# ARISTOTLE'S "GREATEST DIFFICULTY": UNIVERSALITY OF THOUGHT IN *METAPHYSICS* M 10 AND Θ 9

ABSTRACT
*Metaphysics* M 10 is the only place where Aristotle provides a solution to the "greatest difficulty" from Book B: If the principles of substances are particular, but objects of scientific knowledge must be universal, how can there be any scientific knowledge of these principles? The nub of Aristotle's solution is that in an important sense scientific knowledge is concerned with particulars. The paper shows why this solution neither compromises Aristotle's official account of scientific knowledge, nor assimilates scientific knowledge to perception, nor does it presuppose any metaphysically loaded conception of forms (as either particular in themselves or as neutral with respect to universality and particularity). Rather, Aristotle's point can be understood against the background of his analysis of geometrical thought in Θ 9. At various points, the geometrician must choose or "set out" one particular actualization of the potential inherent in the respective figure, but she must do so in a way that is conducive to a grasp of this potential in its full universality. The paper explores Aristotle's promise (most explicit in *On Memory* 1) to take the interplay between universality and particularity in geometrical diagrams as the model for scientific thinking in general.

RÉSUMÉ
*Métaphysique* M 10 est le seul endroit où Aristote fournit une solution à la "plus grande difficulté" du Livre B: si les principes des substances sont particuliers, mais les objets de la connaissance scientifique doivent être universels, comment peut-il y avoir une connaissance scientifique de ces principes? Aristote répond que, dans un sens important, la connaissance scientifique porte sur des choses particuliers. L'article montre pourquoi cette solution ne compromet pas le compte rendu officiel d'Aristote sur la connaissance scientifique, ni n'assimile la connaissance scientifique à la perception, ni ne présuppose une conception sophistiquée des formes (comme étant soit particulières en elles-mêmes, soit neutres en ce qui concerne l'universalité et la particularité). La solution d'Aristote dans M 10 peut plutôt être compris dans le contexte de son analyse de la pensée géométrique dans Θ 9. À différents moments, le géomètre doit choisir une actualisation particulière du potentiel inhérent à la figure concernée, mais il doit le faire d'une manière qui permette de saisir ce potentiel dans sa pleine universalité. L'article explore la promesse d'Aristote (la plus explicite dans *Sur la mémoire* 1) de prendre l'interaction entre l'universalité et la particularité dans les diagrammes géométriques comme modèle pour la pensée scientifique en général.

## 1. Introduction: Aristotle's response to the "greatest difficulty" in *Metaphysics* M 10[1]

[1] Earlier versions of this paper were presented in Berlin (2017), Oxford (2017), Prague (2018), and Berlin (2019). I thank the audiences for valuable feedback. In particular, I would like to thank Jonathan Beere, Sarah Broadie, Michel Crubellier, Ondřej Černý, Janine Gühler, Thomas Johansen, Gonzalo Gamarra Jordán, Emily Katz, David Lefebvre, Marko Malink, Stephen Menn, Michael Peramatzis, Michalis Sialaros, and Justin Winzenrieth. I also owe thanks to the anonymous referee of the *Revue de Philosophie Ancienne* for helpful comments and suggestions. The research was supported by Czech Science Foundation Grant No. 22-11418S.

Towards the end of *Metaphysics* M 10 (1087a10-13), Aristotle formulates what, he claims, "involves the greatest difficulty of the things that have been said". The difficulty he has in mind corresponds neatly to the final *aporia* of Book B (*B*#14 = 1003a6-17)[2], asking whether the principles (ἀρχαί) are universal (καθόλου), or whether they are in the way in which particulars (ὡς τὰ καθ' ἕκαστα) are spoken of. If universal, the *aporia* goes, then apparently the principles will not be substances, and so either what is generally recognized to be a substance (*cf. Metaphysics* Z 2, H 1, Λ 1) turns out to be no substance after all, or something non-substantial will be prior to substances. If, on the other hand, the principles exist as particulars, it will seem that there can be no scientific knowledge of them (and by implication of the things they are principles of) if it is true that "all scientific knowledge is universal"[3].

The broader context of *Metaphysics* M 9β-10 suggests that *B*#14 is not addressed here as an isolated puzzle[4]. Rather, it is understood as an integral part, and in a way the climax, of an interconnected set of *aporiai* from Book B. The first half of M 10 (1086b14-1087a7) is clearly concerned with *B*#9, asking whether the principles are determined by number (there is just one-per-type principle) or by kind (there are many-per-type principles)[5]. This puzzle, in turn, seems to pick up on one particular sub-question of *B*#8. This *aporia* asks whether there is some cause apart from matter (995b32-33)[6] and, if so, what it is like: whether it is, for instance, one or many in number (995b33-34)[7]. It is *B*#8 that was singled out both in the preview (B 1, 995b31-36) and in the full version of B 4 (999a24-b24) as "the most difficult" and "most in need of exploration"[8]. From a broader perspective, one can readily understand why this privilege is now, at the end of M 10, transferred to *B*#14 (and more precisely to its second horn). Aristotle is clearly willing to answer *B*#8 in the positive (there surely *is* such a cause apart from matter, namely the form), but at the same time he wants to avoid the unfortunate consequences of the Platonist separation of such causes. It is the separation of Forms which is, arguably, the main target of *B*#9 and M 10 1086b14-1087a7: Aristotle argues here that the alleged elements (στοιχεῖα) of these Forms (and by implication of everything) can be neither "particular" (in the

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[2] I follow the numbering of M. Crubellier, A. Laks (eds.), *Aristotle´s Metaphysics Beta: Symposium Aristotelicum*, Oxford, Oxford University Press, 2009.

[3] For a more detailed discussion of the first horn, cf. *Metaphysics* Z 13, 1038b8-1039a14. In Z 13 (1038b29-1039a8) Aristotle also considers (just as at B 6, 1003a10-13) the scenario in which universals are substances and the substance of X is composed of them in order to show how absurd this is.

[4] I call M 9β the part of chapter 9 starting at 1086a21 which is clearly a more important break than the one between chapters 9 and 10. Some scholars, such as W.D. Ross (*Aristotle´s Metaphysics. A Revised text with Introduction and Commentary*, Oxford, Clarendon Press, 1924) or E. Berti ("Les livres M et N dans la genèse et la transmission de la Métaphysique", in A. Graeser (ed.), *Mathematics and metaphysics in Aristotle*, Bern, Haupt, 1987, p. 11–31) – following W.W. Jaeger (*Aristoteles, Grundlegung einer Geschichte seiner Entwicklung*, Berlin, Weidmannsche Buchhandlung, 1923) – thought this line marks the beginning of an entirely different treatise, namely an earlier version of M 1-9α. Other interpreters, such as J. Annas (*Metaphysics: books M and N*, Oxford, Clarendon Press, 1976) – following Ps.-Alexander and Syrianus – thought this is the beginning of the third inquiry into numbers and ideas as "the principles of beings" announced at M 1, 1076a29-32. Yet other interpreters, such as M. Crubellier (*Les livres "Mu" et "Nu" de la Métaphysique d'Aristote: traduction et commentaire*, dissertation defended at University Lille 3, 1994) and S. Menn (*The Aim and the Argument of Aristotle´s Metaphysics*, forthcoming, 1γ3), take M 9β-10 to mark a new stage of the third inquiry which has already started in M 6. In my understanding, the primary aim of M9β-10 is, roughly, to refute one Platonist path to the ultimate principles of being which should be found as the elements (namely the highest genera) of Forms, and to insist, in the constructive part of M 10 (1087a7-25), that an alternative account of immanent formal causes can escape the difficulties.

[5] Moreover, 1086b16-19 seems to be drawing on the first horn of B#12bis (B 6, 1002b21-25).

[6] Or: something apart from the particular material composite that could be predicated of its matter (999a25-b3).

[7] See C. Wildberg, "Aporia 9-10", in M. Crubellier, A. Laks (eds.), *op. cit.*, p. 152-155; *cf.* also S. Menn, "Metaphysics Z10-16 and the Argument-Structure of Metaphysics Z", *Oxford Studies in Ancient Philosophy*, 21, 2001, p. 104-106.

[8] μάλιστα δὲ ζητητέον καὶ πραγματευτέον (995b31-32); ἀπορία... πασῶν χαλεπωτάτη καὶ ἀναγκαιοτάτη θεωρῆσαι (999a24-25). Only *B*#11 is characterized in a similar way (996a4-9, 1001a4-5). For a systematic discussion of *B*#8, *cf.* S. Broadie, "Aporia 8", in M. Crubellier, A. Laks (eds.), *op. cit.*, p. 135-150.

specific sense of being just one-per-type) nor universal (in the sense of being many-per-type). Once this criticism has been accepted and it has been denied (once more at M 10 1086b37-1087a4) that the principles of substances could be universals, one's attention turns very naturally back to the second horn of *B*#14. If the principles are not universal and not particular in the sense of being one-per-type separate entities, but are instead many in the same way as the particulars – each being just one of many principles of the same kind – then how on earth can they become objects of scientific knowledge[9]? Aristotle seems well aware that he should in some way answer this question if his non-Platonist reply to *B*#8 is to work[10].

In this sense, a whole set of puzzles and reflections culminates in the second horn of *B*#14. And Aristotle seems to be addressing this horn at the end of M 10 with a full awareness of its significance as the "greatest difficulty"[11]. The importance of this text is underlined by the fact that there turns out to be no other passage addressing this urgent difficulty in Aristotle's *Metaphysics* as we have it[12].

**Text 1**

[i] But if nothing prevents there from being many alphas and many betas, as with the elements/letters (στοιχεῖα) of speech, and no alpha-itself and beta-itself beside the many, then as far as this goes the syllables of each kind will be infinitely many.

[ii] The [claim that] all scientific knowledge is universal, so that the principles (ἀρχαί) of beings must also be universal and not separated substances, involves the greatest difficulty of the things that have been said; but the claim is true in one way and not true in another way.

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[9] This question echoes the first horn of B#9: "and how will scientific knowing be possible if there will be no one over all?" (B 4, 999b26-27).

[10] Another, complementary, way of highlighting the importance of the second horn of *B*#14 and Aristotle's response to it at the end of M 10 is by referring to Aristotle's favorite anecdote (*cf.* A 6, 987a29-b10, M 4, 1078b12-1079a4), which he has just reminded the reader of at M 9β, 1086b2-7. Aristotle here represents Socrates as the founder of the search for universal definitions and Plato as the one who (led by his Heraclitean distrust towards the "flowing" sensible reality) spoiled this promising project by "separating" the universals as self-standing substances. Against this background, the "greatest difficulty" addressed at M 10, 1087a10-21 could be paraphrased as a dilemma of how Socrates' project can be taken over – and extended from ethical to natural subjects of inquiry – without accepting the disastrous (as has just been shown once more at 1086b14-1087a7) ontological implications of the theory of Forms.

[11] It has long been recognized that Aristotle is here addressing a very important question; according to some interpreters, it is even a question that touches upon the very fundaments of his project in *Metaphysics*. Many interpreters have seen behind Aristotle's move in **Text 1** a genuine dilemma arising from at least an apparent tension inherent to his account of sensible substances and their intelligibility. E. Zeller (*Die Philosophie der Griechen II.2: Aristoteles und die alten Peripatetiker*, Leipzig, Fues's Verlag, 1879, p. 309-313, *cf.* 348) spelled out this difficulty in a way which has become the standard formulation (*cf.*, e.g., D. Allan, *The Philosophy of Aristotle*, Oxford, Oxford University Press, 1970, p. 120; or J.H. Lesher, "Aristotle on Form, Substance, and Universals: A Dilemma", *Phronesis*, 16(1), 1971, p. 169-178.). There is, he claims, an inconsistent triad of claims to which Aristotle commits himself: (1) What primarily *is* (and that is the *substance* of each thing) is also primarily *knowable*. (2) All substances are *particulars* (that is, no universal is a substance). (3) All scientific knowledge is *universal*. (For a possible background of Zeller's inconsistent triad in Hegel's reading of Aristotle, see S. Menn, "Zeller and the Debates about Aristotle's Metaphysics", in G. Hartung (ed.), *Eduard Zeller: Philosophie- und Wissenschaftsgeschichte im 19. Jahrhundert*, Berlin, W. de Gruyter, 2010, p. 108-110.) According to Harold Cherniss' no less notorious diagnosis, in M 10, Aristotle comes himself to recognize "the discrepancy between the real and the intelligible" to which his project in *Metaphysics* inevitably, according to Cherniss, leads (H.F. Cherniss, *Aristotle's Criticism of Plato and the Academy*, Baltimore, Johns Hopkins Press, 1944, p. 340).

[12] At *Metaphysics* Λ 5, 1071a17-24 Aristotle seems to be addressing B#14 and insisting that the principles are particular. But he doesn't offer any answer here to the difficulty about the scientific knowability of such principles raised at B 6, 1003a13-17.

[iii] For scientific knowledge, like to-know-scientifically, is twofold, in potentiality (δυνάμει) and in actuality (ἐνεργείᾳ). The potentiality, like matter, being universal and indeterminate, is [scientific knowledge] of what is universal and indeterminate, but the actuality is determinate and of what is determinate, a this (τόδε τι) and of a this.
[iv] But incidentally [even] sight does see the universal color, because this color which it sees is color, and [*a fortiori*] what the literate person discerns, this alpha, is alpha[13].
[v] For if the principles had to be universal, what is out of them would also have to be universal, as in demonstrations: and if this were so, nothing would be separate or a substance. But it is clear that scientific knowledge is in one sense universal, and in another sense not.

[i] εἰ δὲ μηθὲν κωλύει ὥσπερ ἐπὶ τῶν τῆς φωνῆς στοιχείων πολλὰ εἶναι τὰ ἄλφα καὶ τὰ βῆτα καὶ μηθὲν εἶναι παρὰ τὰ πολλὰ αὐτὸ ἄλφα καὶ αὐτὸ βῆτα, ἔσονται ἕνεκά γε τούτου ἄπειροι αἱ ὅμοιαι συλλαβαί.
[ii] τὸ δὲ τὴν ἐπιστήμην εἶναι καθόλου πᾶσαν, ὥστε ἀναγκαῖον εἶναι καὶ τὰς τῶν ὄντων ἀρχὰς καθόλου εἶναι καὶ μὴ οὐσίας κεχωρισμένας, ἔχει μὲν μάλιστ' ἀπορίαν τῶν λεχθέντων, οὐ μὴν ἀλλὰ ἔστι μὲν ὡς ἀληθὲς τὸ λεγόμενον, ἔστι δ' ὡς οὐκ ἀληθές.
[iii] ἡ γὰρ ἐπιστήμη, ὥσπερ καὶ τὸ ἐπίστασθαι, διττόν, ὧν τὸ μὲν δυνάμει τὸ δὲ ἐνεργείᾳ. ἡ μὲν οὖν δύναμις ὡς ὕλη καθόλου οὖσα καὶ ἀόριστος τοῦ καθόλου καὶ ἀορίστου ἐστίν, ἡ δ' ἐνέργεια ὡρισμένη καὶ ὡρισμένου, τόδε τι οὖσα τοῦδέ τινος.
[iv] ἀλλὰ κατὰ συμβεβηκὸς ἡ ὄψις τὸ καθόλου χρῶμα ὁρᾷ ὅτι τόδε τὸ χρῶμα ὃ ὁρᾷ χρῶμά ἐστιν, καὶ ὃ θεωρεῖ ὁ γραμματικός, τόδε τὸ ἄλφα, ἄλφα.
[v] ἐπεὶ εἰ ἀνάγκη τὰς ἀρχὰς καθόλου εἶναι, ἀνάγκη καὶ τὰ ἐκ τούτων καθόλου, ὥσπερ ἐπὶ τῶν ἀποδείξεων· εἰ δὲ τοῦτο, οὐκ ἔσται χωριστὸν οὐθὲν οὐδ' οὐσία. ἀλλὰ δῆλον ὅτι ἔστι μὲν ὡς ἡ ἐπιστήμη καθόλου, ἔστι δ' ὡς οὔ.

(*Metaphysics* M 10, 1087a7-25, trans. S. Menn, mod.)

When it comes to the answer Aristotle formulates in this passage, there is not much interpreters agree upon except that this answer is striking. It is centered around a distinction between potential and actual scientific knowing (τὸ ἐπίστασθαι δυνάμει and ἐνεργείᾳ)[14]. Aristotle associates universality with the former and characterizes the latter as being concerned with "a this" or "a so-and-so" (τόδε τι).[15] That allows him to conclude – in his characteristic manner –

[13] Michael Peramatzis suggests quite a different construal of [iv] (in an unpublished paper presented at the Reading Party on Aristotle's Metaphysics Mu in Oxford, September 2017). Roughly, the idea is that ἀλλά introduces Aristotle's response to an objection one can raise (not unlike the difficulty (II) I formulate below): isn't it implied by [iii] that there is no difference between the objects of scientific knowledge and the objects of sense-perception? Aristotle, according to Peramatzis, is addressing this objection in [iv] by insisting that the proper object of scientific knowledge (namely "that this color is color" or "that this alpha is alpha") can at most become an incidental object of sense-perception. This presupposes that we construe the second part of [iv] quite differently than interpreters normally do: "καὶ ὃ θεωρεῖ ὁ γραμματικός τόδε τὸ ἄλφα ἄλφα" ought to be understood as a second example of what the ὄψις ὁρᾷ only κατὰ συμβεβηκός, while a knower grasps it in its own right. I return to this reading, and my reasons for not following it, below in Section 3.
[14] Cf. *De Anima* B 5, 417a21-b2, *Magna Moralia* B 6.13-14. It is worth noticing that Aristotle does not employ here the distinction of *Posterior Analytics* between demonstrative and non-demonstrative scientific knowledge, or the principle of scientific knowledge, i.e. νοῦς (for a helpful discussion of it, see B. Morison, "Theoretical Nous in *Posterior Analytics*", *Manuscrito*, 42(4), 2019, p. 1-43.). It goes without saying that the scientific knowledge of the ultimate principles under consideration in **Text 1** cannot be a demonstrative scientific knowledge.
[15] For the second, alternative, way of construing τόδε τι, see *Cat.* 5, 2a13-14 with M. Burnyeat, *A Map of Metaphysics Zeta*, Pittsburgh, Mathesis Publications, 2001, p. 49 fn. 99. I return below in Section 5 to how this

that the dictum according to which "all scientific knowledge is universal" is in one sense true, but is not true in the sense of implying that the principles are universals[16].

There have been, as we will see, several widely diverging views on what exactly the distinction drawn here amounts to and whether it can really contribute to solving the difficulty or not. Though what is first of all surprising is that Aristotle formulates such an ambiguous (and questionable) answer at all. It would seem that he could have solved the second horn of *B*#14 in a much more straightforward and safer way. He could have said that universals are indeed prior to the particular principles of individual substances *in knowledge* (or *in account*) while the latter are prior *in being* (in οὐσία)[17]. Or he could have made an exception specifically for the principles in the strictest sense (the highest ἀρχαί of *Metaphysics* Λ 6-10) which can, admittedly, become objects of scientific knowledge or νοῦς despite their not being universals[18]. As S. Menn complains: "Quite likely this is what Aristotle *should* have said, but in the only passage where he seems to be deliberately addressing this argument [i.e. the second horn] of *B*#14, he takes a bolder line..."[19] What is striking is the generality and implicit radicality of Aristotle's response: *prima facie*, at least, his claim is that all relevant acts based in a scientific knowledge are concerned with something particular rather than universal. This is indeed a bold and counter-intuitive thing to say. Many interpreters have suspected that Aristotle was simply carried away here by his polemic with the Platonists, and that he committed himself to something he would otherwise never accept. Other scholars attempted to interpret Aristotle's solution more charitably. But none of the existing readings, I will argue, can properly deal with difficulties inherent in **Text 1**. This paper offers a novel interpretation of **Text 1**, based on a close analysis of Aristotle's argument and supported by his account of geometrical thought in terms of potentiality and actuality in *Metaphysics* Θ 9 (**Text 2**). If correct, it shows that, very far from manifesting any tension between Aristotle's accounts of knowledge and being, the solution of **Text 1** has a solid ground in his epistemology.

## 2. Two difficulties with M 10, 1087a7-25 and three influential approaches

### (A) *Charging Aristotle with inconsistency*

One common approach to our text is characterized exactly by the kind of suspicion mentioned above. Aristotle's alleged solution in **Text 1** is accused of being plainly inconsistent with his official account of scientific knowledge as developed systematically in *Posterior Analytics*. This approach goes back at least to Syrianus, whose judgment about **Text 1** was harsh: "His [sc. Aristotle's] statement that scientific knowledge of universals is potential, while that of

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construal may fit the proposed interpretation of **Text 1**. I thank to the anonymous referee of *Revue de Philosophie Ancienne* for the suggestion to explore this possible connection.

[16] Alternatively (it was suggested to me), one could read Aristotle's assertion in [ii] about "the claim" (τὸ λεγόμενον) being "true in one way and not true in another way" as concerning the whole implication including the ὥστε clause. But from what follows, this does not seem to be the intended meaning: while Aristotle puts a lot of effort into explaining the truth and the falsity of the dictum "all scientific knowledge is true", he does nothing comparable for the universality of principles, and he only offers reasons for denying it in [v].

[17] This is, for example, how the relation between sensible and mathematical beings is described in *Metaphysics* M 2 (*cf.* 1077a36-b14).

[18] This strategy is, for instance, developed in Aristotle's name against Zeller's notorious criticism by G. Hertling, *Materie und Form und die Definition der Seele bei Aristoteles: ein kritischer Beitrag zur Geschichte der Philosophie*, Bonn, Weber, 1871, p. 41-43. *Cf.* Ch. Rapp, "The German Chancellor, Confessional Struggles, therein Aristotle & his Allegedly Individual Forms. Georg von Hertling as an Interpreter of Aristotle", in C. King, Ch. Rapp, & G. Hartung (eds.), *Aristotelian Studies in 19th Century Philosophy*, Berlin, De Gruyter, 2019, p. 179-206.).

[19] S. Menn, "Aporiai 13-14", in M. Crubellier, A. Laks (eds.), *op. cit.*, 236-237.

particulars (τῶν καθ' ἕκαστα)[20] is actual, is clearly that of someone who, because of his contentiousness towards his predecessors, is prepared to contradict what is said in his own *Posterior Analytics*, to the effect that it is not possible to have scientific knowledge of particulars, never mind that this knowledge should be better and more perfect than that of universals."[21] But this kind of reproach, as it stands, is clearly, at the very least, uncharitable. For Aristotle is certainly *not* prepared to contradict the account of *Posterior Analytics*. Quite to the contrary, he takes care to insist (in both [ii] and [v]) that the dictum according to which all scientific knowledge is universal remains true – at least in one sense – also in the face of the suggestions he is making in [iii] and [iv]. Aristotle can hardly have in mind something that would straightforwardly contradict *Posterior Analytics*, such as the claim that syllogisms with a particular minor premise are more perfect (τελειότεροι) than Barbara, as Syrianus surmises[22]. Similarly, he can be hardly giving up here on the demand for any proper explanation to operate on the appropriate level of universality[23].

***Two difficulties***

Now, if a part of Aristotle's aim is, indeed, to insist that the doctrine of *Posterior Analytics* remains true, rather than saying something that would contradict it[24], how are his suggestions in [iii] and [iv] to be understood? At the most general level, two answers seem possible. Perhaps (a) by "actual scientific knowing" Aristotle means here only some *specific kind of application* of the universal "potential scientific knowledge"; in that case, many acts of scientific knowing, such as performing demonstrative syllogisms with universal conclusions, would simply not be taken into consideration in **Text 1**. Another possibility is (b) that Aristotle wants to say about *all acts* of scientific knowing, without any exception, that they are concerned with a this; but then the hope must be that the notions of potentiality (δύναμις) and actuality (ἐνέργεια) can make this, apparently bold, claim compatible with the demand for *all* scientific knowledge to be universal[25]. The difference between these two approaches turns on the question of whether Aristotle leaves, implicitly, room in **Text 1** for acts of scientific knowing that are *not* concerned

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[20] Clearly, Syrianus does not see any important difference between the expressions τόδε τι and καθ΄ ἕκαστον with respect to **Text 1** (unlike interpreters discussed under (B) below).

[21] Syrianus, *On Metaphysics* M 10, 164.4-8, trans. J. Dillon and D. O'Meara, slightly mod.

[22] Syrianus, *On Metaphysics* M 10, 164.8-12. He seems to have primarily *Posterior Analytics* A 14 and A 24 in mind, cf. *Prior Analytics* A 7.

[23] As articulated in *Posterior Analytics* A 4-5.

[24] While modern interpreters are usually not as dismissive as Syrianus, the charge of inconsistency with the *Analytics* is raised by many of them, see, e.g., E. Zeller, *op. cit.*, p. 309-331; H. Bonitz, *Aristotelis Metaphysica*, Bonn, Marcus, 1848, p. 569 fn. 1; H. Maier, *Die Entstehung der Aristotelischen Logik*, Tübingen, Laupp, 1900, p. 216-220; P. Natorp, *Platos Ideenlehre*, Leipzig, Dürr, 1903, p. 421; W.D. Ross, *op. cit.*, vol. I, cviii-cx; C. Werner, *Aristote et l'idéalisme platonicien*, Paris, Alcan, 1910, p. 60-71.; T. Gomperz, *Greek thinkers: A history of ancient philosophy*, London, J. Murray, 1905, p. 77-78.; G. Rodier, "Quelques remarques sur la conception aristotelicienne de la substance", *L'Annee Philosophique*, 20, 1909, p. 73-74.; J. Tricot, *Aristote: La métaphysique*, Paris, Vrin, 1962, p. 439-442.; W.J. Oates, *Aristotle and the problem of value*, Princeton, N.J., Princeton University Press, 1964, p. 181-183.; A.R. Lacey, "Οὐσία and Form in Aristotle", *Phronesis*, 10(1), 1965, p. 60-62.; I. Düring, *Aristoteles*, Heidelberg, Winter, 1966, p. 251.; D. Allan, *op. cit.*, p. 120-121..

[25] The latter view (b) is clearly preferred by Ps.-Alexander (*On Metaphysics* M 10, 791.31-793.23) and it can find support in Aristotle's claims in *De Anima* Γ 7-8 (431b2-12, 432a3-14) and *On Memory* 1 (449b30-450a7), cf. *Physics* H 3, 247b4-7, to the effect that *every* act of thinking (νοεῖν) depends on some act of *phantasia* (and via *phantasia*, presumably, is somehow concerned with something particular), *cf.* also W. Leszl, "Knowledge of the Universal and Knowledge of the Particular in Aristotle", *Review of Metaphysics*, 26(2), 1972, p. 303. The former view (a) can be supported by texts like *Prior Analytics* B 21 (67a22-26) or *Posterior Analytics* A 1 (71a17-24) where Aristotle, apparently, discusses the application of universal scientific knowledge to particular instances as a *specific* kind of operation ("simultaneous learning"); cf. *De Anima* B 5, 417b26-29. *Cf.* R. Heinaman's helpful distinction between potential$_1$ and potential$_2$ scientific knowing ("Knowledge of Substance in Aristotle", *Journal of Hellenic Studies*, 101, 1981, p. 65-67) and R. Sirkel, *The Problem of Katholou (Universals) in Aristotle*, dissertation defended at the University of Western Ontario, 2010, p. 73-81..

with a this. But this question is, I believe, not decisive. Both approaches, after all, presuppose that there is at least *some* genuine scientific knowing (ἐπίστασθαι), qualified as an activity (ἐνέργεια), which is concerned with a this.

**Question 1**. One crucial question, then, is whether *some* such scientific knowing is possible at all against the background of *Posterior Analytics*. One need only read the opening lines of *Posterior Analytics* A 2 to see what kind of difficulty is lurking here: "We think (οἰόμεθα) that we scientifically know (ἐπίστασθαι) something simpliciter (that is not in the sophistical way, i.e. incidentally), when we think that we know (γινώσκειν) the cause through which the thing is [and know] that it is its cause and it cannot be otherwise."[26] A bit later, in A 4, Aristotle spells out what the demand that the object of scientific knowledge "cannot be otherwise" amounts to: the object of scientific knowledge needs to hold "of all" (73a28-34) and "*per se*" (73a34-b24) which together compose the relevant sense of holding "universally" (73b26-27), "so that it is clear that what holds universally, belongs to things of necessity" (b27-28); this and only this, it seems, qualifies as a genuine object of scientific knowledge[27]. Now, one can ask how any act of scientific knowing complying with these demands can apply to a principle conceived as a particular in line with *B*#14 and **Text 1**. This seems difficult exactly because Aristotle does *not* limit the principles in question here to the highest immaterial (and eternally existing) ἀρχαί and he explicitly excludes the idea of conceiving them as universals. It is far from clear how any act of genuine scientific knowing could be concerned with the immanent causes of perceptible (or, for that matter, mathematical) objects, such as their forms, if these are conceived as something no less particular and so apparently no less ephemeral than the composites themselves.

**Question 2**. Another, closely connected, difficulty concerns the relation in **Text 1** between scientific knowing and sense-perceiving. What Aristotle says in [iii] and [iv] seems to bring the former strikingly close to the latter. So close, in fact, that the question naturally arises whether the scientific knowing as conceived in this passage can be distinguished, in a sufficiently robust way, from sense-perceiving at all. The worry behind this question is that an important criterion for distinguishing the intellectual and the perceptual cognition (namely universality)[28] seems to be *prima facie* discarded in this passage. If the parallel between discerning (θεωρεῖν) and seeing in [iv] is taken at face value, it seems that the universality of the scientific knowledge in question is nothing essentially different from the "universal" applicability of the five senses to their respective ranges of qualities. But if this is so, one can ask why we should call the cognitive disposition in question *scientific knowledge* at all, rather than a sophisticated kind of sense-perception. This worry seems relevant against the background of Aristotle's criticism of his predecessors for assimilating intellectual cognition to sense-perception[29]. In fact, Aristotle formulated such a worry himself in his discussion of *B*#8: "So", he says in *Metaphysics* B 4 "if there is nothing beyond the particulars, there would be nothing intelligible, but everything would be perceptible and there would be no scientific knowledge of anything, *if one does not want to call 'scientific knowledge' [what in fact is] sense-perception*" (999b1-3)[30]. With these passages in mind, one can wonder whether Aristotle's solution to the "greatest difficulty" in

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[26] *Posterior Analytics* A 2, 71b9-12. *Cf.* in this context also A 6, esp. 74b32-29, and A 8. For a helpful discussion of Aristotle's definition, see L. Angioni, "Aristotle's Definition of Scientific Knowledge", *History of Philosophy & Logical Analysis*, 19(1), 2016, p. 79-104.

[27] Leaving aside the distinction between "necessary" and "regular" (επὶ τὸ πολύ) as drawn at *Posterior Analytics* B 12, 96a8-19, *cf.* A 14, 79a17-24 and A 30. On necessity, see, e.g., L. Angioni, "Aristotle on Necessary Principles and on Explaining X through X's essence", *Studia Philosophica Estonica*, 7(2), 2015, p. 88-112.

[28] See, e.g., *Posterior Analytics* A 31, *Metaphysics* A 1, or *De Anima* B 5, 417b18-26.

[29] Most notably in *De Anima* Γ 3, 427a17-b14, cf. *Metaphysics* Γ 5, 1009b1-39.

[30] For the mixing up of the two names in the other direction, cf. *Posterior Analytics* A 31, 88a9-11: "so it is clearly impossible to know scientifically some of the objects of demonstration by sense-perception (τὸ αἰσθάνεσθαι), if one does not call 'sense-perception' this, i.e. having scientific knowledge through demonstration".

**Text 1** is not in fact just a verbal trick consisting in calling "scientific knowing in activity" something that, strictly speaking, should qualify as a sophisticated kind of sense-perceiving.

The suggestion I want to make is that in order to answer **Questions 1 & 2**, we should read Aristotle's claims in [iii] and [iv] in a less radical way than they have usually been taken, and that support for such a reading can be found in the second half of *Metaphysics* Θ 9. But before turning to this chapter, it will be worth mentioning two approaches to **Text 1**, adopted by quite a few modern scholars, and briefly discussing how they can deal with the two questions. What these approaches have in common is, first, that they attempt to explain **Text 1** in a more charitable light than interpreters (**A**) charging Aristotle with inconsistency, and, second, that they find Aristotle committing himself here to a metaphysically loaded view on the status of the formal principles.

**(B)** ***Ascribing the "accidentality thesis" to Aristotle***

It has been suggested, most notably by H. Cherniss[31] and J. Owens[32], that Aristotle's solution is drawing on a specific view on the status of universals. This view was later termed by M.M. Tweedale the "accidentality thesis"[33] and has since been ascribed by several scholars to Alexander of Aphrodisias[34]. According to this view, universality is an accident of something, namely the "natures" or "forms", which on their own are neutral with respect to particularity and universality[35].

The idea is, roughly, that when Aristotle claims in [iii] that "the actuality [of scientific knowing] is determinate and of what is determinate, a this and of a this (τοῦδέ τινος)", by τόδε τι he does *not* mean what he meant before by καθ' ἕκαστον contrasted with καθόλου (*cf.*, e.g., 1086b20-21): the form as an object of actual scientific knowing is not characterized as *a particular* here, but as an *individual* which is in itself neutral with regard to the distinction between particularity and universality[36]. This, the thought continues, is confirmed by the analogy with seeing in [iv]. Here, it is claimed, Aristotle wants to say that "this alpha" is a determinate form – in itself neutral with respect to particularity and universality – to which

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[31] *Op. cit.*, p. 338-358.

[32] "The Grounds of Universality in Aristotle", *American Philosophical Quarterly*, 3(2), 1966, p. 162-169. See also J. Owens, *The Doctrine of Being in the Aristotelian Metaphysics*, Toronto, Pontifical Institute of Mediaeval Studies, 1978, p. 426-434. *Cf.* J. Lear, "Active Episteme", in A. Graeser (ed.), *op. cit.*, p. 149-174; or A. Madigan, *Aristotle: Metaphysics, Book B and Book K 1-2*, Oxford, Clarendon Press, 1999, p. 144.

[33] M.M. Tweedale, "Duns Scotus's Doctrine on Universals and the Aphrodisian Tradition", *American Catholic Philosophical Quarterly*, 67(1), 1993, p. 79.

[34] For a systematic defense of this interpretation of Alexander, *cf.* R. Sirkel, *op. cit.*, p. 130-143. and R. Sirkel, "Alexander of Aphrodisias's Account of Universals and Its Problems", *Journal of the History of Philosophy*, 49(3), 2011, p. 297-314. For a warning against ascribing the accidentality thesis to Alexander in a too robust form, see M. Rashed, *Essentialisme: Alexandre d'Aphrodise entre logique, physique et cosmologie*, Berlin, W. de Gruyter, 2007, p. 254-256; R. Chiaradonna, M. Rashed, "Before and After The Commentators: An Excercise in Periodization", *Oxford Studies in Ancient Philosophy*, 38, 2010, p. 288. For Alexander's account of universals, see further A.C. Lloyd, *Form and Universal in Aristotle*, Liverpool, F. Cairns, 1981, ch. 4; M.M. Tweedale, "Alexander of Aphrodisias' Views on Universals", *Phronesis*, 29(3), 1984, p. 279-303; R. Sorabji, *The philosophy of the commentators, 200-600 AD: A sourcebook. Vol. 3: Logic and Metaphysics*, Ithaca, N.Y., Cornell University Press, 2005, p. 149-155; R.W. Sharples, "Alexander of Aphrodisias on Universals: Two Problematic Texts", *Phronesis*, 50(1), 2005, p. 43-55; R. Chiaradonna, "Alexander, Boethus and the Other Peripatetics: The Theory of Universals in the Aristotelian Commentators", in R. Chiaradonna, G. Galluzzo (eds.), *Universals in ancient philosophy*, Pisa, Eddella Normale, 2013, p. 322-324; M. Havrda, "Five Views of *definienda* in Alexander's *Quaestiones* 1.3 and 2.24", *Elenchos* 42(2), 2021, p. 351-374.

[35] Alexander explicitly formulates something like the accidentality thesis in the famous *Quaestiones* I 3 and I 11 (*cf.*, e.g., *On Metaphysics* B 6, 233.20-21). This thesis, however, was (mis)interpreted in a radically nominalist light by later Greek commentators who ascribed to Alexander the view that universals are accidents of hylomorphic compounds rather than universality being an accident of natures (*cf.* on this M.M. Tweedale, *op. cit.*).

[36] This kind of accidentality thesis is sometimes also identified in *DA* Γ 4, 429b10-22, *cf.* most notably R.M. Polansky, *Aristotle's De anima*, New York, Cambridge University Press, 2007, p. 445-451 and 470-471.

universality belongs as an accident (κατὰ συμβεβηκός). The actual scientific knowing of this alpha is then, allegedly, conceived as being a potential scientific knowing of alpha in general[37].

There are several difficulties with this interpretation. The implied relation between actual and potential scientific knowing is surprising, to say the least[38]. And the key contrast between the intended meaning of τόδε τι and καθ΄ ἕκαστον appears doubtful, especially against the backdrop of Aristotle's discussion of *B*#14 at 1003a6-10, where τόδε τι seems to have been taken as a καθ΄ ἕκαστον and *as such* contrasted with καθόλου (*cf.* again *Metaphysics* M 10, 1086b25-27). As for our two questions, interpretation **B** seems to offer some kind of answer to **Question 1**: since the object of actual scientific knowing is not a transient particular, it can, arguably, better satisfy the criteria of *Posterior Analytics* – although one may wonder whether the alleged neutrality can be enough. One problem is that, on this reading, **Text 1** would seem to imply that every sense-perceived color is, on its own, equally neutral with respect to particularity and universality. Sense-perception, thus, could not be distinguished from intellectual cognition as being concerned with particulars, and so there would be no good answer to **Question 2**[39].

**(C)** ***Relying on the special status of intrinsically particular substantial forms***

Some interpreters[40] have taken the final lines of M 10 as evidence for how far Aristotle was prepared to go in pursuing his intuition that substantial forms are in themselves particular (or "individual"), rather than individuated by matter, as is traditionally held. These interpreters usually acknowledge that **Text 1** introduces a "fundamental revision" to Aristotle's account of scientific knowing, but rather than charging Aristotle with inconsistency, they attempt to interpret this revision charitably.

An answer to **Question 2** seems to lie ready at hand. Arguably, also in *De Anima*, Aristotle's most important criterion for distinguishing between intellectual and perceptual cognition is not that of universality and particularity[41], but that of essences and non-essential attributes[42]. If this is so, then scientific knowing can be successfully distinguished from sense-perception even if it turns out in **Text 1** that there is no difference in universality between them.

What seems more difficult is to see how the intrinsically particular forms could become objects of a genuine scientific knowing satisfying the criteria of *Posterior Analytics* (in line with **Question 1**). If what we actually know as, say, the cause of Socrates' life is something intrinsically particular that now exists and later does not, how can there be any assurance that what we know "cannot be otherwise"? If the cause in question is no less particular than Socrates himself, no such assurance seems available. This paradox has been pointedly analyzed by R. Heinaman.[43] He first defends the consistency of Aristotle's alleged solution in **Text 1** with what we find in other texts, arguing that, unlike the particular non-essential features of substances, Aristotle never excludes the intrinsically particular substantial forms from being objects of

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[37] *Cf.* J. Owens, *op. cit.*, p. 428.: "The grammarian knows actually this alpha. It is not actually a universal. But his knowledge of what-IS-Being, which is the source of its 'thisness', *can* be applied to any other alpha whatsoever. It *is able to* be applied universally and so is *potentially* universal" (my emphasis).

[38] This has been pointed out by W. Leszl, *op. cit.*, p. 312: "Aristotle would be claiming that actual grasp of a 'this', that is, recognition of the form in an individual, is, at the same time, potential grasp of all the other instances of the form". But at 1087a7-25 Aristotle seems to be taking, in line with *De Anima* B 5, potential scientific knowing as something that *precedes* and underlies the actual scientific knowing, rather than being posterior to it.

[39] For a more detailed critical discussion of this position, *cf.* W. Leszl, *op. cit.*, p. 305-313.

[40] See M. Frede, G. Patzig, *Aristoteles "Metaphysik Z": Einleitung, Text und Übersetzung*, München, Beck, 1988, p. 56.; C. Witt, *Substance and essence in Aristotle: an interpretation of Metaphysics VII-IX*, Ithaca, Cornell University Press, 1989, p. 155-179. A similar view is also adopted by J. Annas, *op. cit.*, p. 179-182, and R. Heinaman, *op. cit.*

[41] As Aristotle seems to be suggesting at *De Anima* B 5, 417b19-26, but problematizing it at 417b26-29.

[42] As Aristotle seems to be suggesting at *De Anima* Γ 4, 429b10-22.

[43] *Op. cit.*, p. 71-77.

scientific knowing. But at the end of his paper, he confronts Aristotle with the problem of perishability of these forms. Aristotle, of course, recognizes that these forms are, in a sense, perishable,[44] and he does not seem to offer any good explanation of why this should not be a problem for their scientific knowability. So, Heinaman concludes on a skeptical note with a rhetorical "question... as to whether Aristotle has the right to be consistent" in **Text 1**[45].

Besides this difficulty, there is also something suspiciously rigid about the way in which interpretation **C** understands the relation between potentiality and actuality in [iii]. It seems to assume that "potential knowledge has one object and actual knowledge another object". But as W. Leszl has pointed out, this assumption appears to be based on "an absolutization of the distinction between what is potential and what is actual", which, he argued, can only lead us astray because "a potentiality is [by definition] a potentiality of what is actual"[46]. How could an actual knowing be the actualization of a potential knowing if the two had entirely different objects?

## 3. The parallel between θεωρεῖν and seeing and the relation between potentiality and actuality

To sum up, it seems difficult for both charitable interpretative approaches **B** and **C** to satisfactorily answer the two questions concerning, first, Aristotle's demands on scientific knowing familiar from *Posterior Analytics* (**Question 1**), and, second, its relation to sense-perception (**Question 2**). This is intimately related to (a) their understanding of what is said about seeing and θεωρεῖν in [iv] in terms of a straightforward parallel. Moreover, (b) each of them takes the relation between potentiality and actuality in [iii] in a way which is at least questionable (for it either reverses the relation or makes it too rigid). I want to outline an alternative approach to these two points which does not commit Aristotle to any comparably loaded view about forms and at the same time answers, or so I hope, the two questions in a more satisfactory way. It is the second point which will lead us to *Metaphysics* Θ 9.

### (a) *θεωρεῖν and seeing in [iv]*

The truth is that [iv] can, despite the almost unanimous agreement of scholars, be read as not drawing any parallel between seeing and θεωρεῖν at all. As Michael Peramatzis has suggested, it is possible to take the phrase καὶ ὃ θεωρεῖ ὁ γραμματικός not as comparing the activity of a literate person with that of sight, but rather as introducing another object, beside the universal color, that is seen by sight only incidentally[47]. The whole of [iv] can then be understood as Aristotle's response exactly to the kind of worry raised under **Question 2**: one could suspect that if actual scientific knowing is concerned with a this, it cannot be distinguished from sense-perception. But, Aristotle is taken to respond, the proper object of scientific knowing here is, strictly speaking, different, namely more complex than the object of sense-perception. It is, for example, "that this color is color" or "that this alpha is alpha", and these can never be objects of sense-perception in their own right, but only incidentally.

Now, despite having some attraction, I think this reading is not likely to be correct. One reason is grammatical: if this were what Aristotle meant, it is hard to understand how he could have omitted the ὅτι in the phrase τόδε τὸ ἄλφα [ὅτι] ἄλφα. Another reason comes from a larger context where alpha stands for a principle of substance, that is, something which is apparently

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[44] At *Metaphysics* Z 15, 1039b20-27, drawing on Z 7-9; *cf.* also, e.g., Λ 6, 1071b5-6.
[45] *Op. cit.*, p. 77.
[46] W. Leszl, *op. cit.*, p. 294, 298.
[47] *Cf.* fn. 13 above.

not perceptible[48]. Yet another reason concerns the relation between [iv] and Aristotle's official account of incidental sense-perception in *De Anima*. It is a challenge for any reading to explain how this account allows for the case of incidentally sense-perceiving the universal color (more on that below). But as long as this remains the only example in [iv] of an incidentally sense-perceived item, one has at least some hope of understanding Aristotle's motivation for introducing this surprising case (there is presumably something specific about it which would not be obvious in the more standard cases). But on the discussed reading, Aristotle also uses another example: sense-perceiving incidentally alpha. That seems much closer to the standard cases from *De Anima* of sense-perceiving incidentally Cleon's son or human or flesh, and if these kinds of examples are to the point, it becomes quite mysterious why Aristotle also speaks of the incongruous case of incidentally sense-perceiving the universal color.

I find it, in any case, more promising to retain the traditional construal and ask what Aristotle wants to communicate by his peculiar example of incidental sense-perception. What is common to all cases of incidental sense-perception in *De Anima*, arguably, is that X is sense-perceived incidentally because what is sense-perceived in its own right *is* X in the sense that X can be predicated of it. So, for example, the son of Diares is incidentally sense-perceived because the white object which is sense-perceived in its own right just *is* the son of Diares (that is, being the son of Diares can be truly predicated of that object)[49]. The structure will be similar when we move from individuals to kinds, such as man or flesh: when sense-perceiving (and discriminating) an object with "the characteristic look" of flesh, the animal sense-perceives flesh incidentally[50]. That structure cannot apply to the case of [iv] straightforwardly, for the white thing we sense-perceive which may or may not be Diares' son is surely not a color. Rather sense-perception of white color is involved, as an integral element of sense-perceiving the white thing. What Aristotle does in [iv], I submit, is to focus on this element, i.e. sense-perception of, e.g., white color, which has otherwise no autonomy in his account of sense-perception[51], and to ask what can be truly predicated of it. Clearly, Socrates' white color that I sense-perceive is a color. And clearly, this white color is an instance of the universal white color which could also be predicated of other bodies. Either of these observations, I submit, would be sufficient for Aristotle to make the point he intends to make in [iv]. And both have their place in the larger context of Aristotle's theory of sense-perception.

First, each sense is "universal" in so far as it can discriminate *any* quality of the given range, and so, e.g., each particular color that sight discriminates is, in a way, just a case of discriminating color in general because the particular color is just one of the colors that exist and that sight is capable of discriminating. Second, when sense-perceiving the white object that

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[48] See 1086b22-24, where *BA* was taken to stand for any substance and the two letters for the principles of this substance (whatever these in reality turn out to be).

[49] See *De Anima* A 6, 418a20-23; Γ 1, 425a24-27. I take a further condition intended by Aristotle to be that being a white thing is a distinctive feature of the son of Diares in the given context. The same holds, *mutatis mutandis*, in the case of kinds (see the following footnote). It is thus misleading to say that in the case of incidental sense-perception "quality is… a subject… of which other categories [typically a substance] are predicated" (S. Cashdollar, "Aristotle's Account of Incidental Perception", *Phronesis*, 18(1), 1973, p. 163). For an overview and a discussion of existing interpretations of incidental sense-perception, see M. Perälä, "Aristotle on Incidental Perception", in J. Toivanen (ed.), *Forms of Representation in the Aristotelian Tradition. Volume One: Sense Perception*, Leiden, Brill, 2022, p. 66-98.

[50] See *De Anima* Γ 6 430b29-30; *cf.* Γ 3, 428b19-22, and Γ 4, 429b10-18. For the notion of "the characteristic look" in this context, see M. Frede, "Aristotle on Thinking", *Rhizai. A Journal for Ancient Philosophy and Science*, 5, 2008, p. 295-296. The case of cross-modal incidental sense-perception (*DA* Γ 1, 425a30-b4) seems to be derived from these basic cases.

[51] It is not the case for Aristotle that we primarily sense-perceive qualities like colors and only secondarily objects to which these qualities belong. *Cf.* for this claim K. Corcilius, "The Gate to Reality: Aristotle's Account of Perception in De Anima II 12", in C. Cohoe (ed.), *Aristotle's On the Soul: A Critical Guide*, Cambridge, Cambridge University Press, 2022, p. 122-154.

happens to be the son of Diares, white color is, arguably, not sense-perceived on its own, prior to sense-perceiving the particular object to which it belongs; but it is, nevertheless, in an important sense universal[52]: the white thing sense-perceived is white in exactly the same sense in which any white thing is white; for anything that ever was, is, or will be white, being white was, is, and will be exactly what sight is now telling us it is[53].

Either of these two considerations, I submit, allows us to reformulate Aristotle's point in [iv] thusly: already on the level of the most basic sense-perception, as the model case of cognitive acts concerned with particulars, there is a sense in which the content is universal. Aristotle says so in order to make more acceptable the striking claim from [iii], according to which the actual scientific knowing is of a this. Being of a this, he wants to assure us in [iv], doesn't imply having no universal content. This I take to be the meaning of ἀλλά with which [iv] begins[54]: any actual scientific knowing is indeed of a this as we have just been told in [iii], *but* it is, in a sense, also of the universal. These two kinds of content are not mutually exclusive, as the parallel with sense-perception is intended to show. And Aristotle is not willing to stop with this parallel. The point is that what holds already of sense-perception, albeit in an incidental way, will hold *a fortiori* of actual scientific knowing in a way that will, presumably, no longer be just incidental.

Very roughly, while Socrates' white color is an instantiation of the universal white color (and of color in general) and so the universal is incidentally sense-perceived, this alpha, as an object of knowledge, is such an instantiation of the universal alpha that it essentially *stands for* the universal type: knowing in actuality this alpha involves *per se* taking it as exemplifying the universal alpha; and so scientifically knowing in actuality the principle of a particular substance involves *per se* taking it as standing for the principle of any substance of the given kind[55]. Thus, the fact that the actual scientific knowing is concerned with a this doesn't mean that there is no place for universality in it, that its "universality" is reducible to universal applicability, or that it is only incidental, like in the case of the senses. If this is right, Aristotle does draw a parallel in [iv] between seeing and θεωρεῖν (as against the alternative construal), but this is not a straightforward parallel, which would imply that the object of the latter is as particular as the object of the former (as against the standard reading).

**(b) *actuality and potentiality in [iii]***

The discussed issue about [iv] is closely connected to how the relation between potentiality and actuality in [iii] should be understood. One would, I suppose, naturally expect that (against interpretation **B**) the potential scientific knowing precedes and underlies the actual scientific knowing (as, for instance, *De Anima* B 5, 417a21-29 suggests), but that the two must be more intrinsically related than interpretation **C** assumes. If, as Aristotle says, the actual scientific knowing is concerned with a particular, then the corresponding potential scientific knowing

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[52] For a reading along these lines, see M. Crubellier *op. cit.*, p. 388-389. I thank Michel Crubellier for a helpful discussion of these lines.

[53] Cf. *Metaphysics* Γ 5, 1010b23-26. Something like this consideration seems to be also behind Aristotle's claim in *Posterior Analytics* A 31, 87b29-33 and B 19, 100a16-b1 that although we sense-perceive particulars, sense-perception is of universals. For the place of these two considerations in Aristotle's theory of perception, I refer the reader to R. Roreitner, *The Unmoved Causes of Receptivity: Perception in Aristotle's* De Anima, forthcoming.

[54] It is this ἀλλά that, according to Peramatzis, the traditional reading can't satisfyingly explain. But this doesn't seem decisive. In the traditional reading, one can explain the ἀλλά in the following way: [iii] the actual scientific knowing doesn't have universals for its proper object (the proper object is a this), [iv] *but rather*, just as sight sees the universal color only incidentally, so the actual scientific knowing has the universal for its object only incidentally. What is problematic about this reading, I take it, is not that there is no way of making sense of ἀλλά, but the implication that the actual scientific knowing is of universals only incidentally in the same way as seeing.

[55] See again 1086b22-24 (*cf.* fn. 48 above).

must, in some sense, be already potential scientific knowing *of* particulars[56]. And *vice versa*: if an acquired potential scientific knowledge is a scientific knowledge of something universal or a universal scientific knowledge, then also its actualization should in some sense be universal and apprehend its object in a universal way. Otherwise, one could hardly be a genuine actualization of the other.

If this intuition about potentiality and actuality of scientific knowing is broadly correct, it will follow that the universality ascribed in **Text 1** to potential scientific knowing must not be *lost* but rather – somehow – *fulfilled* in the actual scientific knowing, or, at any rate, in some way *preserved* in it[57]. From here, it is a short step to saying that the universality is fulfilled or retained by the actual scientific knowing in a way in which it can never pertain to (actual) sense-perceiving. If this is right, it will confirm the suggestion, made above, to see in [iv] a parallel between θεωρεῖν and seeing, which, however, is not straightforward because the accidentality is only characteristic of the latter.

But how exactly should we understand the way in which the actual scientific knowing concerned with a *particular* object actualizes or fulfills the potential *universal* scientific knowing? It is here, I suggest, that *Metaphysics* Θ 9 can be of help. The key thought is the following. Unlike sense-perceiving, the act of scientific knowing, as conceived by Aristotle, needs to take into account the potentiality of which its actual object is an actualization, but which could have also been actualized in many (and perhaps innumerable) other ways[58]. In this sense, the *per se* content of an actual scientific knowing is never exhausted by the particular actuality of its object, as is the case with sense-perception. Rather, the particular actuality here *stands for any* actualization of the respective potentiality and in this sense *reveals* this potentiality instead of simply replacing it[59].

## 4. Universal theorems and particular diagrams in terms of potentiality and actuality (*Metaphysics* Θ 9, 1051a21-33)

As a way of fleshing these ideas out, let us now, finally, turn to Aristotle's discussion of two elementary geometrical theorems, in terms of potentiality and actuality, in *Metaphysics* Θ 9.

**Text 2**

[i] The geometrical theorems (διαγράμματα) are found/proved (εὑρίσκεται) in/by actuality (ἐνεργείᾳ); for [the mathematicians] find/prove by dividing. If divisions were already made, [the theorems] would be evident; but as it is, they are in there potentially.

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[56] That already the potential scientific knowing has to do with particular objects is suggested by *Physics* H 3, 247b4-7.

[57] It is worth noticing that the way in which potential scientific knowing is of universals is nowhere in **Text 1** qualified as incidental and that there is no mention of potential sense-perceiving being of universals in a non-incidental way.

[58] This can hold, of course, only in the cases where the actual object *is*, in fact, an actualization of some potentiality. Immaterial substances of *Metaphysics* Λ 6-10 fall clearly outside the scope of this analysis.

[59] The proposed reading has some affinities with the one developed by W. Leszl, *op. cit.* (for a similar approach see W. Sellars, "Aristotle´s Metaphysics: An Interpretation", in *Philosophical Perspectives: History of Philosophy*, Springfield, Ill., C.C. Thomas, 1967, p. 100-107), *cf.* also S. Menn, *op. cit.*, p. 247-248. G. Galluzzo ("Universals in Aristotle's Metaphysics", in R. Chiaradonna, G. Galluzzo (eds.), *op. cit.*, p. 209-254) argues that **Text 1** is compatible with the traditional view that forms are individuated by matter rather than being intrinsically individual, but I am not convinced by the assumption on which he builds his argument, namely that **Text 1** is not concerned with formal principles at all but exclusively with material elements.

[ii = example 1] Why is [any] triangle [equal with respect to its internal angles to] two right angles? Because the angles around one point are equal to two right angles. So, if the line parallel to the side had been drawn up (ἀνῆκτο), it would have been clear immediately on seeing it.

[iii = example 2] Why is the angle in the semicircle universally (καθόλου) [equal to] the right angle (ὀρθή)? [For] ([διότι])[60] if three lines are equal, the two which are the base and the one dropped straight (ὀρθή)[61] from the center, this is clear on seeing it to the person who knows that.

[iv] Thus it is evident that the things which are potentially (τὰ δυνάμει ὄντα) are found/proved when they are brought (ἀγόμενα)[62] into actuality; the explanation is that thinking is the actuality; so that the potentiality is from actuality, and because of this [the mathematicians] know by making; for the particular actuality is posterior in coming to be.

[i] εὑρίσκεται δὲ καὶ τὰ διαγράμματα ἐνεργείᾳ· διαιροῦντες γὰρ εὑρίσκουσιν. εἰ δ' ἦν διῃρημένα, φανερὰ ἂν ἦν· νῦν δ' ἐνυπάρχει δυνάμει.

[ii = example 1] διὰ τί δύο ὀρθαὶ τὸ τρίγωνον; ὅτι αἱ περὶ μίαν στιγμὴν γωνίαι ἴσαι δύο ὀρθαῖς. εἰ οὖν ἀνῆκτο ἡ παρὰ τὴν πλευράν, ἰδόντι ἂν ἦν εὐθὺς δῆλον.

[iii = example 2] διὰ τί ἐν ἡμικυκλίῳ ὀρθὴ καθόλου; διότι ἐὰν ἴσαι τρεῖς, ἥ τε βάσις δύο καὶ ἡ ἐκ μέσου ἐπισταθεῖσα ὀρθή, ἰδόντι δῆλον τῷ ἐκεῖνο εἰδότι.

[iv] ὥστε φανερὸν ὅτι τὰ δυνάμει ὄντα εἰς ἐνέργειαν ἀγόμενα εὑρίσκεται· αἴτιον δὲ ὅτι νόησις ἡ ἐνέργεια· ὥστ' ἐξ ἐνεργείας ἡ δύναμις· καὶ διὰ τοῦτο ποιοῦντες γιγνώσκουσιν· ὕστερον γὰρ γενέσει ἡ ἐνέργεια ἡ κατ' ἀριθμόν.

(*Metaphysics* Θ 9, 1051a21-33, trans. S. Makin, mod.)

There are several controversial issues surrounding this passage which cannot be addressed here on their own. I will focus only on what is directly relevant for our overarching questions and relegate most of the difficulties to footnotes.

In the introductory bit [i], Aristotle claims that the διαγράμματα are proved/found (εὑρίσκεται) by or in actuality/activity (ἐνέργεια). I agree with H. Bonitz, T. Heath, and G.E.R. Lloyd[63], against W.D. Ross, H. Mendell, and S. Makin[64], that it makes more sense to understand διαγράμματα primarily as geometrical theorems (including the proofs which make them

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[60] There is a textual problem here, for the major manuscripts have all διὰ τί instead of διότι. An alternative solution was suggested by W.D. Ross, *op. cit.*, who retains διὰ τί and understands it as a part of the preceding sentence. This, however, leads to a weird syntax. P.S. Hasper ("Being clear about the explanation: A mathematical example in Aristotle, *Metaphysica* Θ.9, 1051a26-9", *The Classical Quarterly*, 61(1), 2011, p. 172-177) offers an ingeniously elegant reconstruction which allows him to retain διὰ τί as a part of the same sentence. I will come to this suggestion below. I am starting, provisionally, from accepting – with the majority of scholars – the emendation to διότι and from Makin's understanding of the sentence (going back to G.E.L. Owen in M. Burnyeat (ed.), *Notes on Eta and Theta of Aristotle's Metaphysics*, Oxford, University of Oxford - Faculty of Philosophy, 1984, p. 148-149).

[61] The translation follows G.E.L Owen's solution (see the preceding footnote) adopted by S. Makin (*Aristotle: Metaphysics, Book Theta*, Oxford, Oxford University Press, 2006, p. 236) and, with some caution, G.E.R. Lloyd ("Mathematics and Narrative. An Aristotelian Perspective", in A.K. Doxiadēs, B. Mazur (eds.), *Circles Disturbed: The Interplay of Mathematics and Narrative*, Princeton, Princeton University Press, 2012, p. 378-395). More on the issues looming here below.

[62] Following manuscripts EJ with Ross. Manuscripts AbΓ (followed by Bonitz) have ἀναγόμενα ("being reduced to").

[63] See H. Bonitz, *op. cit.*, p. 407; T. Heath, *Mathematics in Aristotle*, London, Routledge, 1949, p. 216; G.E.R. Lloyd, *op. cit.*, p. 384-385. *Cf.*, e.g., S. Menn, *The Aim and the Argument of Aristotle's Metaphysics*, forthcoming, IIIα3.

[64] See W.D. Ross, op. cit.; H. Mendell, "Two Geometrical Examples from Aristotle's Metaphysics", *Classical Quarterly*, 34(2), 1984, p. 360; S. Makin, *op. cit.*

evident)[65] rather than just as "diagrams" or "constructions"[66]. The theorems and their proofs are found or proved by "dividing", and that must mean, or at least include[67], constructing appropriate diagrams. These make the theorems clear or evident, which are otherwise present in the figures only in the mode of potentiality.

The two geometrical theorems which follow in [ii] and [iii] are clearly meant to exemplify what has been said in [i]. Aristotle's examples of the διαγράμματα present in the figures in the mode of potentiality and revealed through divisions are "the reason why (every) triangle has its angles equal to two right angles" (~ Euclid I.32β) and "the reason why the angle in the semicircle is universally equal to the right angle" (~ Euclid III.31α). In each case, Aristotle briefly outlines how the theorem is revealed through additional constructions. For the sake of brevity, I leave the first example aside and focus exclusively on the second one[68].

Aristotle's instruction concerning the second theorem is extremely concise and contains one particularly difficult point relating to the second occurrence of the expression ὀρθή: this is closely connected to other questions, such as how we should punctuate [iii] and what to do with the second διὰ τί which in fact all major manuscripts read in place of διότι. Most interpreters, beginning with Ps.-Alexander (596.21-597.12), understood ὀρθή here as the perpendicular to the diameter. The problem with this construction is that it cannot reveal the theorem in question in its universality as it will only prove it for the special case of the isosceles triangle. As such it will be open exactly to the kind of objection Aristotle raises in *Posterior Analytics* A 5: such a proof can neither provide nor manifest any scientific knowledge. J.L. Heiberg – followed by W.D. Ross and T. Heath – suggests[69] that Aristotle presupposes something like Euclid III.21 ("[All] the angles in the same segment of a circle are equal") and refers to it as ἐκεῖνο – that which one needs already to know in order to prove the theorem in question. But this seems entirely *ad hoc*. Not only is there no reference to anything like III.21 in the two parallel texts in *Posterior Analytics* A 1 (71a17-24) and B 11 (94a28-34), nor, as H. Mendell points out[70], is there in fact any in the whole Aristotelian corpus. It is also strange to assume that ἐκεῖνο refers to a theorem that has not been mentioned at all rather than the one treated in [ii][71]. In order to make Aristotle's instruction more plausible, H. Mendell suggests several possible emendations of the text[72], one of them being an addition of ὅτι in front of ὀρθή: "if three lines are equal, the

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[65] Cf. *Metaphysics* B 3, 998a25-27; Δ 3, 1014a35-b3; *Categories* 12, 14a36-b2, *Sophistical Refutations* 16, 175a16-30. The mathematical theorems here are not to be understood as something *construed* by human reason, but rather as something that is objectively present in the things themselves and can be discovered by us.

[66] *Cf.* G.E.R. Lloyd, *op. cit.*, p. 384-385: "it would be banal to the point of tautology to say that they [i.e. diagrams] become clear when the divisions have been made".

[67] In the case that διαίρεσις means not just constructing some dividing lines, but rather breaking down the original theorem into more simple ones (as Michalis Sialaros has suggested to me).

[68] For the first example, cf. *Metaphysics* M 10, 1086b34-36. The main issue here is, roughly, whether Aristotle's intended proof can be identified with Euclid's proof of I.32β or with the extant non-Euclidean (perhaps Pythagorean) proof (*cf.* T.L. Heath, *A History of Greek Mathematics. From Thales to Euclid*, Oxford, Clarendon Press, 1921, 317–21.). It can hardly be Euclid's proof (despite Ps.-Alexander's and Eustathius' attempts, cf. *ibid.*, p. 217), for besides drawing a parallel to one of the sides, Euclid's proof presupposes that another side is prolonged, and there is not the slightest trace of this move in Aristotle. The problem with the alternative (Pythagorean) proof is that in the known version a parallel to the base is drawn through the apex, which seems hardly compatible with Aristotle's instruction to draw the parallel *up* (ἀνῆκτο). G.E.L. Owen (*op. cit.*, p. 150-151.) and H. Mendell (*op. cit.*, p. 359-362) suggested, independently, a reasonable solution (accepted by both S. Makin and G.E.R. Lloyd): the intended proof is basically the alternative (Pythagorean) proof, except that the parallel is drawn not to the base, but to one of the two remaining sides.

[69] J.L. Heiberg, *Mathematisches zu Aristoteles*, Leipzig, Teubner, 1904, p. 21; W.D. Ross, *op. cit.*, p. 270-271; T. Heath, *op. cit.*, 73-74.

[70] *Op. cit.*, p. 363-364.

[71] It would also be strange if Aristotle were suggesting that III.31α is proved on the basis of the more complex and advanced theorem III.21. See H. Mendell, *op. cit.*, p. 364–5, for further objections.

[72] *Ibid.*, p. 366-370.

two which are the base and the one dropped from the center, [then] *that the angle is right* is clear on seeing it to the person who knows that"[73]. G.E.L. Owen[74] suggests what *prima facie* appears to be a more elegant solution and what has since been adopted by S. Makin and, with some caution, by G.E.R. Lloyd. If we take ὀρθή to mean "straight line" (i.e. εὐθεία) rather than "perpendicular", the proof is from the beginning universal as it should be, without the necessity of emending the text. On the other hand, Owen's constatation that ὀρθή when "used of a line (not an angle)... means 'straight'"[75] is more of a wish than a sure discovery, for there is no support for this meaning to be found in Aristotle[76]. A third possibility, and the last I want to mention, is the one proposed by P.S. Hasper.[77] He argues that we should retain the second διὰ τί and re-punctuate [iii] in the following way: διὰ τί ἐν ἡμικυκλίῳ ὀρθὴ καθόλου; διὰ τί, ἐὰν ἴσαι τρεῖς, ἥ τε βάσις δύο καὶ ἡ ἐκ μέσου ἐπισταθεῖσα, ὀρθή, ἰδόντι δῆλον τῷ ἐκεῖνο εἰδότι ("On what ground is the angle in the semicircle universally the right angle? On what ground, if there are three equal lines, the base [consisting of] two and the one erected from the center, [the angle in the semicircle is] right, is clear on seeing it for anyone who knows that"). This reading has the undisputable virtue of preserving the transmitted text untouched, and given the difficulties faced by all other solutions, one may be inclined to tolerate what seems to be a stylistically dubious repetition of διὰ τί... ὀρθή.

In either way, on Mendell's, Owen's, or Hasper's reading, the intended proof is similar to Euclid's proof. Apart from the theorem of [ii] (~ I.32β), it presupposes something like I.5α ("For isosceles triangles, the angles at the base are equal to one another")[78]. With a look at **Figure 1**, the proof then proceeds smoothly: since *DA* equals *DB* and *DC*, then (from I.5α) the angle *DAB* equals the angle *DBA,* and the angle *DAC* equals the angle *DCA*. From here it follows that the angle *BAC* is half the sum of the angles in the triangle[79]. So, if one knows ἐκεῖνο, i.e. the theorem discussed in [ii] (~ I.32β), then what was to be proved becomes evident. It is exactly because the line we construct in the given semicircle need not be the perpendicular but can be *any* straight line dropped from the center that the *particular* diagram reveals the *universal* theorem as such. This, I take it, is exactly the point Aristotle wants to make. And if this is so, it can, as we will see, shed light on **Text 1**. In order to reveal the διάγραμμα inhering potentially in the figure we need to choose (or "set out") from the infinite range of potentialities one that we actualize; but it is vital that we actualize it as an example standing for *any* of them. In this sense, the resulting actuality needs, in a way, to preserve or comprise all the potentialities which have *not* been actualized. In this way, a particular actuality will be able to reveal a universal cause or theorem.

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[73] One problem with this solution is that, according to it, what becomes clear to the mathematician is only the fact *that* the angle is right, while the initial question was about *why* it is right. A more drastic possibility, which avoids this problem and which Mendell says he prefers, is to delete straightaway the second ὀρθή as a mistake of a scribe (*ibid.*, p. 367, 369).

[74] In M. Burnyeat (ed.), *op. cit.*, p. 148-149.

[75] See *ibid.*, 148.

[76] And apparently not even beyond Aristotle, see P.S. Hasper, *op. cit.*, p. 174.

[77] *Op. cit.*

[78] Cf. *Prior Analytics* A 24, 41b13-22.

[79] Euclid proceeds in a slightly different way here, drawing rather on I.32α which makes the identification of the angle in the semicircle as the right angle more elegant and fitting exactly the definition I.10.

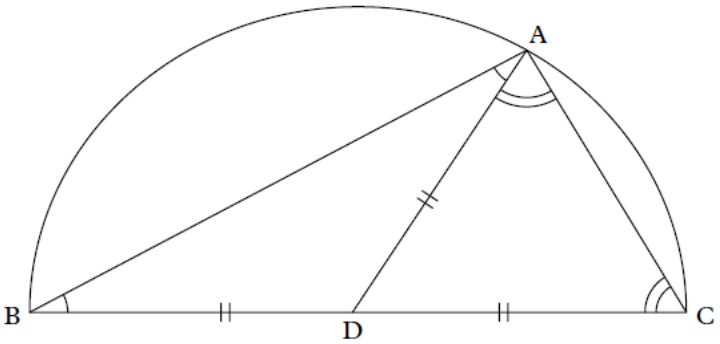


**Figure 1** (from S. Makin, *op. cit.*, p. 235.)

In the final, and most difficult bit of the text, i.e. [iv], Aristotle draws a general lesson from the two examples. Since there are several important, but unfortunately controversial, points contained here, I will go through this passage sentence by sentence. Readers who prefer to get directly to general upshots may jump from here to the beginning of the next section.

What the two examples show, Aristotle says, is that what is in potentiality (τὰ δυνάμει ὄντα) is found/proved by being brought (ἀγόμενα) into actuality (ἐνέργεια). τὰ δυνάμει ὄντα can either refer to διαγράμματα (which have already been said in [i] to "be in there potentially") or to the divisions/constructions which make the διαγράμματα evident[80]. In either case it seems vital again that while τὰ δυνάμει ὄντα can be actualized in (innumerably) many particular ways, the fact that one of these needs to be chosen does not mean that what is found or proved is just this particular case to the exclusion of others. Rather, what is found or proved are τὰ δυνάμει ὄντα as such and this implies that they need to be "brought into actuality" not in any old way, but so that the particular construction reveals the potential beings *in their universality*. In other words, the mathematician must understand that whichever other straight line she drew, the result would be exactly the same, and this is not an additional step, as Heiberg, Ross, and Heath imply with reference to Euclid III.21, but an aspect inherent to the geometrical procedure from its very beginning[81].

The sentence that follows is difficult. What we find in the manuscripts (accepted by Bonitz, Jaeger, or Makin) is αἴτιον δὲ ὅτι νόησις ἡ ἐνέργεια. But Ross – followed by other interpreters – thought this must be corrupt and in need of being emended either into αἴτιον δὲ ὅτι ἡ νόησις ἐνέργεια or into αἴτιον δὲ ἐστι νόησις ἡ ἐνεργείᾳ. In the first case, Aristotle would be explaining what *brings* (ἄγειν or ἀνάγειν) τὰ δυνάμει ὄντα into actuality; this actuality presupposes some thinking, "dividing" or constructing a line, and this thinking is itself another ἐνέργεια[82]. In the second case, Aristotle would be, in the same spirit, straightforwardly claiming that the actual νόησις is the cause which brings τὰ δυνάμει ὄντα into actuality. In both these cases, νόησις would refer to the process which brings the construction about, and the ἐνέργεια of this sentence would be something quite different from the ἐνέργεια of the preceding sentence – which would be a rather surprising shift. Fortunately, none of these emendations is necessary, for a sufficiently good sense can be made of the received text. Aristotle can be taken as saying that the actuality into which τὰ δυνάμει ὄντα are brought is not any old actuality but an actuality or activity *of thought* (νόησις), and that this is exactly the reason why τὰ δυνάμει ὄντα can be

[80] G.E.R. Lloyd, *op. cit.*, p. 381, spells this out as "*relations* subsisting potentially" (my emphasis).
[81] Cf. *Prior Analytics* A 24, 41b13-22. On the generality of proof in Greek mathematics, see I. Mueller, *Philosophy of Mathematics and Deductive Structure in Euclid's Elements*, Mineola, N.Y., Dover Publications, 1981, p. 11-16; R. Netz, *The Shaping of Deduction in Greek Mathematics*, Cambridge, Cambridge University Press, 1999, p. 240-270; C. Cellucci, "The Universal Generalisation Problem", *Logique et Analyse*, 52, 2009, p. 3-20.
[82] This, at least, seems to be Ross' understanding drawing on *Metaphysics* Θ 8, 1049b24-25.

revealed *qua* such by a particular actualization. What the mathematicians are doing when they divide a figure or drop a line is not just constructing some diagram – the diagram itself is not the goal – but enabling an activity of thinking (νοεῖν). Since this is so, the actuality of the diagram they produce is not exhausted by being a particular constellation of (more or less exactly) drawn lines. It is actual as an object of thought, not standing just for itself, but revealing "that which is in potentiality" irrespective of the particular way in which it is actualized in the diagram.

The following sentence (ὥστ' ἐξ ἐνεργείας ἡ δύναμις) can then be interpreted as a further development of the same idea. It can be understood in two, not necessarily incompatible, ways depending on whether we take the potentiality in question to be the one belonging to the figure (picking up on τὰ δυνάμει ὄντα)[83], or whether we take it to be a disposition of scientific knowledge that one acquires upon succeeding to prove or discover something[84]. In both cases, it makes good sense to say that the potentiality *is from* or *depends on* (ἐξ) the actuality/activity of thinking: the potentiality belonging to the figure could not be scientifically known without this activity (which is realized together with a particular diagram), and the disposition of scientific knowledge could not be acquired without performing – imperfectly – the respective activity, as Aristotle has been stressing throughout *Metaphysics* Θ[85].

The last two sentences are, on their own, less problematic: καὶ διὰ τοῦτο ποιοῦντες γιγνώσκουσιν· ὕστερον γὰρ γενέσει ἡ ἐνέργεια ἡ κατ' ἀριθμόν. The particular (ἡ κατ' ἀριθμόν) actuality is posterior to the potentiality in coming-to-be (as Aristotle, of course, has already admitted in *Metaphysics* Θ 8, 1049b17-1050a3). And, therefore, if some potentiality of the object is to be scientifically known in actuality (and presumably also if some acquired scientific knowledge is to be actualized), it is necessary that this potentiality is brought into actuality. Since, as we already know, this bringing into actuality presupposes some additional constructions, it can be concluded that the mathematicians "know by making". Some productive activity is necessary on their side which brings into actuality, in a particular way, the potential inherent in the figure[86]. So, on the one hand, the potential can be scientifically known[87] only in dependence on some actuality. But, on the other hand, each particular actuality of a διάγραμμα and of a knower scientifically knowing it in actuality will be an actualization of the respective potentiality and so posterior to it in coming-to-be.

## 5. Applying the results from Θ 9 to M 10

When we come now, with this passage in mind, back to **Text 1**, we can hopefully better see how Aristotle's solution to the "greatest difficulty" can be understood without necessarily implying fundamental revisions to his account of scientific knowledge (**Question 1**) or blurring the contrast between actual scientific knowing and sense-perception (**Question 2**). What **Text 2** suggests, as I tried to show, is that while the actual scientific knowing is indeed necessarily concerned with something particular (e.g., a particular figure or diagram), the universality of

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[83] So S. Makin, *op. cit.*, suggesting that we should supply εὑρίσκεται as the verb of this sentence. *Cf.* J. Barnes, *The complete works of Aristotle: the revised Oxford translation*, Princeton, NJ, Princeton University Press, 1984.
[84] Cf. *De Anima* Γ 4, 429b6-10.
[85] See *Metaphysics* Θ 5, 1047b31-35; Θ 8, 1049b29-1050a3. This understanding is further suggested by *De Anima* Γ 5, 430a20-21 ~ Γ 7, 431a2-3. Reading the present passage against this background suggests that there is no substantial difference between the activity performed by someone who is still acquiring a scientific knowledge and by someone who already has the knowledge and only actualizes it – except that the latter will result in a more perfect activity involving no unnecessary or futile steps. (Thanks to Emily Katz for a discussion of this issue.)
[86] And which also brings into actuality, in this particular figure, the scientific knowledge of the theorem in question – assuming that the person already has this knowledge.
[87] And the scientific knowledge about it acquired – if the person does *not* have it yet.

the potentiality in question (e.g., the fact that *any* angle in the semicircle will turn out to equal the right angle, and its universal cause)[88] must not be lost or exhausted in its particular actualization. Otherwise, the proof could not succeed and no genuine "scientific knowing" would take place. The potentiality needs to be actualized in a different way, such that its particular actualization *stands for* any actualization and so *reveals* the potentiality in its full universality.

Aristotle talks of such a "revealing" himself in *Posterior Analytics* A 10 when describing the relation between imperfectly drawn diagrams on the one side and whatever the content of geometrical demonstrations may be on the other side. "The geometer doesn't base any conclusion on the assumption that this [imperfectly drawn] thing here is a line such as he has announced [sc. straight or one foot long], rather [what matters is] that such is what is revealed through these [drawings] (τὰ διὰ τούτων δηλούμενα)" (77a1-3). That through which the other things are revealed is, admittedly, conceived here in a rather narrow sense as the *imperfect* drawing that is never really straight and never exactly one foot long[89]. In contrast, **Text 2** doesn't mention this kind of imperfection at all; it doesn't seem relevant for Aristotle's reflection here that the line dropped from the center is never in fact *perfectly* straight. Rather, what is relevant is that one has to choose *one particular* line while the proof must embrace *any* such line. But despite this difference, the language of revealing from *Posterior Analytics* A 10 seems usefully transferable to **Text 2**. Both texts talk, admittedly, about a certain imperfection of particular geometrical diagrams vis-à-vis the universal content of theorems proved in geometry, and what is in each case demanded from the geometer seems at least comparable: she must not conceive what is drawn *in its particularity* but needs to take it as *revealing* something universal; in other words, her thought needs to conceive this drawn line (connecting, say, the center with the semicircle) neither with its imperfections, nor as excluding other lines that could serve the same purpose[90].

This goes well together with Aristotle's characterization of the universal as "τυχὸν" and "πρῶτον" in *Posterior Analytics* A 4: "something belongs [to something else] universally when it is shown (δεικνύηται) about whichever and first [subject] (ἐπὶ τοῦ τυχόντος καὶ πρώτου)" (73b32-33). The subject of demonstration or actual scientific knowing must be "whichever" (τυχόν) and "first" (πρῶτον) subject of the relevant kind. On the one hand, it must not, for instance, be an *isosceles* triangle when the theorem in question (be it, e.g., Euclid's I.32β) is about triangle in general, for although the theorem will surely hold about any ("whichever") isosceles triangle this will not be the "first" subject of it, for there are other (scalene) triangles for which it holds as well. On the other hand, since there is, *pace* the Platonists, no single object corresponding to "triangle in general", the mathematician needs to consider "whichever" triangle, and that means exactly considering the triangle she draws or imagines as standing for *any* triangle, that is, "using" it as "whichever" triangle (73b36)[91].

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[88] And, when the respective scientific knowledge has already been acquired, also the universality of this knowledge.

[89] Cf. *Metaphysics* M 3, 1078a17-21.

[90] Cf. *Prior Analytics* A 41, 49b33-50a1 where the two kinds of "imperfection" are treated in parallel. *Cf.* also *Meteorology* Γ 5, 375b33-34: "it would make no difference which" plane one choses. In *Posterior Analytics* A 31, 88a12-17, a similar thought seems to be extended beyond geometry to physical objects: "In some cases if we saw we should not seek – not because we have knowledge by seeing (εἰδότες τῷ ὁρᾶν) but because we grasp the universal from seeing (ἔχοντες τὸ καθόλου ἐκ τοῦ ὁρᾶν). E.g. if we saw the glass to be perforated and the light coming through it, it would also be plain why it does – even if we see each piece of glass separately whereas we think at a single time that it is thus in every case" (trans. J. Barnes).

[91] This demand for "using" (χρῆσθαι) the given shape as "whichever" triangle has its counterpart in the demand formulated in *On Interpretation* 7 for the terms or predicates being "used universally": to say that something is "used universally" is different from saying that something "is a universal" (see 17b11-13). Cf. *Prior Analytics* A 41, 49b33-50a1: in *ekthesis* the geometer "makes no use" of particular features of the diagram. These passages support what **Text 1** was argued to be implying, namely that the "actual scientific knowing" is not concerned with

**Text 2** can be taken as providing an account in terms of potentiality and actuality of this demand on scientific thinking for taking a particular perceptual case as standing for and revealing something universal[92]. If the proposed interpretation of **Text 2** is on the right track, it gives Aristotle a solid ground for claiming in **Text 1** that all (relevant) actual scientific knowing is concerned with a particular actual object, and for insisting at the same time that the dictum according to which "all scientific knowledge is universal" remains in a non-reductive sense true (**Question 1**)[93]. In this context, it becomes quite natural to construe τόδε τι as "a so-and-so", with τι as the particularizing element, meaning "a particular exemplification" of τόδε, which can be, say, triangle or flesh[94]; but **Text 1** conveys the same message also under the standard construal of τόδε τι as "a this", which only makes the exemplificatory function less pronounced. Especially in contrast to approaches **A** and **C**, the proposed interpretation allows the sense of the dictum in **Text 1** to remain sufficiently robust, and so attenuates at least the feeling of an unavoidable tension with *Posterior Analytics*. Take the second example from **Text 2**. The object of scientific knowing (or proving) here is clearly *not* the particular diagram *qua* such, e.g., **Figure 1**, although some such diagram is necessary, according to Aristotle, for any actual proof. This diagram needs to reveal (δηλοῦν) something that applies universally, e.g., the cause for *any* potential angle in *any* given semicircle of its turning out to equal the right angle. Conceived in this universality, the cause in question is a potential cause which can only be revealed through some of its particular actualizations if the latter is taken to stand for any such actualization (so one needs to "set out" a particular angle *BAC*).

If the proposed reading of **Text 2** provides the right framework for understanding Aristotle's solution in **Text 1**, one key question remains: how can the geometrical model from **Text 2** be extended beyond mathematics, say, to natural sciences? Is such an extension feasible?

## 6. Extending the diagrammatical model beyond mathematics

The question is pressing, for there is *prima facie* nothing parallel to the mathematical *ekthesis* in the demonstrative practice of natural sciences. It seems therefore apposite, in addressing this question, to start from the evidence suggesting that, contrary to the expectation one may have, Aristotle did think such a parallel can be established and is worth exploiting. He draws this parallel most explicitly in a passage from *On Memory* 1:

**Text 3**

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a universal but always with a particular object, and yet that it remains a genuine actualization of the potential *universal* scientific knowing and as such *is* in a non-trivial sense universal. *Cf.* P.S. Hasper, "Sources of Delusion in Analytica Posteriora 1.5", *Phronesis*, 51(3), 2006, p. 252-284, and his discussion of *Posterior Analytics* A 4-5 as undertaking a step from a purely extensional to an intensional understanding of universality. He concludes: "An argument that x is F only counts as a primary-universal proof if (1') it is immediate for x, that is, if the arbitrary individual set out is only treated as being x and further properties of that individual belonging to kinds lower than x are eliminated from consideration, and (2') x is indeed primarily responsible for F to belong, that is, x is the highest kind to which F belongs" (*Ibid.*, p. 283-284.). *Cf.* also E. Katz, "Geometrical Objects as Properties of Sensibles: Aristotle's Philosophy of Geometry", *Phronesis*, 64(4), 2019, p. 495-497.

[92] This may also be helpful as a way of capturing how Aristotle's account of diagrams and geometrical objects differs from Plato's well-known account in *Republic* VI (510d-e). The fact that a diagram reveals something universal does not mean that it is only used for thinking some *other object* beyond it. As an actualization of a certain potentiality whose particular aspects are disregarded, it rather stands for all such objects *including itself*.

[93] This I take to mean that the actual scientific knowing, despite its being concerned in each case with a particular object, is a genuine actualization of the *universal* potential scientific knowledge.

[94] *Cf.* fn. 15 above.

> Grant that *phantasia* has been discussed in *On the Soul*, and one cannot think (νοεῖν) without a *phantasma*. For the same experience takes place in thinking (ἐν τῷ νοεῖν) as in drawing a diagram (ἐν τῷ διαγράφειν), since in the latter case we make no use of the fact that the quantity (τὸ ποσὸν) of a triangle is determinate (ὡρισμένον), yet we draw it with a determinate quantity (ὡρισμένον κατὰ τὸ ποσόν). And in the same way someone who thinks, even if he does not think a quantity (κἂν μὴ ποσὸν νοῇ), sets out a quantity before the mind's eye (τίθεται πρὸ ὀμμάτων ποσόν), although he does not think it as a quantity (ᾗ ποσόν). And if the nature of the object is quantitative (ἂν ἡ φύσις ᾗ τῶν ποσῶν), but indeterminate (ἀορίστων δέ), one sets out a determinate quantity (τίθεται ποσὸν ὡρισμένον) but thinks it as a quantity only (ᾗ ποσὸν μόνον).
>
> (*On Memory* 1, 449b30-450a7, trans. F.D. Miller, Jr., mod.)

Here the use of diagrams in mathematical proofs is taken as a model for thinking (νοεῖν) more generally conceived.[95] Not only does one in mathematics always draw or imagine the object with a determinate size, even though one thinks it as having no determinate size. In non-mathematical thinking, i.e. thinking which is not concerned with quantities as such, too: we need to "set out before the mind's eye" a quantity although we don't think it as a quantity. One example Aristotle has, presumably, in mind is his favourite example of an object of thought from, e.g., *De Anima* Γ 4, 429b10-18, namely flesh. When grasping the essence of flesh, I need, apparently, to "set out before the mind's eye" a perceptible instance of flesh which will necessarily have, e.g., a certain size, although its size, and its quantitative dimensions more generally, are as such irrelevant for the content of my thought[96].

What the quoted passage does not tell us is why we should believe this is so[97]. Instead, Aristotle refers us back to his *De Anima*, where he already provided us not only with an account of *phantasia*, but also with reasons for taking thought (of certain objects at least) to depend on *phantasia*[98]. The interpretation of these reasons has since antiquity been a matter of no small controversy which cannot be addressed here. I limit myself to summing up what I take to be the most promising line of understanding Aristotle's reasons[99]. The ultimate reason why grasping the essence of a natural object will necessarily involve *phantasia* and "setting out something before the mind's eye", I submit, is given at *De Anima* Γ 4, 429b10-18: first, natural objects are

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[95] For a helpful account of the place of this passage within *Mem.* 1 and Aristotle's science of living things more generally, see K. Corcilius, A. Falcon, "Aristotle on Remembering and Memory. Toward an interpretation of *Mem.* 1", *Medicina nei secoli*, 34(1), 2022, p. 11-30. There has been surprisingly little discussion of how the diagrammatical model is to be understood. The main issue discussed with respect to this passage has been whether *phantasmata* are pictorial likenesses or not. *Pro*: e.g., R. Sorabji, *Aristotle on Memory*, London, Duckworth, 1972, p. 5-7, 72-74; D. Bloch, *Aristotle on Memory and Recollection: Text, Translation, Interpretation, and Reception in Western Scholasticism*, Leiden, Brill, 2007, p. 61-64, 67-70. *Contra*: e.g., R.A.H. King, *Aristotle and Plotinus on Memory*, Berlin, W. de Gruyter, 2009, p. 42-44, 60; *cf.* V. Caston, "Aristotle and the Problem of Intentionality", *Philosophy and Phenomenological Research*, 58(2), 1998, p. 249-298. For a brief account based on the idea of functional incompleteness of *phantasia*, see M.V. Wedin, *Mind and Imagination in Aristotle*, New Haven, Yale University Press, 1988, p. 136-137. For a discussion of the relation between thought and memory, see L. Castagnoli, "Is Memory of the Past? Aristotle on the Objects of Memory", in L. Castagnoli, P. Ceccarelli (eds.), *Greek Memories: Theories and Practices*, Cambridge, Cambridge University Press, 2019, p. 248-255.

[96] The idea of "setting out before the mind's eye" functions here most likely as a synecdoche of the same kind as the one identified by Aristotle behind the notion of *phantasia* at *De Anima* Γ 3, 429a2-4.

[97] For one existing account, see C. Cohoe, "When and Why Understanding Needs Phantasmata: A Moderate Interpretation of Aristotle's *De Memoria* and *De Anima* on the Role of Images in Intellectual Activities", *Phronesis*, 61(3), 2016, p. 358-366..

[98] For the dependence, see *De Anima* A 1, 403a8-10; Γ 3, 427b16, 27-29; and especially Γ 7, 431a14-15, b2, and Γ 8, 432a3-10.

[99] A fuller treatment is forthcoming in R. Roreitner, *The Unmoved Causes of Receptivity: Thought in Aristotle's* De Anima. *Cf.* T.K. Johansen, *The Powers of Aristotle's Soul*, Oxford, Oxford University Press, 2012, p. 234-236.

"like the snub" which implies that they cannot be understood without somehow taking their matter into account[100]; and second, the latter cannot be achieved without somehow activating the perceptive part of the soul. Aristotle's formulation of the second idea is brief and cryptic: "It is by that which can perceive that [one] discriminates the hot and the cold, i.e. that of which flesh is a *logos*" (429b14-16)[101]. His thought can be spelled out along two complementary lines[102]. First, an activation of the perceptive part of the soul is an indispensable element in activating one's *knowledge of the fact* (τὸ ὅτι), in our case the fact that flesh exists, which is a *sine qua non* for even meaningfully raising the question why (διὰ τί), let alone for grasping that reason, which will come to the same as grasping what the thing in question is (τί ἐστι), i.e. its essence[103]. Second, an activation of the perceptive part of the soul is an indispensable element in activating one's *knowledge of the matter*, in our case the matter of the flesh, i.e. the hot and the cold, which is a *sine qua non* for grasping the essence (τί ἐστι) as, effectively, the reason (τὸ διότι) for this matter of its being this or that (in our case its being flesh). Let me elaborate on these two lines of thought one by one.

(a) The idea that perception is the ultimate authority on which our knowledge of facts (τὸ ὅτι) is based is formulated, for example, in *Metaphysics* A 1: "We take none of the senses to count as a wisdom, although they are the properly authoritative kinds of cognizing (κυριώταται γνώσεις) particular objects. But they don't capture the *why* about anything, such as *why* fire is hot, but only *that* it is hot" (981b10-13). Further support can be gathered from *De Anima* and *Metaphysics* Γ 5-6 (*cf.* I 6), and especially from the notion of perceptual discrimination (κρίνειν), implying that the healthy sense is the ultimate authority over questions like "is this object sweet or not?", and more generally questions like "does an object of such and such qualities exist?"[104]

Now one might think this has nothing to do with our question because we are concerned with the *activation* of an already acquired knowledge whereas the authority of the senses has only to do with the *acquisition* of it. But there are good reasons to think that Aristotle did not see the two questions as being separable from each other in this neat way. For one thing, his ultimate argument for the dependence of thought on *phantasia* at *De Anima* Γ 8, 432a3-10 makes it very clear that the consideration applies *mutatits mutandis* to *both* the case of knowledge acquisition and the case of activating an already acquired knowledge[105]. And this has a certain intuitive appeal. Take Aristotle's favourite examples of thunder and eclipse. The question of what thunder or eclipse is makes no sense unless I perceive or can recall the characteristic auditive or visual phenomenon referred to under this name: it is, arguably, an integral part of my knowledge *that* thunder or eclipse exists. And it also has an intuitive appeal to insist that my understanding of the ultimate cause and the essence of this phenomenon cannot be isolated from the perceptual nature of it. In fact, both examples seem to underscore this

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[100] Cf. *Physics* B 2 or *Metaphysics* E 1, 1025b28-1026a7.

[101] The epexegetic reading of καί is supported by texts like *Metaphysics* Z 17, 1041b11-27.

[102] *Cf.* also S. Menn, "From De Anima III 4 to De Anima III 5", in G. Guyomarc'h, C. Louguet, C. Murgier (eds.), *Aristote et l'âme humaine: Lectures de* "*De anima*" *III offertes à Michel Crubellier*, Leuven, Peeters, 2020, p. 152.

[103] Cf. *Posterior Analytics* B 1-2.

[104] See, e.g., *De Anima* B 6, 418a14-16; *Metaphysics* Γ 5, 1010b23-26; or *Metaphysics* I 6, 1062b35-1063a5. On the importance of "dwelling in intimate association" (ἐνῳκηκέναι) with the phenomena of nature for the task of grasping its principles, see *On Generation and Corruption* A 2, 316a5-10: "Lack of experience diminishes our power of taking a comprehensive view of the admitted facts. Hence those who dwell in intimate association with nature and its phenomena are more able to lay down principles such as to admit of a wide and coherent development; while those whom devotion to abstract discussions has rendered unobservant of the facts are too ready to dogmatize on the basis of a few observations." (trans. H. H. Joachim). Cf. *Nicomachean Ethics* Θ 3, 1147a21-22; *Physics* B 1, 193a7-9; and the illuminating analysis by S. Kelsey, "Empty Words", in D. Ebrey (ed.), *Theory and Practice in Aristotle's Natural Science*, Cambridge, Cambridge University Press, 2015, p. 199-216.

[105] "That is why without perceiving nobody could learn or understand anything, *and* whenever one contemplates, one necessarily, at the same time, contemplates a *phantasma*." (*De Anima* Γ 8, 432a7-9)

inseparability in that the cause identified by Aristotle (extinguishing of fire, interposition) is irreducibly perceptual, too: the explanation is, so to speak, carried out within the medium of perceptual forms[106].

This doesn't mean, of course, that such an explanation could be *reduced to* perception or *phantasia*. Aristotle rejects this option very explicitly[107]. And it also does not mean that the explanation could not be formalized and, in its formal aspect, in a way "understood" without activating the relevant perceptual contents. This kind of formalization is, after all, one of Aristotle's grand achievements. The point is that this formal understanding must be distinguished from a proper scientific understanding (ἐπίστασθαι) based in a true insight (νοῦς) into the first principles. Such an insight (and so, such an understanding), I submit, cannot, according to Aristotle, take place without a corresponding activity of the perceptive part of the soul. Hence his claim that thinking, even in the highly demanding sense of grasping the essences of mathematical or natural objects, cannot take place without *phantasia*. One way of spelling out Aristotle's justification of this claim, I have argued, is by insisting that our knowledge of the fact (τὸ ὅτι) – as a *sine qua non* of any inquiry into, and any knowledge of, the reason why (τὸ διότι) – contains an irreducible perceptual element insofar as it draws on the irreplaceable epistemic authority of the senses.

(b) Let us pass to the second, closely connected, line of justification. Flesh, according to Aristotle, is a certain *logos* of the hot and the cold, and the latter are discriminated by the perceptive capacity of the soul. Aristotle seems to be taking for granted here the application of the *Posterior Analytics* B account of inquiry to composite substances, spelled out most fully in *Metaphysics* Z 17: in order to understand *what* man or flesh is (τί ἐστι), we need, first of all, to identify the matter of man or flesh and ask for the reason why (διὰ τί) this or that matter is man or flesh[108]. If it turns out that this matter is something properly discriminated by the perceptual capacity, as Aristotle explicitly states in the case of flesh, then he will be in a position to insist that the identification of the reason why, and so the grasp of what it is (i.e. of the essence) can only take place, so to speak, within the medium of perceptual forms[109]. This, again, does not exclude, of course, the possibility, or even the need, of a formalization, and so the possibility of formally understanding the syllogism involved here without any relevant use of the perceptive capacity. But this, again, is perfectly compatible with the demand for employing the perceptive capacity when the reason in question is to be fully and properly understood.

Once Aristotle's insistence on the dependence of thought on *phantasia* is justified along the lines of (a) and/or (b), we can see why he believes that the use of diagrams in geometrical demonstrations can be taken as a useful model for what we may describe as the *diagrammatical dimension* of thought in general[110]. If each thought involves some perceptual content, and each perceptual content is particular or singular[111], then the thought needs to approach it as a sort of diagram, that is, as exemplifying something universal. Something along these lines is, after all, already suggested by Aristotle's analogy with letters in **Text 1**: there seems to be, on the one

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[106] *Cf.* Aristotle's claim that "the thinking part [of the soul] thinks the forms in *phantasmata*" (*De Anima* Γ 7, 431b2) and that "the objects of thought are in perceptual forms" (*De Anima* Γ 8, 432a4-5). *Cf.* also Aristotle's examples of ἀγχίνοια in *Posterior Analytics* A 34.

[107] See *Posterior Analytics* A 31 on the one hand and *De Anima* Γ 3 with Γ 8, 432a10-14 on the other.

[108] *Metaphysics* Z 17, 1041a32-b9.

[109] Despite the fact that the *logos* itself, defining flesh, will presumably not be as such perceptible. I take it that this *logos* cannot be simply identified as a ratio, but that it will be intimately connected to perceptivity (cf. *Parts of Animals* B 8, 653b19-30), and perceptivity as such is nothing perceptible.

[110] The claim cannot, of course, be entirely general. Aristotle believes that there are objects identical to their own essences (cf. *De Anima* Γ 4, 429b11-12), namely immaterial substances, and these seem to be excluded from his arguments for the dependence of thought on *phantasia* in *De Anima* Γ 7-8.

[111] *Cf.* V. Caston, *op. cit.*, p. 287-290, characterizing *phantasia* as having "indefinite singular content". It seems impossible to have a *phantasma* of triangle as such or flesh as such. The triangle or the flesh appearing to me will necessarily have a certain specific distribution of its internal angles, a certain specific size, color, texture, etc.

hand, no other way of activating one's literacy than with respect to a set of particular letters (whether heard, seen, or imagined); on the other hand, understanding this particular *alpha* is impossible without *eo ipso* going beyond its particularity and taking it exactly as an exemplification of the general type *alpha* – in a way which makes this understanding essentially different from the case of merely perceiving *alpha* but no less dependent on such a perceptual (or imaginative) act[112]. All this suggests that there are good reasons for taking **Text 2** as the key to our understanding of Aristotle's notorious claim in **Text 1** that active scientific knowing has always something particular for its object.

If this proposal is on the right track, one could further ask about the upshots of **Text 1** for the ontology of scientific knowledge and its objects. That question, however, is at least equally complex and lies even further beyond the scope of the present paper.[113] I limit myself to only one preliminary observation. The key point in spelling out the ontological implications would, arguably, be how to interpret the materiality and indeterminateness ascribed to potential knowledge and its object in [iii]. I think, we can quickly exclude the straightforward reading of this characterization which would identify the correlate of potential knowledge with something like the prime matter[114]. By potentiality on the knowledge side Aristotle can hardly mean a *pure* potentiality; rather he seems to mean an acquired expert capacity which enables the possessor of it to think some specific kind of objects whenever she wishes[115]. One would then naturally expect the correlative object of this knowledge to be on the same level of potentiality, and so not *entirely* indeterminate. What does, then, Aristotle imply about it in [iii]? If we take matter here to be a mere metaphor or analogy, it will be hard to infer anything specific. But one could also consider the option that the correlative object of a potential knowledge really is some kind

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[112] Something similar is suggested by *De Anima* B 5, 417a25-29 which is a close parallel of **Text 1** [iv].

[113] A full treatment of this question would need to start from a discussion of the ontology of geometry, which, however, is a very difficult and controversial issue on its own. I do not think that the interpretation of **Text 2** provided in Section 4 implies any definite view on this matter. The key question would be what Aristotle means when claiming at *Metaphysics* M 3, 1078a25-31 that geometrical objects exist not "in fulfillment" but in potentiality or "materially" (ὑλικῶς). There is a strong exegetical tradition interpreting this claim in mentalist terms as ascribing to the natural world nothing more than a *possibility for us* to think geometrical objects as purely mental entities, see Syrianus' comments on *Metaphysics* M 3, *cf.* already Alexander of Aphrodisias, especially *On Metaphysics* A 6, 52.13-21 (although Alexander's view is open to non-mentalist interpretations, as shown by R. Sorabji, op. cit., p. 149-152, 293; *cf.* M. Rashed, *Alexandre d'Aphrodise, Commentaire perdu à la Physique d' Aristote (Livres IV-VIII)*, Berlin, W. de Gruyter, 2011, p. 58-64). See also J. Annas, *op. cit.*; E. Halper, "Some Problems in Aristotle's Mathematical Ontology", *Proceedings of the Boston Area Colloquium in Ancient Philosophy*, 5(1), 1989, p. 247-276; M.J. White, "The Metaphysical Location of Aristotle's Μαθηματικά", *Phronesis*, 38(2), 1993, p. 166-182. Compare also Ross' reading of **Text 2** [iv] discussed in Section 4. For a suggestion that "direct links" to the physical world are secured due to some of the geometrical objects being perfectly instantiated, see J. Lear, "Aristotle's Philosophy of Mathematics", *Philosophical Review*, 91(2), 1982, p. 161-192. For a criticism of this view, see R. Sorabji, "Θ.9 1051a29-33 and its relevance to Aristotle´s philosophy of mathematics", in M. Burnyeat (ed.), *op. cit.*, p. 152-154. An approach more congenial to the present discussion was proposed by I. Mueller, "Aristotle on Geometrical Objects", *Archiv für Geschichte der Philosophie*, 52(2), 1970, p. 156-171; *cf.* I. Mueller, "Aristotle's Doctrine of Abstraction in the Commentators", in R. Sorabji (ed.), *Aristotle Transformed: The Ancient Commentators and Their Influence*, Ithaca, N.Y, Cornell University Press, 1990, p. 464-465: the geometer studies something real and objective, namely the underlying "potential" structure of sensible reality, the matter of natural beings taken not *qua* hot or warm, but purely *qua* extended. For an interpretation inspired by Mueller, see E. Hussey, "Aristotle on mathematical objects", *Apeiron*, 24(4), 1991, p. 105-134. *Cf.* also S. Menn, *The Aim and the Argument of Aristotle´s Metaphysics*, forthcoming, Iγ3, p. 28-29 fn. 73; R. Pettigrew, "Aristotle on the Subject Matter of Geometry", *Phronesis*, 54(3), 2009, p. 239-260. For an alternative, insightful account of the ontology of geometrical objects, interpreted as "groups of properties of certain sensible objects", see E. Katz, *op. cit.*

[114] G. Brakas (*Aristotle's Concept of the Universal*, Hildesheim, G. Olms, 1988, p. 106-107), for instance, describes the object of the potential scientific knowing in **Text 1** as a "pure potency" and "nothing actually", comparing it explicitly with the prime matter and the potential intellect from *De Anima* Γ 4, 429a18-27 and 429b29-430a2. *Cf.* already Ps.-Alexander, *On Metaphysics* M 10, 792.24-31.

[115] *Cf.*, again, *De Anima* B 5, 417a26-29 and 417b18-26.

of matter. If the dispositional knowledge of a material X *is* the form of X present in the knower's soul without its matter,[116] then the correlative object of this knowledge (before being activated) is, perhaps, exactly this matter as that which *can* be X on account of the form. Activating the knowledge would then amount to grasping how the form makes the correlative matter be X in actuality (i.e. something determinate). If the observations above concerning the dependence of thought on *phantasia* were on the right track, then the knowledge can only be properly activated together with the perceptive part of the soul as involving an exemplification of the matter of X being actualized by its form.

That said, I am well aware that I was able to provide at most a very rough sketch of the epistemological and ontological implications of the proposed reading of **Text 1** and that both are in need of further exploration. The aim of this paper has been limited to explaining what role Aristotle's striking claim that actual scientific knowing is of "a this" or "a so-and-so" plays in his response to the "greatest difficulty" in *Metaphysics* M 10 and why he has the right to insist that it is not incompatible with his high demands on scientific knowledge.

Let us, then, conclude by returning to our initial question: Was Aristotle not just carried away in **Text 1** by his polemic against the Platonists? Shouldn't he rather have drawn on his distinction between priority in knowledge, belonging to universals, and priority in being, belonging to particular substances and their particular principles[117]? One reason why Aristotle did not opt for this straightforward solution, I submit, is that it would, in his eyes, open a kind of gap between knowledge and being, and that such a gap is incompatible with his sanguine view of what is achieved in the highest realization of our intellectual capacities. If all our thoughts were simply *of universals*, which as such do not exist, then our intellectual access to reality would only be indirect, unlike in the case of perception. Most of our thoughts probably are of this kind. But Aristotle seems to have believed that, at least in principle, we are capable of more, namely directly grasping the primary causes of reality, which cannot be universals, although the understanding of them cannot but be universal. Hence, I submit, the need for a more sophisticated solution to B#14, along the lines of **Text 1**.

[116] See, e.g., *De Anima* Γ 4, 430a6-9 (with 429a13-18, 27-29, and Γ 8, 431b24-432a3), *Metaphysics* Z 7, 1032a32-b2, b14, b27; Z 9, 1034a23-24; Λ 7, 1072b22; *cf.* Λ 9, 1075a1-2.
[117] *Cf.* p. 5 above.