indispensable for the polis: δεύτερον δὲ τὸ καλούμενον βάναυσον (ἔστι δὲ τοῦτο τὸ περὶ τὰς τέχνας ὧν ἄνευ πόλιν ἀδύνατον οἰκεῖσθαι· τούτων δὲ τῶν τεχνῶν τὰς μὲν ἐξ ἀνάγκης ὑπάρχειν δεῖ, τὰς δὲ εἰς τρυφὴν ἢ τὸ καλῶς ζῆν).

[30] Οὔσης δὲ καὶ ἀναπαύσεως ἐν τῷ βίῳ, αἰ ἐν ταύτῃ διαγωγῆς μετὰ παιδιᾶς, *EN* 4. 14. 1127 b 34 f.; καταφεύγουσι δ᾽ ἐπὶ τὰς τοιαύτας διαγωγὰς τῶν εὐδαιμονιζομένων οἱ πολλοί, διὸ παρὰ τοῖς τυράννοις εὐδοκιμοῦσιν οἱ ἐν ταῖς τοιαύταις διαγωγαῖς εὐτράπελοι, 10. 6. 1176 b 12–14 (on pleasant amusements, παιδιαί); οὐ γὰρ ἐν ταῖς τοιαύταις διαγωγαῖς ἡ εὐδαιμονία, ἀλλ᾽ ἐν ταῖς κατ᾽ ἀρετὴν ἐνεργείαις, on corporeal pleasures, 1177 a 9–11; δοκεῖ γοῦν ἡ φιλοσοφία θαυμαστὰς ἡδονὰς ἔχειν καθαρειότητι καὶ τῷ βεβαίῳ, εὔλογον δὲ τοῖς εἰδόσι τῶν ζητούντων ἡδίω τὴν διαγωγὴν εἶναι, 10. 7. 1177 a 25–27; λείπεται τοίνυν πρὸς τὴν ἐν τῇ σχολῇ διαγωγήν, *Pol*. 8. 1. 1337 a 21 f. on the purpose of musical education).

[31] χρήσιμοι δὲ τῶν ἀρετῶν εἰσι πρὸς τὴν σχολὴν καὶ διαγωγὴν ὧν τε ἐν τῇ σχολῇ τὸ ἔργον καὶ ὧν ἐν τῇ ἀσχολίᾳ, *Pol*. 7. 15. 1334 a 16–18; ὥστε φανερὸν ὅτι δεῖ καὶ πρὸς τὴν ἐν τῇ διαγωγῇ σχολὴν μανθάνειν ἄττα καὶ παιδεύεσθαι, 8. 3. 1338 a 21–22; ἢ πρὸς διαγωγήν τι συμβάλλεται καὶ πρὸς φρόνησιν (καὶ γὰρ τοῦτο τρίτον θετέον τῶν εἰρημένων), 8. 4. 1339 a 25–26; ἡ δὲ πρώτη ζήτησίς ἐστι πότερον οὐ θετέον εἰς παιδείαν τὴν μουσικὴν ἢ θετέον, καὶ τί δύναται τῶν διαπορηθέντων τριῶν, πότερον παιδείαν ἢ παιδιὰν ἢ διαγωγήν. εὐλόγως δ᾽ εἰς πάντα τάττεται καὶ φαίνεται μετέχειν. ἥ τε γὰρ παιδιὰ χάριν ἀναπαύσεώς ἐστι,

concept for Aristotle's political ideal is well known, and its relevance for his reasoning in the *Met*. A 1–2 will be discussed in the next section, but it is appropriate to warn here against associating the word with leisure as a part of Aristotle's political ideal.[32] More relevant are the contexts in which Aristotle speaks about leisure as the result of economic and social prosperity and peace (see e.g. *Pol*. 7. 1326 b 31; 8. 1341 a 28).

The arts that are pertinent to διαγωγή are thus not ones that produce objects of luxury and fine arts, but more specifically 'fine arts' for the amusements of leisure.[33] The crafts that provide comfort (on which see above n. 29) are probably not mentioned in this context because they less vividly demonstrate the advance to non-utilitarian knowledge. That this is about the invention of 'fine arts' like music, literature etc., not about crafts of luxury, may explain Aristotle's otherwise strange characteristic of these arts as 'not for use' (διὰ τὸ μὴ πρὸς χρῆσιν εἶναι τὰς ἐπιστήμας αὐτῶν).[34] Strictly speaking, this is not correct: Aristotle further notes that

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τὴν δ' ἀνάπαυσιν ἀναγκαῖον ἡδεῖαν εἶναι (τῆς γὰρ διὰ τῶν πόνων λύπης ἰατρεία τίς ἐστιν), καὶ τὴν διαγωγὴν ὁμολογουμένως δεῖ μὴ μόνον ἔχειν τὸ καλὸν ἀλλὰ καὶ τὴν ἡδονήν, 8. 5. 1339 b 11–19. This absolute usage in the narrow meaning of leisure time seems to be specifically Aristotelian: in the earliest attested instances of the noun διαγωγή (Eur. fr. 1117. 1 Nauck² [dubium]; Plato; Isocr. *ep*. 4. 2), it is used only in the neutral meaning of a mode of life or a certain way of spending time or behaviour. The verb διάγω with αἰῶνα, βίον etc. is attested much earlier, see LSJ sub v. II (*H. Hom*. 20. 7, Aeschylus, Sophocles, etc.)

[32] It is not quite correct that the meaning of the word in general is, as Schütrumpf 2005, 501 puts it, 'sinnerfüllte Lebensgestaltung'; rather this is the pregnant meaning that Aristotle in time assigns to it, when he discusses the leisure of the ruling class in his ideal state in *Politics*, Books 7–8.

[33] The later implicit description of these crafts as those that produce what is pertinent πρὸς ῥᾳστώνην καὶ διαγωγὴν (2. 982 b 23) is not very helpful, because ῥᾳστώνη is ambiguous and can mean making life or some activities easier and thus imply the crafts that produce technical improvements or objects of comfort ('the things that make for comfort and recreation', Ross), but it can also mean 'relief from activities', 'rest', and imply the arts that provide leisure entertainments. Aristotle uses ῥᾳστώνη in both of these senses (see *De inc. an.* 713 a 21, *Pol.* 1256 a 26 for the former, and *DC* 284 a 29–32; cf. fr. 197 Rose = fr. 159 Gigon = Porph. *VP* 42). Jaeger 1910, 495 and 1957, ad loc. took it as virtually synonymous with διαγωγή, which he correctly understood as rest from business activities. In fact, the absolute employment of ῥᾳστώνη favours the latter meaning, and the pair presumably means something like 'rest and the accompanying leisure activities'.

[34] Both the designation of these arts as pertinent to διαγωγή and as not pertinent to χρῆσις confused Alexander of Aphrodisias, who supposed that Aristotle was already speaking about theoretical sciences; he thus had to assume that Aristotle did not explicitly mention the arts that produce pleasure, and he (tacitly) assumes Aristotle is speaking of the arts 'of necessary things' (δείκνυσι τὴν ἐπὶ τὴν σοφίαν καὶ τὴν τελειοτάτην γνῶσιν ὁδόν, καὶ πῶς παρῆλθεν εἰς ἀνθρώπους ἡ σοφία

the fact that the pursuit of theoretical knowledge did not begin until what is pertinent to necessity and to leisure entertainments had been already provided proves that theoretical knowledge does not serve any practical need (φανερὸν ὅτι διὰ τὸ εἰδέναι τὸ ἐπίστασθαι ἐδίωκον καὶ οὐ χρήσεώς τινος ἕνεκεν, 2. 982 b 22–25). Moreover, in the present context, he immediately adds that the fine arts serve 'pleasure'. The fine arts thus cannot be considered 'useless' *tout sens*, but Aristotle's point is that they are appreciated not primarily for the utility they produce, viz. not in respect of the quantity of pleasure, but for the skill ('knowledge') that is applied. They thus come closer to theoretical sciences than the crafts for necessary things in terms of the intrinsic value of knowledge involved.

The 'competition' between the inventors of two kinds of arts demonstrates that the intrinsic value of knowledge grows as its practical utility diminishes. This appears to be the causal link that connects the development of two kinds of crafts (which are both 'productive' in Aristotle's strict sense) with the origin of theoretical sciences: hence, Aristotle says, due to this growing esteem for knowledge for its own sake, even at the stage when all knowledge is still productive, at a certain point when all things pertinent either to necessary needs or to entertainment and pleasure had been provided, theoretical sciences were invented, and this happened for the first time in Egypt.[35] Aristotle thus uses the repute of the inventors of the fine arts as part of his historical explanation of the origin of theoretical

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καὶ ἡ τῶν τιμιωτάτων ζήτησίς τε καὶ θεωρία, ὅτι μετὰ τὴν τῶν ἀναγκαίων καὶ χρειωδῶν εὕρεσιν περιττότερόν τι καὶ ἐλεύθερον ἤδη νοεῖν σχολαζόντων τῶν ἀνθρώπων. τὰς δὲ τῶν ἡδέων ποριστικὰς τέχνας καὶ αὐτὰς ταῖς χρειώδεσιν ἐγκατατάττει· ὡς γὰρ δεόμενοι καὶ χρείαν ἔχοντες ἡδονῶν τε καὶ ἀναπαύσεως τὰ ποιητικὰ αὐτῶν ἐζήτουν). Alexander nevertheless rightly takes πρὸς ῥᾳστώνην καὶ διαγωγήν (2. 982 b 23) as related to the arts 'for pleasure', viz. for recreation, and thus understands διαγωγή differently in the second instance. Schwegler 1847, 19 f. attempted to 'improve' this inconsistency and argued that πρὸς ῥᾳστώνην καὶ διαγωγήν does not refer to πάντων ὑπαρχόντων, but to ἡ τοιαύτη φρόνησις, viz. to theoretical knowledge, but Bonitz rightly refuted this. At 981 b 20 f. πάντων τῶν τοιούτων κατεσκευασμένων, which precedes the invention of theoretical sciences, clearly refers both to crafts that produce necessary things and to those that are pertinent to διαγωγή; thus, πάντων ὑπαρχόντων τῶν ἀναγκαίων καὶ πρὸς ῥᾳστώνην καὶ διαγωγήν should have the same meaning.

[35] Aristotle is also well aware elsewhere that the development of crafts and sciences entails both the existence of individuals with the corresponding gifts and society's approval of their efforts. When explaining the development of the art of poetry, he points not only to the extraordinary mimetic capacities of humankind (this is crucial for the origin of literature and the arts), but also to the inherent pleasure that human beings experience when they observe others' mimetic actions, recognising who and what is imitated (this is crucial for the stimulation and progress of arts), see *Poet*. 4. 1448 b 4–8, 20–24 for the first and b 8–19 for the second.

sciences: the admiration for the inventors of these arts, which exceeds that for the inventors of the crafts of necessary things, demonstrates human society's growing appreciation of less utilitarian knowledge and of course its readiness to support materially those who further advance these arts. This prepares the decisive step: the society is now ready to support the development of theoretical knowledge, which is even less useful than the 'fine arts'.

Now let us look at another important element of Aristotle's explanation, the notion of limit. In the passage of the *Politics* 7. 10. 1329 b 27 ff. cited above, Aristotle refers to the limit of society's satisfaction with necessary things; when it has been attained, intellectual efforts were naturally directed at things that serve refinement and the moral improvement of social life.[36] The same notion of limit underlies his statement in the *Met*. A 1: the invention of the fine arts was posterior to the invention of crafts for necessary things and the higher repute of the first was natural, because the need for necessary things had already been satisfied by the second.[37] More definitely, Aristotle points out that theoretical sciences were invented when all 'such things', viz. what was pertinent to the necessities of life and to leisure recreations, had already been provided by the two corresponding kinds of crafts.

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[36] In the *Poetics* 4, Aristotle uses a similar explanation for the advance of the dramatic genres: after the genres of tragedy and comedy became distinctive, as opposed to the earlier non-professional improvisations in both (dithyrambs and phallic songs), the professional poets of the earlier genres of epos and iambic poetry now 'rushed' to the new genres, in correspondence with their natural gifts, because these new genres were on a larger scale and *more prestigious* than the earlier ones (1449 a 2–7).

[37] Spoerri 1985, 57 f. supposed that, in *Met*. A 1 (differently from the *Politics*), Aristotle has in mind the synchronous development of two kinds of *crafts* pointing to the present participles and especially to ἀεί, which seems to imply 'competition' between the inventors in these two categories in one and the same epoch (πλειόνων δ᾽ εὑρισκομένων τεχνῶν καὶ τῶν μὲν πρὸς τἀναγκαῖα τῶν δὲ πρὸς διαγωγὴν οὐσῶν, ἀεὶ σοφωτέρους τοὺς τοιούτους ἐκείνων ὑπολαμβάνεσθαι διὰ τὸ μὴ πρὸς χρῆσιν εἶναι τὰς ἐπιστήμας αὐτῶν). However, it is not credible that Aristotle should ascribe the higher repute of non-necessary inventions to the time when the need for necessary things was not yet satisfied. Rather, the present participles are used to emphasise the overall continuity of the process of inventions of both kinds; and ἀεί looks like Aristotle's idiomatic term, which he often uses in general statements when comparing the relative qualities of two objects (see Bonitz 1875, 11 a 42). The evidence for this statement on the relative reputation of the inventors of two kinds of crafts is of course the then-current reputation of their practitioners (the sentence depends on τὸ εἰκός 981 b 13, like the preceding one, on the reputation of the first inventor of any craft as opposed to empirical practitioners, which is also the inference from the then-current state of affairs).

Aristotle recapitulates this thought in his discussion of the distinctive features of wisdom that is unconsciously pursued by all of humankind. This, he argues, should be the science of first principles, viz. the 'first philosophy' or metaphysics. He adds that this science is not a 'productive' science (982 b 11), and this feature is in accord with the universal but vague notion of 'wisdom' as knowledge that is sought for its own sake and not for its products (see 982 a 14–16). To prove this, he refers to the problems that were attacked by 'the first who philosophized', i.e. by the first theoretical scientists:[38] these were at first quite ordinary problems (πρόχειρα), but gradually the scientists advanced to the major ones, for instance they studied the causes of unusual astronomic phenomena, like eclipses, or the causes, viz. the original principles of the universe. Problems like this are not aligned to any practical need, and thus the only motive for pursuing them is the feeling of wonder at something extraordinary, which can be satisfied only by discovering the cause of such a phenomenon.

In this argument about the unproductive character of theoretical knowledge, Aristotle uses not only the main argument about its psychological roots, but also a proof 'from what had happened', viz. from history: the pursuit of theoretical knowledge started only when *all* things pertinent to need and to leisure entertainment had already been invented (*Met*. A 2. 982 b 19–28):

> ὥστ᾽ εἴπερ διὰ τὸ φεύγειν τὴν ἄγνοιαν ἐφιλοσόφησαν, φανερὸν ὅτι διὰ τὸ εἰδέναι τὸ ἐπίστασθαι ἐδίωκον καὶ οὐ χρήσεώς τινος ἕνεκεν. μαρτυρεῖ δὲ αὐτὸ τὸ συμβεβηκός· σχεδὸν γὰρ πάντων ὑπαρχόντων τῶν ἀναγκαίων καὶ πρὸς ῥᾳστώνην καὶ διαγωγὴν ἡ τοιαύτη φρόνησις ἤρξατο ζητεῖσθαι. δῆλον οὖν ὡς δι᾽ οὐδεμίαν αὐτὴν ζητοῦμεν χρείαν ἑτέραν, ἀλλ᾽ ὥσπερ ἄνθρωπος, φαμέν, ἐλεύθερος ὁ αὐτοῦ ἕνεκα καὶ μὴ ἄλλου ὤν, οὕτω καὶ αὐτὴν ὡς μόνην οὖσαν ἐλευθέραν τῶν ἐπιστημῶν· μόνη γὰρ αὕτη αὐτῆς ἕνεκέν ἐστιν.

As mentioned above, Spoerri was certainly wrong to understand this statement as similar to Plato's thought that the satisfaction of material needs is the precondition for the development of crafts of luxury or fine arts. Plato had in view the growth of desires together with the satisfaction of the most urgent needs, and it is obvious that Aristotle does not relate the pursuit of theoretical knowledge to the appearance of desire for such knowledge or for its products on the whole. Aristotle's idea can be seen in

[38] Aristotle is aware that theoretical knowledge may be practically useful, but according to him, this utility is only accidental and has nothing to do with the motives that influence the scientist in his pursuit of knowledge (the anecdote on Thales, *Pol*. 1. 11. 1259 a 5–18).

his statement on the growing repute of 'fine arts' in their competitions with crafts of necessary things: he has in view that admiration for the achievements of the former arts came naturally to an end when this field was exhausted, just as the achievements of the crafts that produced necessary things were exhausted earlier. This opens the path to admiration for and, of course, to encouragement of inventions in the next and final field of application of human cognitive capacities – theoretical knowledge of mathematics, astronomy, natural philosophy and, lastly, metaphysics.

It is important that in Aristotle's proof about the unproductive character of metaphysical knowledge, the argument 'from history' on the time when the pursuit of theoretical knowledge started is merely subsidiary to the more general psychological argument on the feeling of wonder as a psychological motive for this pursuit, which has nothing to do with any practical need. Apparently, Aristotle does not mean that this feeling did not appear in humankind until substantial progress in two earlier branches of knowledge already ceased. He definitely assigns the search for causes already to the stage of purely utilitarian knowledge, and it is clear that the discovery of explanations in medicine that marked the advance from experience to τέχνη was moved at least partially by the same feeling of wonder. The idea is rather that only at this stage could the desire to solve theoretical problems count on admiration and support from society and that this admiration and support led the pursuit of theoretical knowledge to become systematic and successful.

As is well known, Aristotle was committed to the view that development both in particular fields of knowledge and in scientific knowledge as a whole has certain limits.[39] At one point, he even states that *all* kinds of theoretical and practical knowledge attained their zenith many times, only to perish together with all of civilisation in a cataclysm (κατὰ τὸ εἰκὸς πολλάκις εὑρημένης εἰς τὸ δυνατὸν ἑκάστης καὶ τέχνης καὶ φιλοσοφίας καὶ πάλιν φθειρομένων, *Met.* Λ 8. 1074 b 10–14).[40]

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[39] See Aristotle's passages on the attainment of perfection by certain branches of knowledge and crafts in Edelstein 1967, 122–125 and Zhmud 2006, 210 n. 211.

[40] In Aristotle's usage, the plural φιλοσοφίαι means the branches of theoretical science. Edelstein 1967, 125 is certainly right that εἰς τὸ δυνατόν means 'to the utmost limit', not 'as possible'. This is suggested both by the expression itself and by the context: Aristotle here points out that tradition preserves in a dim form, disguised under mythical additions, traces of a meta-cosmic theory similar to his own, which he considers the crowning achievement in this field. The theory he detects should thus represent the almost entirely forgotten highest stage of development in the relevant field in the past. The destruction implies Aristotle's theory of periodic floods (but, contrary to Plato, affecting only limited areas of the earth and not simultaneously), which throw developed civilisations back to a primitive level (for evidence, see *Meteor*. 1. 14,

This idea of a necessary sequence of stages of intellectual development, of the limitedness of every stage and of overall development is applied in explaining the origin of theoretical sciences in the *Met*. A 1–2: progress, first in utilitarian crafts of necessary things and after that in the 'fine arts', should sooner or later attain its limit, after which no considerable improvements can be expected, and the society will then encourage the inventions that constitute theoretical sciences. This happens because the society has now been duly 'trained' to support non-utilitarian knowledge, first by appreciating the inventors of useful crafts that do not mark a considerable progress in utility in comparison with experience, and second by becoming increasingly appreciative of the inventors of fine arts, here because the intrinsic value of the involved knowledge supersedes that of utilitarian crafts.

It may seem awkward that Aristotle refers to the limit of development in the fine arts at the time when Greek arts were still intensively developing. However, he does not have in view, at least not primarily, the perspectives of the fine arts and of theoretical knowledge in Greece.[41] His aim is to

discussed in Verlinsky 2006, 51–68). The productive crafts, which are irrelevant for the context of the *Met*. Λ (only theoretical knowledge is pertinent), are mentioned because Aristotle hints at floods that *totally* destroy the civilised population of cities (but spare uneducated inhabitants of the mountains, according to the more explicit views of Plato, *Tim*. 22 d–e, *Criti.* 109 d, *Leg*. 677 b, and Theophrastus, F 184. 172–204 FHS&G; according to Aristotle, *Meteor* 1. 14. 352 a 35 – b 4, Greek civilisation developed from such mountain survivors from the previous age). The passage thus attests to Aristotle's faith in the stage of a civilisation when *all* branches of knowledge attain the limits in their development. This does not necessarily mean that Aristotle believes that a cataclysm necessarily occurs when this stage had been attained, in the way in which Plato treats cataclysms as benevolent cleansers of advanced and inevitably morally degenerated civilisations. Aristotle rather thinks that civilisations that are able to attain this stage are destined sooner or later for destruction by periodic cataclysms, and for this reason we know only of the development in our own cycle. For him, as for Plato, Egypt is a civilisation that is spared by floods and other cataclysms (its first inhabitants were not survivors of the flood, but people who gradually settled on the land yielded by the receding sea), albeit not by gradual drying up (see *Meteor*. 1. 14. 351 b 22 – 352 a 3), and thus demonstrates uninterrupted development, which, however, stopped in the remote past.

[41] One should not, however, neglect to mention that Aristotle envisages in the near future the attainment of a limit in the development of the fine arts, but the powerful progress of theoretical sciences. For some indications for this, see a lamentation of the epic poet Choerilus (fr. 2 Bernabé) that poetic art (primarily of epic poetry, of course) had already attained its limit, which Aristotle cites as an example of the *captatio benevolentiae* typical in this time (*Rhet.* 3. 1415 a 1). On Aristotle's own statement in the *Poetics* that epic and iambic genres were already abandoned by their outstanding (potential) poets, who turned instead to tragedy and comedy, see above

explain the *origin* of theoretical sciences, in the land in which they were first invented, Egypt. Aristotle thus appears to believe that the systematic pursuit of theoretical knowledge started in Egypt after the fine arts in this land had already ceased developing. The reasons for this belief can be easily presented. On the one hand, Aristotle shares the conviction of his contemporaries that Egyptian civilisation is the most ancient of all existing ones, and thus had at its disposal enormous time to develop crafts and arts (as well as to accumulate vast experience in the fields of mathematics and astronomy, which is the prerequisite for the discovery of scientific explanations in these fields).[42] On the other hand, Egyptian conservatism in various fields of culture was renowned. Plato praised the lack of novelty in Egyptian music and other fine arts (*Leg*. 656 d – 657 d, cf. 660 a 1; on strict regulations in dances and songs in honour of gods in Egypt, see also 799 a–b). A view like Plato's can be the basis for Aristotle's belief that the fine arts ceased developing in Egypt long ago, before the invention of theoretical sciences.[43]

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n. 36. But according to Aristotle, the forms of tragedy itself in his own time is no longer changing, because it has attained its 'nature' (καὶ πολλὰς μεταβολὰς μεταβαλοῦσα ἡ τραγῳδία ἐπαύσατο, ἐπεὶ ἔσχε τὴν αὑτῆς φύσιν, *Poet*. 4. 1449 a 14 f.). This concerns the formation of tragedy only as a genre and does not rule out further development (so, rightly, Edelstein 1967, 124 n. 145), but for Aristotle, the pinnacle, Sophoclean art, also already belongs to the past. Although he presumably expects that some of the generalisations of the *Poetics* may help to improve the then-present tragedies of which he is more critical (Aristotle leaves open the question whether all elements of tragedy are already perfect, 1449 a 7–9), there is no sign that he expects essential improvements from contemporary poets themselves. The same tenor is found in the statements of Aristotle's approximate contemporaries who were specialists in the τέχναι of 'necessary things'. Thus, according to Hipp. *De locis in hom*. 46 (cited by Zhmud 2006, 59), the art of medicine in general is already discovered; this of course does not imply the complete exploration of the field, but is still significant.

[42] See *Meteor*. 1. 14. 352 b 20–23 on the ancientness of Egyptian civilisation; in the *Politics*, 7. 10. 1329 b 22–31, Aristotle refers to the Egyptian division of the class of farmers from that of warriors (the caste system) as evidence of the ancientness of all useful inventions, which appear recurrently in different civilisations; the logic of his reasoning is not entirely clear, but he appears to argue from the most ancient character of Egyptian civilisation and from the changelessness of its caste system since the tradition began.

[43] As for conservatism in other fields, Diodorus of Sicily (1. 82. 3) reports on the prohibition for Egyptian physicians to depart from the rigid rules of their craft, which seems to be the standard view of ancient Egyptian medicine (and largely corresponding to reality, see von Staden 1989, 41). Aristotle cites the different opinion that it was prohibited only up to the fourth day of illness (*Pol*. 3. 15. 1286 a 9–16), as part of an argument against the domination of written laws, which he does not in general approve. This looks like an *a fortiori* argument (even in Egypt the rules are not absolutely rigid!),

3. Leisure

The prevailing view today is that Aristotle explains the appearance of theoretical sciences, both in Egypt and Greece, by the appearance of a leisure class in these countries, which arose in Egypt earlier and in Greece later. According to Guthrie, who gives a more explicit version of this view, Aristotle implies that the priests who performed the duties of scribes were released from all other obligations and thus had leisure for their scholarly occupations; the economic foundation of this freedom was the ownership of land the temples enjoyed.[44] Since Guthrie believes at the same time that Aristotle finds in Greece the same favourable conditions for the development of theoretical knowledge, he obviously assumes that leisure, which the Greek higher class enjoys, is something on a par with the imagined leisure of Egyptians priests, namely that Aristotle believes that, at a certain stage of social and economic development, the higher class or a part of it attains the possibility to pursue knowledge or to engage in other occupations that bring no utility.

It is true that such a view of the ruling class' leisure as a result of economic prosperity and peace can be found in Greek literature of the fourth century. In Plato's *Critias* (110 a), there is a reasoning, already mentioned above, that scholars usually consider an anticipation of Aristotle's view on the origin of theoretical knowledge:[45] when civilisation gradually emerges after a recurring cataclysm destroys a previous civilisation, for many generations people are engaged exclusively in occupations that are indispensable for survival and only much later, together with attaining leisure, do myths and interest in the events of the past appear. A similar concept appears in Aristotle himself, when he relates the discriminate learning of various non-utilitarian kinds of knowledge to the increasing leisure time of the ruling class after the Persian wars, due to the growth of wealth.[46] In the *Met*. A 1 itself, when mentioning the

thus rather testifying to the general opinion that Egypt was extremely conservative. Even this 'softer' version is of course a striking conservatism in comparison with Greek practice and with the way of healing that Aristotle approves of, which is reasoning from general principle to a particular case, not the rigid application of general rules (*Met*. A 1. 981 a 21–24; Z 7. 1032 b 15–23; *EN* 3. 3. 1112 b 15–20).

[44] Guthrie 1962, 35.

[45] See, most recently: Zhmud 2006, 211 n. 217, Nesselrath 2006, 151.

[46] *Pol*. 8. 6. 1341 a 28–32: σχολαστικώτεροι γὰρ γιγνόμενοι διὰ τὰς εὐπορίας καὶ μεγαλοψυχότεροι πρὸς τὴν ἀρετήν, ἔτι τε <καὶ> πρότερον καὶ μετὰ τὰ Μηδικὰ φρονηματισθέντες ἐκ τῶν ἔργων, πάσης ἥπτοντο μαθήσεως, οὐδὲν διακρίνοντες ἀλλ᾽ ἐπιζητοῦντες. The result of this obsession was the introduction of the αὐλητική in the education of the ruling class, later abandoned.

encouragement of fine arts that were pertinent to διαγωγή, certainly Aristotle has in view that Egypt at that time had already attained the stage of prosperity associated with leisure and the development of arts that are pertinent to it.

This notion of leisure should nevertheless be duly distinguished from the leisure that, in the next sentence, Aristotle assigns to Egyptian priests. Aristotle does not attribute the origin of theoretical sciences to leisure in the aforementioned sense: he says that Egypt is the country where the class of priests had been *released* to have the σχολή. This looks like a reference to a specific institution, rather than to the leisure attained naturally due to peace and economic flourishing.[47] Moreover, the Egyptian priests, unlike the leisure class in Greece, as Guthrie rightly noticed, not only attained freedom from care about their personal material needs but, apparently, also from duties like military or administrative service.

That Aristotle is thinking of a concept of leisure that differs from the leisure of the ruling class in favourable economic conditions is quite natural: he certainly recognizes that leisure of this kind arose in many countries at a certain level, but did not result in the appearance there of theoretical sciences. Like Plato, he believes that such leisure necessarily produces the encouragement of fine arts, rather than of mathematics and astronomy. Aristotle thus has in view that, next to encouragement of and support for such non-utilitarian kinds of knowledge as fine arts, the ruling class in Egypt gave its admiration and support to inventors of theoretical knowledge.

Thus it is plausible that Aristotle treats the Egyptian priests not as the earliest counterpart of the leisure class that appeared later in Greece, but rather as a special case of the encouragement society provides for the representatives of theoretical knowledge. Egypt is thus something that corresponds to what most Greek states did not have, state patronage of science, which was only partially compensated by the sponsorship of monarchs, such as Aristotle himself enjoyed in Atarneus and later at the Macedonian royal court.

This understanding of Egypt as having either unique or very rare conditions for giving birth to theoretical sciences accords better with the reading of the manuscripts of the family α of the *Metaphysics* οὗπερ (accepted by most of the editors, most recently by Primavesi), than does

[47] For the same reason, Aristotle's emphasising leisure in this statement should not be confused with Democritus' view, which was discussed above (contra Menn 2015, 21).

οὗ πρῶτον of the family β (preferred by Ross).[48] On the reading of the version α, Egypt is the place where a special kind of leisure exists.[49] Leisure in this case is not freedom from material cares that the higher class enjoys at a certain level of economic and social development, but a unique institution that releases some part of society not only from the material cares, but also from political duties, and that obliges them instead to cultivate the sciences. This provision did not exist in Greece, of course, or in most other countries, either. According to the β, Aristotle points out that mathematics were discovered in the land where leisure *first* appeared; this does not rule out the later appearance of this kind of leisure also in other countries; here, the point is only Egypt's chronological priority, which is the reason why mathematics were discovered here, although they might be discovered later in some other places. [50]

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[48] Both Ross and Jaeger used only the *Parisinus* 1853 (E) and the *Laurentianus* 87. 12 (A^b) as representatives of two families of manuscripts, α and β respectively, for this part of the text (the other independent member of α, the *Vindobonensis J*, begins only in 994 a 6). Due to D. Harlfinger's findings, nowadays eleven independent members are known for the family α and four for β, see Primavesi 2012, 398, for the stemma. Two families correspond to two different ancient versions of the text. Contrary to Jaeger, who treated them as Aristotle's own two redactions of his lecture courses, Primavesi proved that they are of a late origin, that Alexander did not know two alternative versions and that version β is influenced by Alexander. Primavesi left the question open whether version α antedates or postdates Alexander (p. 458), but, most recently, Kotwick 2016, esp. 4 f., 280, argued that Alexander's commentary influenced the version that was the ancestor of α and β and dated this ancestor version between 250 and 400 AD.

[49] Two other πρῶτον (981 b 22 and 23) are compatible with both kinds of understanding: they go with εὑρέθησαν and συνέστησαν and point to the 'first', viz. original invention (the 'first' in such expressions is often pleonastic in Greek), it need not imply that mathematics were discovered later in other countries, as well.

[50] It is difficult to say whether the different readings in this case are the result of a scribe's mistake or of a purposeful revision of the text. But whatever was the reason for this divergence, it corresponds to Aristotle's commentators' divergent understanding of his thought. Ross, who in this case preferred the reading of β, noted in his apparatus, says that the reading of α corresponds to the paraphrase of this passage in the commentary of Asclepius of Thralles. In fact, Asclepius not only omits πρῶτον in the paraphrase (his testimony can be added to the apparatus of Primavesi), he also treats leisure as the specific privilege granted to the Egyptian priests – they were equipped with all things necessary for life and could devote themselves solely to scientific work (*in Met.* p. 12. 20–29 Hayduck): λέγει δὲ τὰ μαθήματα, γεωμετρίαν, ἀριθμητικήν, μουσικήν, ἀστρονομίαν. ἐζήτησαν γὰρ διὰ τί ποτὲ μὲν γίνονται μεγάλαι αἱ ἡμέραι, ποτὲ δὲ μικραί, καὶ διὰ τί ποτὲ μὲν θέρος, ποτὲ δὲ χειμών, καὶ ὅσα ἄλλα τοιαῦτα. καὶ μάλιστα τὰ τοιαῦτα κατωρθώθησαν ἐν τοῖς τόποις, ἐν οἷς ἐσχόλαζον τούτοις οἱ ἄνθρωποι. λέγει δὲ τὴν Αἴγυπτον· ἐκεῖσε γὰρ πρῶτον συνέστησαν αἱ μαθηματικαὶ ἐπιστῆμαι, ἐπειδὴ οἱ ἱερεῖς τὰ ἀναγκαῖα εἶχον

It thus appears that this reading of the version α should be preferred not only as better testified by manuscript tradition,[51] but also as closer to what Aristotle actually had in view. In this version, Aristotle of course points to general conditions for the origin of theoretical sciences (the growing repute of less utilitarian knowledge and the attaining of limits in the development of fine arts). But although he regards the leisure granted to Egyptian priests to pursue theoretical knowledge as the result of this progress, the no less important condition for the appearance of leisure is the Egyptian caste system itself, and this is a rare institution, of course.[52] Aristotle admits that civilisations, such as the Egyptian or the Greek ones, develop separately, each from a primitive state, according to the same pattern but having started at different times (and moving forward, presumably, at different paces). Nevertheless, the development of science in a way oversteps the borders between countries.[53] Although Aristotle assumes that the progress of mathematics in Greece implies a certain level of development of this civilisation, it was not invented here but was imported from Egypt, since Egypt admittedly had unique conditions

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ἄλλοθεν αὐτοῖς παρεχόμενα καὶ ἐσχόλαζον μόνοις τοῖς μαθήμασιν· διὸ καὶ ἐν τοῖς ἱερογλυφικοῖς γράμμασι ταῦτα εἶχον γεγραμμένα. By contrast, Alexander of Aphrodisias, whose commentary Asclepius used along with the lost commentary of his teacher Ammonius, the main source of his learning, treats the beginning of theoretical knowledge due to leisure rather as a certain stage in the development of humankind as a whole (ἅμα δὲ διὰ τούτων δείκνυσι τὴν ἐπὶ τὴν σοφίαν καὶ τὴν τελειοτάτην γνῶσιν ὁδόν, καὶ πῶς παρῆλθεν εἰς ἀνθρώπους ἡ σοφία καὶ ἡ τῶν τιμιωτάτων ζήτησίς τε καὶ θεωρία, ὅτι μετὰ τὴν τῶν ἀναγκαίων καὶ χρειωδῶν εὕρεσιν περιττότερόν τι καὶ ἐλεύθερον ἤδη νοεῖν σχολαζόντων τῶν ἀνθρώπων, p. 6. 19–22 Hayduck) and does not mention the privileged position of Egyptian priests; in fact, according to Alexander, Aristotle mentioned them only to show the advance from experience to science (ὅτι δὲ καὶ αἱ μαθηματικαὶ ἐπιστῆμαι ἐξ ἐμπειρίας ἤρξαντο, ἐνεδείξατο διὰ τῶν ἱερέων τῶν ἐν Αἰγύπτῳ, οἳ τῷ σχολάζειν διὰ τῶν τηρήσεων τῶν κατ᾽ οὐρανὸν γιγνομένων ἐμπειρίαν πρῶτον ἔσχον, εἶτα τέχνην συνεστήσαντο). It is not certain whether this difference can be explained by the text Alexander used (he does not paraphrase) or by the fact that he confuses the invention of arts pertinent to διαγωγή with theoretical sciences (see above, n. 34).

[51] Latin translation favours reading οὗπερ (see the apparatus of Primavesi), and in general the version α is more reliable.

[52] The plural ἐν τούτοις τοῖς τόποις 981 b 22 f. may imply that a similar institution and, accordingly, an independent invention of mathematics might have appeared also in some other place apart from Egypt, but later; Babylon might be such a place, since Aristotle mentions how long the Babylonians have engaged in astronomic observations (*DC* 292 a 7 f.), and it had also a caste of priests, according to the standard view in antiquity. It is not clear, however, whether Aristotle considers Babylonian astronomy as having attained the level of science or having remained purely empirical.

[53] Aristotle often operates with the notion of civilisations as existing separately in different lands, but, of course, he admits that civilisations borrow from one another.

for the emergence of this science (apart from its caste system, he may imply also the longevity of Egyptian civilisation and accordingly of its development of crafts and arts).

Two pieces of reasoning by Aristotle's older contemporaries, certainly well known to him, give indirect support for the view that Egyptian conditions for the emergence of theoretical sciences are not common, but unique. Since these pieces were already compared with Aristotle's statement in the *Metaphysics*,[54] I will concentrate only on some significant details that have not been duly appreciated.

The first relevant piece is Isocrates' epideictic speech *Busiris*. According to Isocrates, Busiris, the beneficial king and legislator of Egypt, divided Egyptian society into three classes – warriors, those who are occupied with τέχναι, and priests (ch. 15). For the sake of cultivating wisdom, he granted to priests incomes from sacrifices, released them from military and other service to the state and gave the laws that regulated their moderate way of life. He also prescribed to the younger priests the study of astronomy, arithmetic and geometry[55] and to the older ones the most important political tasks, including legislation (ch. 21–23). Due to these privileges, the priests invented the art of medicine and (it is implied) made great advances also in mathematical disciplines and in political art; they also created religious faiths and practices that were of the outmost benefit for human society (the topic on which Isocrates dwells in detail, ch. 24–27), like oaths, purifications and the worship of animals. Pythagoras, who was a pupil of Egyptian priests, introduced both the sciences and the religious rites of the Egyptians to Greece.

The seriousness of this description, as well as the relation of the political and educational system of Plato's *Republic* and his *Timaeus–Critias* to that of the *Busiris* were much disputed.[56] Nevertheless, it is

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[54] See Eucken 1983, 186 n. 62; Livingstone 2001, 145; Zhmud 2006, 226 n. 61; Cambiano 2012, 36.

[55] Isocrates cites the divergent opinions about mathematical knowledge – either that it is practically useful or that it contributes to virtue – but he is noncommittal as to which is correct (ch. 23).

[56] The most important discussion is that of Eucken (1983, 172–212), who argues that *Busiris*, which he dates to the 370s rather than to the traditional earlier date, is polemics containing the ideas of the *Republic* before the publication of the latter dialogue (Plato's ideal state is anticipated by Egyptian institutions), and that *Timaeus*' description of the Egyptian and Athenian states is Plato's response to Isocrates (the primeval Athenian institutions, which are in many respects similar to the Kallipolis, are prior to the Egyptian and were the object of imitation by the latter). In fact, there are many points of similarity or possible allusion, and on general grounds it is more credible that Isocrates alludes to the *Republic* or to its ideas before its publication

certain that Isocrates attempts to make his desperate case of defence of Busiris more convincing than that of Polycrates (ch. 4–6, cf. 33), and he makes clear that his presentation of Egyptian political and educational system appeals to the current views, even if its ascription to Busiris is his new and disputable point (ch. 32). Relevant from the point of view of Isocrates' contemporaries in the present context, however, are only the theoretical implications of this reasoning, not their reliability: first, the privilege of the priests is not only freedom from care for material needs, but also from the greater part of civic duties; and second, this privilege is regarded as something that is peculiar to Egypt; for this reason it serves, at least implicitly, as an explanation why sciences did not emerge in Greece, but in Egypt (the superiority of Egyptian institutions is stressed, even in the case of the caste system in Sparta, which was imported from Egypt but is far inferior to its prototype). At the same time, another passage in the *Busiris* (ch. 28) implies that, after theoretical sciences emerged, the Greeks not only borrowed them, but also developed them further. Isocrates, by no means a proponent of the intrinsic value of scientific knowledge, pleads openly for the utility of the scholarly preoccupations of priests: they are either useful for physical health (medicine) or for applications in practical fields (mathematics) or at least, not being useful directly, for contributing to the mental and moral development of those who learn them. Nothing like their value as the disinterested pursuit of truth is assumed.

As already mentioned, Plato never points clearly to the general causes of the emergence of theoretical knowledge. There is, however, one passage in Plato's dialogues that is relevant for Aristotle's explanation, although the notion of leisure does not appear here. In the story of Atlantis in the *Timaeus* and the *Critias*, the storyteller, Critias, claims that all aspects of the political system of the primeval Athenian state, which existed 9000 years ago and then perished in the cataclysm, resembled the political system of the Egypt of his day. The Athenian goddess Athena created both

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than that Plato rearranged the picture of the Egyptian state in the *Busiris* for his own purposes. Livingstone (2001, 54 f.), who does not dispute the priority of the *Republic*, tends to stress the parodying features of the *Busiris*, but this seems to contradict the purpose of the speech, a refutation of Polycrates. It should be noted, however, that in one point Isocrates differs considerably from Plato: Isocrates' Egyptian state is ruled by the king, not by the philosophers who previously went through the whole scale of administrative activities, including military ones, as described in Plato's *Kallipolis*; on the contrary, the younger priests are engaged only in scientific and religious matters. The scope of administrative duties of the older priests is unclear, except for legislation, and although Isocrates mentions that the most important state affairs are commissioned to them (23 init.), they are, of course, the senior counsellors of the king, not sovereign rulers.

systems, but 1000 years earlier in Athens than in Egypt. The foundation of both states was the caste system, more precisely, the establishment of the separate hereditary classes of soldiers, priests, shepherds, farmers, craftsmen and hunters (*Tim*. 24 a–b). This system is close to the project of the ideal state in Plato's *Republic*, although not completely identical to it.[57] According to the storyteller, the law in Egypt led to the appearance of the whole system of sciences, from the divine science of the universe, as the divine knowledge, to the human sciences founded on this science of cosmos, like medicine and mantic; this system of sciences that exists in the contemporary Egypt emerged even earlier in primeval Athens (24 b 7 – c 3).[58] The causes of these extraordinary achievements of both nations are, first, the perfection of the political system established by Athena, and, second (at least in the case of Athens), the wonderful climate, which should produce the most intelligent people (*Tim*. 24 b–d; *Critias* 109 c).

The philosophical message of this fictional story (which Plato hardly wants to be apprehended as fictional, in my view), seem to be as follows: the high level of knowledge of Egypt and Athens is something unique.

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[57] The summary of the system of the *Republic* is given in the beginning of the *Timaeus* in reference to Socrates' reasoning on the previous day; on the class division, see 17 c – 18 d. *Pace* Naddaf 1994, 196, I do not think that the differences between the systems of primeval Athens and Egypt, on the one hand, and the state of the *Republic*, on the other, should be explained by changes in Plato's ideal system. It is indisputable that the importance of cosmic theory and cosmic theology grew considerably in the later dialogues (although astronomy was important already in the *Republic*), but Plato never abandoned the theory of Forms, and dialectic plays an important role in the philosophical curriculum of the *Laws*. The absence of study of the Forms in the ancient states of the *Timaeus–Critias* suggests rather that Plato gives a hint that the theory of Forms is his own achievement and had no counterpart in the past. The educational system of Athens and Egypt, founded on astronomic theology, would thus be only an approximation to Plato's ideal, which remains essentially the same as in the *Republic*.

[58] 24 b 7 – c 2: τὸ δ᾽ αὖ περὶ τῆς φρονήσεως, ὁρᾷς που τὸν νόμον τῇδε ὅσην ἐπιμέλειαν ἐποιήσατο εὐθὺς κατ᾽ ἀρχὰς περί τε τὸν κόσμον, ἅπαντα μέχρι μαντικῆς καὶ ἰατρικῆς πρὸς ὑγίειαν ἐκ τούτων θείων ὄντων εἰς τὰ ἀνθρώπινα ἀνευρών, ὅσα τε ἄλλα τούτοις ἕπεται μαθήματα πάντα κτησάμενος. On this difficult sentence, see (after Stallbaum) Taylor 1928, 54 ad loc., who rightly stresses that Plato has in view both the Egyptian state's total regulation of all sciences and that he bases all of them on cosmology (which is theology at the same time). The remarkable feature of Egyptian and, correspondingly, primeval Athenian achievements is thus not only the universality of the knowledge, but also the subordination of all kinds of knowledge to the science of the universe. This cosmological and theological orientation of the whole system of knowledge entirely corresponds to the ideal of the late Plato, see the *Tim*. 90 c–d on the necessity for the individual to assimilate the motions of the soul to the cosmic motions and ultimately to the god, by learning cosmology (on this passage, see the valuable comment of Sedley 2000, 798–801).

The causes of these achievements are a peculiar political system, namely, the caste division of the society, which provides due specialization of each class in its specific functions, including specialization in sciences, and the best system of education and special natural gifts in both peoples.[59] The story possibly also gives a hint in the form of the prophecy that the Greeks might attain results comparable to their ancestors and to the Egyptians, provided that the right political system would be established along with the state system of education and care for scientists. Note also that although Plato overestimates the scientific achievements of the Egyptians and is certainly beyond the mark when ascribing to Egypt an all-embracing system of sciences, he does not attribute any purely theoretical character to them.

As is well known, Plato was not satisfied with the pace of scientific progress in contemporary Greece (nor with the lack of unity of sciences in Greece or with their subordination to the supreme science, such as he finds in Egypt). In the *Republic* (7. 528 b 8 – c 4), he points out that the problems of stereometry, first of all the Delian problem of doubling of cube, were not solved for two reasons: first, because the geometricians have no state encouragement and, second, because they lack a state-appointed ἐπιστάτης, or superintendent of their studies.[60] According to Plato, it is next to certain that the state patronage of science that must provide further progress can be realized only in his ideal state.

This shows us the gradual growth of the idea, still unknown to Herodotus, that the sciences in Egypt are the monopoly of the caste of priests and owe their flourishing to this institution. Both Isocrates and Plato stress the advantages of the position of scientists in Egypt in contrast to that in Greece, rather than implying a similarity between the two countries. Nor do they have in view the freedom from material care of a certain class of people (this is not specifically an Egyptian feature), but the division of functions among the hereditary classes, which did not exist in other countries (both stress that the class of scientists is released from military duty). It is thus plausible that Aristotle, who unlike Isocrates and Plato tries to give a *general* explanation of the origin of sciences and attempts to draw the course of development that leads to their emergence, also

[59] It is not said directly that the sciences are the privileged field of the priests, and one may wonder whether the other higher class, the soldiers, are engaged in them.

[60] Adam 1902, II, 123: it is "perhaps the earliest demand in literature for the State-encouragement – we might almost say – the State endowment – of pure science". Adam compares Plato's reproach to the Greeks for their ignorance of stereometry in *Leg*. 7. 819 d ff. The situation in Greece is contrasted in the latter passage to the proper state system of mathematical education in Egypt (819 c).

regarded the priests' freedom from daily duties as his predecessors did – not as an example of the leisure the ruling class enjoys at a certain level of economic development and in the presence of slavery, as in Greece, but as a specific and rare or even unique institution. Another, indirect support for this reading is provided by Aristotle's design for the best state in the *Politics*. The Egyptian caste system is explicitly adduced here as the precedent for his own project, whose advantages are proved by experience (7. 10): the caste system, being a comparatively rare institution, was happily invented and purposefully introduced to Egypt by Sesostris and independently also in other places, Crete and Italy.[61] It is thus a recurrent phenomenon, and this proves both its usefulness and practicability, in contrast to theoretical proposals, such as the community of children and property proposed by Plato (7. 10. 1329 a 40 – b 35).[62]

In spite of the relevance of Isocrates' and Plato's ideas for Aristotle's view of the origin of theoretical sciences, we should not underestimate the originality of his thought. Neither Isocrates nor Plato lay down specific requirements for the development of theoretical knowledge, as opposed to practical knowledge (both regard medicine and mathematics as the occupations of priests). Moreover, released from concern for their daily needs, the priests are burdened by political duties, at least according

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[61] According to Herodotus and Isocrates, who followed him, the Spartan division of classes stems from the Egyptian one. By contrast, Aristotle, in spite of misleading ἐντεῦθεν, is thinking of the independent origin of this institution in Italy and Crete (see Schütrumpf 2005, 398 on 1329 b 22, cf. 399 on 1329 b 25).

[62] Aristotle finds the separation of warriors from farmers not only in Crete and Egypt, but also in Sparta (*Pol*. 2. 5. 1264 a 10–11) and Thessaly. He considers the separation's arrangement in Sparta, Crete and Thessaly (the farmers cultivate the land of the members of the ruling class) better than Plato's proposal (in which the farmers cultivate their own land and pay a quota of their production to the guardians), because the latter system should make them less obedient (1264 a 32–36). But in general all three states failed to find a secure system of keeping the class of farmers, slaves or serfs in obedience (2. 9. 1269 a 34 – b 12); the Cretan system owes its relative tranquillity not to provisions of the legislator, but to felicitous coincidence: all Cretan states have serfs and thus have no reason to support subaltern rebellions in neighbouring states (1269 a 39 – b 5, 1272 a 18–19). Aristotle does not approve the Cretan system of holding the serfs on almost equal footing with citizens (1264 a 20–22), at least as a generally applicable measure, see 1269 b 9–10. But in *Pol*. 7. 10 Aristotle mentions only Egypt and Crete as examples of the caste system, not Sparta and Thessaly, apparently because he regards the first two as more ancient (the Spartan system is borrowed from Crete, 2. 10. 1271 a 22–24; on the Cretan πολιτεία as the most ancient Greek polis, see Arist. fr. 611. 14 Rose), and thus as justified in claiming independent origin. Lack of criticism of the Egyptian caste system in the *Politics* appears to imply that it corresponds more than the other caste system to Aristotle's criteria of security; the Cretan caste system, not commendable as such, is approved only as corresponding to the conditions in Crete.

to Isocrates. The problem of the historical origin of the pursuit of truth that has no utility, material or moral, is typically Aristotelian, and he accordingly adduces explanations.

Also, there is no reason to ascribe to Aristotle an ample overestimation of Egyptian scientific achievements as is typical of his predecessors, especially Plato. Nothing like an all-embracing set of sciences with astonishing achievements in all of them appears to correspond to Aristotle's view: only once does he refer to Egyptian medicine, in a context that implies only its rigidity (see above, n. 43), and as for theoretical sciences, he mentions only Egyptian mathematics; it is not clear whether he thought Egyptian astronomy could advance beyond the purely observational stage of experience (cf. n. 69). When he refers to the progress of theoretical science from the most trivial to the advanced problems, he cites as examples of the latter those that occupied the Pre-Socratics – unusual astronomic phenomena, like eclipses, and the origin of the universe (*Met*. A 2. 982 b 11–17). It is quite possible that the point of the *Met*. A 1–2 is only the first step in the creation of explanatory science and only in mathematics that occurred in Egypt, not the appearance of developed science, much less sciences as existing in Greece. This first step in all crafts and sciences, however, as Aristotle notes, is extraordinary difficult,[63] and it is not surprising that he looks for its unique prerequisites, ones that are not necessary for its further advance.[64] The modicum of reality in his imagining Egypt as a paradise for sciences is the state system of medical care, which has no analogy in Greece, and the state-supported astronomers and geometers – this could give an idea that the state encouraged not only useful knowledge, but also the pursuit of non-utilitarian knowledge.[65]

Some scholars supposed that Aristotle's explanation tacitly rejects Herodotus' classic account of the origin of Egyptian geometry in the practical tasks of measuring land.[66] I see no reason to believe that Aristotle

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[63] See *SE* 34. 183 b 16–34 on the difficulties and smallness of beginning in comparison with the ease of further progress (on the importance of this idea for Aristotle, cf. Mansfeld 1985, 128 f.). The starting point Aristotle has in view here is the invention of τέχνη as opposed to previously existing experience in this field (see below 183 b 36 – 184 b 8 on the lack of τέχνη of argumentation that could be taught before his *Topics*; see Mansfeld 2016, 117 on the problems related to this claim).

[64] It is quite possible that, contrary to the unanimous view, Aristotle's designation of mathematics in Egypt as τέχναι is meaningful and implies that, although the decisive step to theoretical sciences was made here, on the whole Egyptian mathematics still preserved its practical orientation (I hope to return to this question).

[65] Von Staden 1989, 23 f.

[66] See most recently Cambiano 2012, 36. Wehrli 1969, 114 f. opposes Aristotle's explanation (theoretical mathematics emerged due to the leisure of priests) of the

deviated from Herodotus' view, which became traditional.[67] Aristotle previously stated that theoretical sciences, as well as productive crafts, arise from experience (981 a 1–3). This corresponds to his otherwise well-attested view that the crucial point for finding the principles of any science, productive or theoretical, is the accumulation of experience in the related field (*APr.* 1. 30. 46 a 3–10): ἐμπειρία, specific for every τέχνη and for every ἐπιστήμη, provides the premises for proofs in both mathematics and astronomy (46 a 17–24).[68] It is beyond doubt that the systematic accumulation of observed facts, which amounts to experience, takes place in practice: this is suggested by the previous reasoning on the empirical origins of medical craft (981 a 7–9); and Aristotle's example of the

practical origin of Egyptian mathematics in Eudemus and Herodotus. According to Wehrli, Eudemus did not follow Aristotle, but Democritus' idea that need gives the first impulse to the development of culture. Meier 2002, 249 doubted Eudemian provenience of this passage in Proclus, in part precisely because Eudemus diverged from Aristotle on this point. I also doubt this, in spite of Zhmud's vigorous defence of Eudemus' authorship of this passage (Zhmud 2002), but because of the typically Neo-Platonist and Proclus' ideas of the passage, not because of its alleged contradiction of Aristotle's view.

[67] This was rightly noticed by Zhmud 2006, 211, against Wehrli and Meier (see the previous note). The evidence he cites to endorse his statement (*Met*. 981 a 12 f.; 981 b 10 f.; *EN* 1139 a 17 f.) is, however, irrelevant to the problem. In two passages from the *Met*. A 1, Aristotle admits that there are perceptual and empirical origins of crafts, but not of mathematics or theoretical sciences in general; the *EN* passage is hardly relevant at all.

[68] It is sometimes stated that Aristotle thought that the principles of mathematics are non-empirical and are not attained by induction, see Kullmann 1974, 221 with n. 1 (but see *ibid*. 241 on the possibility that mathematics, ideally, also needs induction to find its principles); Fiedler 1978, 170. But *EN* 6. 9. 1142 a 11 ff., on which this view is based (the ἀρχαί of mathematics do not come from experience, but from abstraction), is related to learning already discovered principles, not to their discovery or justification; the underlying idea seems to be that the principles of mathematics can be learned in abstraction from the facts, whereas in ethics and physics it would be a purely formal knowledge; *EN* 7. 9. 1151 a 16 ff., adduced by Kullmann in this context, says that the principle of moral action is not the subject of reasoning, but is present beforehand in a moral agent because of his virtue or vice, just as in mathematics the starting point is not proven, but taken as a *hypothesis* (hypothesis here is a general principle of mathematics, rather than a hypothetical assumption, see Heath 1949, 278 f.). Yet the point of comparison is that deductive reasoning should have a starting point that is not demonstrated by this reasoning, not that it cannot be demonstrated at all. Thus although there is no evidence for Aristotle's view of the origin of the first principles of mathematics, I see no reason to admit that mathematics is an exception from his teaching that the principles of all sciences have empirical origins and can be justified only inductively, by reference to all pertinent instances of experience (*APr.* 1. 30. 46 a 3–10; *APo.* 2. 19. 100 a 3 – b 5).

transformation of experience into theoretical science is astronomy, the discipline whose empirical stage has distinctively practical purposes (*APr.* 1. 30. 46 a 19–21). Accordingly, Aristotle had no reason to deny Herodotus' established view that the practical needs of land surveying were the primary impulse for the development of Egyptian geometry (presumably, nor had he reason to deny that Egyptian arithmetic and astronomy had equally empirical and practical origins).[69] Aristotle's point in the *Met*. A 1–2 is not to reject, but to correct the current view, which simply explains the origin of mathematical knowledge by practical need; he stresses what escaped the notice of his forerunners: the emergence of mathematics beyond experience means the beginning of a new branch of knowledge, a theoretical one, and this cannot be understood as a response to need and as a product of experience only. For this reason, he concentrates on explanations differing from those of Herodotus – the disinterested search for explanations, the growing encouragement of non-utilitarian achievements, the attainment of the limit to development of earlier knowledge and the state's provision of leisure to the Egyptian priests, which enabled mathematical knowledge to advance from the empirical stage to the level of science.[70] This of course does not mean that the experience that was sufficient to make this step was acquired due to this leisure; its source was practical preoccupations.[71] The false premise of this reasoning, the existence of theoretical mathematics in Egypt, does not diminish its interest for the history of ideas.

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[69] The longevity of astronomic observation in Egypt and in Babylon is all that Aristotle mentions of Oriental achievements in this field (*DC* II. 12. 292 a 7–9); this, however, does not necessarily mean that he thought astronomy in these countries stopped at the purely empirical level.

[70] It is better to leave open the question whether Aristotle attributes the earlier empirical stage of Egyptian mathematics also to priests or to secular specialists in the measurement of land, the ἁρπεδονάπται, who might also have been known to him.

[71] Already Alexander, who relied on *APr.* 1. 30. 46 a 17–22, supposed that Aristotle implies the empirical origin of mathematical sciences in Egypt (*in Met*. p. 7. 3–9): leisure allowed priests both to conduct astronomic observations and survey land and also (by discovering the universal principles) to transform accumulated experience into τέχναι of astronomy and geometry. He is certainly right about Aristotle's general view of the empirical origin of mathematics, but not about the philosopher's view of acquiring experience and his treatment of leisure in *Met*. A 1-2.

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In his classic statement in the introductory part of the *Metaphysics* (ch. 1), Aristotle asserts that theoretical knowledge emerged earliest in the countries where leisure has been attained and adds that, for that reason, the mathematical sciences appeared first in Egypt, because there the priests were allowed to have leisure. According to the scholarly view prevailing nowadays, Aristotle assigns to the appearance of leisure the crucial role in the emergence of theoretical knowledge. Scholars agree that the appearance of leisure in Greece was an important, although not the sole condition for the emergence of theoretical knowledge and for its rapid progress. They maintain at the same time that Aristotle errs when he finds in Egypt mathematics that resembled Greek mathematics both in their deductive character and in their theoretical purposes and that he errs when he assigns to priests the decisive role in the development of mathematical knowledge. On the contrary, W. Spoerri used the preceding part of Aristotle's reasoning to prove that his genuine explanation consists in the gradual development of practical kinds of knowledge: they satisfied material needs and released human forces for the pursuit of the non-utilitarian truths of theoretical sciences; according to Spoerri, the leisure of Egyptian priests is superfluous for this explanation and was probably inserted from another of Aristotle's treatises.

The author argues that both these interpretations are unjust to the text of the *Metaphysics* and to the complexity of Aristotle's explanation, which embraces both general social-psychological preconditions for the emergence of theoretical knowledge and specific favourable ones for its emergence precisely in Egypt. Aristotle notices that already the inventors of the earliest crafts, which produce vitally necessary things, were admired not only because of the utility of their inventions (this utility does not greatly surpass the experience that had already been accumulated in the same field), but because of the intrinsic value, the 'wisdom' of their achievements – the classification of recurrent phenomena that have been fixed by experience, the grasping of their causes and the new capacity to transmit knowledge to other persons who do not have their experience. At the next stage of development, the inventors of the τέχναι that were pertinent to leisure amusements (music, poetry, painting, sculpture) were esteemed as 'wiser' than the inventors of necessary things, because the society grew to value the excellence of knowledge more than its practical utility.

Aristotle explains the beginning of the pursuit of theoretical knowledge (along with the factors inherent in knowledge – the accumulation of experience due to practice in the fields of mathematics and astronomy) by the attainment of the limit

in the development of both kinds of τέχναι. Once this limit had been attained and further improvements did not evoke more admiration, the inborn human desire to find explanations now turned systematically to problems that were not related to practical utility. The society was also now prepared to 'admire', viz. to encourage and materially support, the intellectual search in the field of non-practical knowledge.

These generalisations are valid for the development of knowledge as a whole, but when speaking about Egypt as the land in which mathematics appeared, Aristotle also has in view the specific Egyptian institution, the caste system: it provided to the Egyptian priests freedom from military and administrative duties and released them from care for their material needs. This probably means that, due to these favourable conditions, the priests became the kind of people among whom the first theoretical scientists appeared when the society was prepared to encourage their studies. Aristotle is mistaken, of course, when he finds theoretical mathematics in Egypt, but he does *not* extrapolate to Egypt the leisure this is typical of Greece – the leisure of intellectuals as dependent on accidental family conditions, payment for teaching or the generosity of sponsors. The leisure Aristotle has in view is the unique product of Egypt's extraordinary political system, viz. state support for scientific knowledge.

В своем классическом рассуждении во вступительной части "Метафизики" (гл. 1) Аристотель утверждает, что теоретическое знание зародилось ранее всего в тех странах, в которых появился досуг, и добавляет, что по этой причине математические науки впервые появились в Египте – там жрецам был предоставлен досуг. Современные ученые обычно полагают, что Аристотель отводит именно досугу решающую роль в зарождении теоретического знания. Они соглашаются с Аристотелем в том, что появление в Греции досуга было важным, хотя и не единственным условием для развития теоретического знания. Вместе с тем, они констатируют, что Аристотель заблуждался, находя в Египте дедуктивную по методам и теоретическую по свои целям математику, которая впервые появилась лишь в Греции; он также ошибался, отводя жрецам важную роль в развитии математического знания. Напротив, В. Шперри попытался доказать, что аристотелевское объяснение возникновения теоретического знания состоит в постепенном развитии ремесел и искусств (τέχναι), обеспечивших материальные условия жизни и освободивших силы людей для поиска теоретического знания, а упоминание о досуге египетских жрецов является излишним, возможно, вставкой из другого сочинения Аристотеля.

В статье доказывается, что оба понимания упрощают аристотелевское объяснение, которое охватывает и общие социально-психологические условия возникновения теоретического знания и специфические благоприятные предпосылки для возникновения его именно в Египте. Согласно Аристотелю, уже изобретатели первых, жизненно необходимых ремесел и искусств были открывателями причинных объяснений, основанных на классификации практического опыта (например, в медицине), и потому вызывали восхищение не только благодаря пользе этих достижений, но и их "мудрости", внутренней ценности. Изобретатели τέχναι на следующей ступени развития, служивших

для услаждения досуга (Аристотель имеет в виду музыку, литературу и изобразительные искусства), вызывали восхищение в качестве более “мудрых”, чем изобретатели необходимых τέχναι, ввиду возросшей способности общества ценить совершенство знания больше его практической пользы. Начало систематического поиска в области теоретического знания Аристотель объясняет достижением предела в развитии τέχναι двух первых видов (наряду с имманентными факторами – накопление опыта в практической сфере, достаточного для поиска научных объяснений). Благодаря этому, врожденный человеку интерес к поиску объяснений и обобщений направился на систематический поиск объяснений, не имевших практического значения; общество же, научившееся одобрять все менее утилитарные виды знания, оказалось готовым “восхищаться”, т.е. поддерживать, в том числе материально, интеллектуальные достижения в области чистого, не приносящего практической пользы знания.

Хотя эти условия определенно относятся к развитию научного знания в целом, Аристотель, говоря о Египте как стране, где впервые возникла математика, благодаря досугу, предоставленному жрецам, имеет в виду специфический политический институт, кастовую систему. Кастовый строй обеспечил египетским жрецам свободу и от военных и административных обязанностей, и от материальных забот о существовании. Вероятно, Аристотель подразумевает, что благодаря этим условиям среди египетских жрецов появились первые представители теоретического знания, а египетское общество было готово поддержать эти усилия, благодаря длительному предшествующему развитию τέχναι в Египте. Аристотель, таким образом, ошибается, находя теоретическую, то есть дедуктивную математику в Египте, но не экстраполирует на Египет досуг в той форме, которой он был типичен для Греции – досуг ученых, зависящий от наличия семейных средств, учеников, платящих за обучение, или щедрости благотворителей. Аристотель имеет в виду специфический вид досуга, который обеспечивает кастовая система, то есть государственную поддержку научного знания.

CONSPECTUS

Статьи сопровождаются резюме на русском и английском языке
Summary in Russian and English