

In what sense there is no science of corruptible things: an analysis of *Posterior Analytics* I 8

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Abstract: Aristotle claims that the object of scientific knowledge cannot be otherwise, and at *Posterior Analytics* I-8 Aristotle adds that there is no scientific knowledge of corruptible objects. These claims have been traditionally understood in terms of a strict requirement of eternal existence: objects of genuine scientific knowledge must be eternal in the sense that they must exist eternally. In this paper, I offer an alternative view and discuss Aristotle's argument in *Posterior Analytics* I-8.

Keywords: Scientific explanation. Essentialism. Causality. Demonstration. Knowledge. Ontology.

Resumo: Aristote afirma que o objeto do conhecimento científico não pode ser de outro modo, e em *Segundos Analíticos* I-8 ele acrescenta que não pode haver conhecimento científico das coisas corruptíveis. Tradicionalmente, essas afirmações têm sido entendidas como se Aristóteles exigisse que o objeto de conhecimento científico fosse eterno, isto é, existisse por toda a eternidade. Neste artigo, examino o argumento de Aristóteles em *Segundos Analíticos* I-8 e proponho uma interpretação diversa da tradicional.

Palavras chave: Explicação científica. Essencialismo. Causalidade. Demonstração. Conhecimento. Ontologia.

In *Posterior Analytics* I-8, Aristotle says that “necessarily, the conclusion of such a demonstration (which is a demonstration *simpliciter*) is eternal¹” (75b22-24) and, a little further, he argues that “there is no demonstration or scientific knowledge *simpliciter* of corruptible things” (75b24-25). My aim is to discuss what Aristotle means when he advances such claims. Whereas the first claim seems to commit him to the view

¹ Reading “*aidion*” at 75b22 with the editors and most manuscripts.

that scientific knowledge has eternal truths as objects, the second claim seem to put him together with Plato in rejecting the knowability of the (heraclitean-movable) sensible things. But are these claims a correct description of what Aristotle was putting forward? A strict requirement of eternity would not preclude all natural sciences from the title of scientific knowledge?

My aim is to suggest an alternative view about Aristotle's claims on the eternity and incorruptibility of the objects of scientific knowledge. I will examine *Posterior Analytics* (henceforth *APo*) I-8 and compare it with Aristotle's theory developed in the previous chapters of *APo*.²

I

My first step is to discuss what Aristotle means with "corruptible" at 75b24 ff. In order to make my discussion easier to follow, I will use the triad of terms which Aristotle uses to display the structure of a syllogism in the first figure³ as well as to display relations of causality⁴: *A* is the major term, *C* is the minor term, *B* is the middle term. In the light of this syllogistic structure, there seems to be only two sensible options: either "corruptible" at 75b24 refers to the proposition *C-A*, which is the conclusion of a syllogism, or it refers to the minor term *C*, which is the

² Of course, I cannot discuss all the difficulties at length, and I will presuppose my account of Aristotle's definition of scientific knowledge as expounded in Angioni 2007.

³ Such a use of *A*, *B* and *C* occurs not only in the official exposition of syllogistics in *Prior Analytics* (25b37-9 ff.) but also in some discussions about the syllogistic framework of scientific demonstration (see *APo* 74b28-9 ff., 78a31-2 ff.). But we should be careful about Aristotle's arbitrary choice of letters, since at *APo* I 15-26 he rather takes *A-B* as a given predicative statement (*A* as major and *B* as minor term) and uses *C* to introduce the notion of a middle term.

⁴ For such a use of *A*, *B* and *C*, see 98b5-7 ff., as well as 78a31-2 ff., 93a30-1 ff., 94a28-30 ff., 95a16-17 ff., 89b 15-7 ff.

subject of the conclusion.⁵ The term “corruptible” does not preserve the same sense in each option. On the one hand, applied to a proposition (like in 75b27), “corruptible” means that the truth-value of this proposition may change according to the circumstances: it may be true now, but it may be false in another time. “Socrates is seated” is a good example of such a corruptible proposition. On the other hand, “corruptible” means something different when it is applied to the term *C*: it means that *C* can exist and not exist, that is, *C* may exist in a given time, but may pass into non-existence at another time. All individuals of sublunary species are corruptible in this sense, whereas celestial bodies, the World and the Prime Mover are not corruptible in this sense.⁶

These two usages of the term “corruptible” are not incompatible with each other. From the fact that a term *C* is corruptible, a proposition about it might turn to be corruptible too. Now, there are many ways in which a proposition about a corruptible *C* is itself corruptible in the sense appropriate to a proposition. “Socrates is seated” is corruptible in the sense that Socrates can lose the property of being seated so that the proposition turns to be false etc. But “Socrates is a man” cannot be corruptible in this sense, whereas it can be called corruptible in the sense that it is not *always* true, since its truth depends on the existence of Socrates, but Socrates does not exist all the time.⁷ This difference

⁵ To take the major term *A* as corruptible is not a real option, since this will amount to taking the conclusion *C-A* as corruptible. The major term *A* works as predicate in our syllogistic structure, so that its “being the case or not being the case” will amount to its being true of a given subject or not, and this collapses into talking about the conclusion *C-A* as corruptible.

⁶ Perhaps mathematical entities might be called “uncorruptible” in this sense too, but this claim involves many difficulties (see *Metaphysics* XIII 1077b14-7) which I shall not and need not discuss.

⁷ See *Categories* 13b16-27: the existence of Socrates seems to be a necessary condition for the attribution of some predicates to it to be true. Aristotle’s discussion at *Categories* 10 is rather confusing, since at 13b31-3 he suggests that Socrates’s non-existence makes some privative statement about it

between two ways in which a proposition can be called “corruptible” is relevant to my point, as I shall argue later.

Actually, Aristotle uses the term “corruptible” (*phthartê*) as an adjective of “proposition” or “premise” (*protasis*) in 75b27, where the proposition or premise which counts as corruptible is also described as a non-universal proposition. Now, one might argue that, when Aristotle comes to explain why this “corruptible premise” is not universal (in 75b 28-29), he seems to favour the first sense above mentioned. The sentence in which Aristotle explains how this premise falls short of being universal – “*hoti toi men estai toi d' ouk estai eph' hon*” – is very difficult. One might take Aristotle’s elliptical sentence as an abbreviation of the following: “*hoti toi men estai [to kategoroumenon] toi d' ouk estai [to kategoroumenon] [toutôn] eph' hon [to kategoroumenon legetai]*”. This construal results if one takes the expression “*eph' hon*” as introducing – as it is usual in Aristotle’s works – a range or class of things to which a given universal term is attributed, if one supplies for the relative pronoun “*hôn*” an implied antecedent working as a partitive genitive to which “*toi men*” and “*toi de*” refer, and if one supplies as subject for “*estai*” a given universal term whose instances are the referents of “*toi men*” and “*toi de*”. The translation would run as follows: “a given predicate might be true of some instance of the subject but not be true of another”.⁸ Now, this amount to saying that Aristotle had in mind indefinite propositions such as “man is musical” or particular propositions such as “some man is musical”. The predicate “musical” might be true of some man (“*toi men estai*”), but not true of others (“*toi d' ouk estai*”) at a given instant.

Now, sentences of this kind are exactly the sentences in which the predicate is a *sumbebekos* in the strict sense Aristotle defines in *Topics*

to be true. Any way, these difficulties do not affect my point, since I am concerned with the truth of some positive predicates (like *being a man and being rational*) attributable to an individual like Socrates.

⁸ Actually, Mure’s translation goes exactly in this direction. See also Ross 1949: 534.

102b6-9 – an accidental predicate that can be true or false of the same subject in different circumstances. It makes no difference to my point whether one takes accidental predicates in relation to a range of individual instances of the same kind or in relation to different times of the diachronic career of a same individual, since both options satisfy the definition given by Aristotle at *Topics* 102b6-9. One might argue, in short, that Aristotle uses the notion of “corruptible” in the context of *APo* I-8 to introduce *accidental predications*, that is, the sentences in which the predicate is just a contingent *sumbebekos* of its subject. Actually, Aristotle says that “there is no demonstration or scientific knowledge *simpliciter* of corruptible objects, except accidentally” (75b25).⁹ One might take this passage as a piece of evidence for the construal suggested above: one might argue that Aristotle is making the claim that accidental predications (in the sense of contingent predications as they are described in *Topics* 102b6-9), which ultimately refer to singular subjects like Socrates, cannot be demonstrated and are not liable to scientific knowledge.

Now, it is true that Aristotle does not allow a place for accidental predications (in the sense of *Topics* 102b6-9) in any science, and this is confirmed more than once in the *Metaphysics*.¹⁰ However, I claim that Aristotle is not talking about this subject in our passage. It is true that “corruptible” in 75b27 introduces a kind of *corruptible sentence*, but Aristotle is not talking about accidental predications. When he says that “there is no demonstration of corruptible objects, except *kata sumbebekos*”, his expression “*kata sumbebekos*” is far from introducing the notion of accidental predication as defined in *Topics* 102b6-9. First of all, Aristotle is not even saying that knowledge of corruptible objects is *kata sumbebekos* knowledge. He is rather saying that knowledge of corruptible objects is *such that it is similar (houtós hōsper) to kata sumbebekos knowledge*. And “*kata sumbebekos* knowledge” is understood in opposition to

⁹ Later I will discuss the meaning of this statement, but for now let me take it in this vague formulation.

¹⁰ See *Metaphysics* VI 2, as well as (perhaps) VII-15, 1039b27-30.

“knowledge *haplós*”, as in the definition of scientific knowledge advanced in 71b9-12. Thus, let us take a look at that definition.

II

In 71b9-12, Aristotle defines scientific knowledge as follows “We think we scientifically know something *S*, *simpliciter* (not in the sophistic way, *kata sumbebekos*) when we think we have grasped that this is the cause by which *S* is the case, and [when we think that] this cannot be otherwise”.

I need not discuss whether this definition is just a preliminary account or already contains everything that is relevant for a sufficient characterisation of Aristotle’s notion of scientific knowledge. I just want to discuss a little bit the meaning of the expression “*kata sumbebekos*”, in order to elucidate the issues that are at stake in *APo* I-8.

A vague interpretation of 71b9-16 would say that the object of scientific knowledge, which cannot be otherwise, is necessary in the sense that it always exist and exists always in the same way. From this point, one might infer that the object of scientific knowledge is “incorruptible” and “eternal”, so that there will be no scientific knowledge of things that do not satisfy these conditions.¹¹ One might be tempted to say, according to this line I am describing, that *APo* I-8 argument relies on this thesis and develops a general argument quite similar to the argument found in *Metaphysics* Epsilon 2-3, i.e.: there is no science except of that which is necessary, eternal and incorruptible, so that there cannot be any science of accidental predications.

Nevertheless, I think this interpretation of *APo* is wrong. I am not saying that Aristotle would not agree with the claim that there is no science of accidental predications. I am just arguing that this is *not* Aristotle’s point in *APo* I-2 or I-8. Aristotle is concerned with different

¹¹ For such a view, see Porchat 2001: p. 38-40.

issues in *APo* I-2 and I-8. First of all, let me say how the definition of scientific knowledge in 71b9-12 should be understood¹².

Aristotle claims that we have scientific knowledge of a proposition *C-A* (a conclusion of a demonstration)¹³ when all the following conditions are satisfied:

(1) we know that *B* is the cause of *C-A*.

(2) we know that the causal relation that explains *C-A* cannot be otherwise.¹⁴

Condition (2) amounts to saying that we get scientific knowledge of *C-A* if and only if we get the *appropriate* cause¹⁵ to explain why *C-A* is as it is. The appropriate cause cannot be more than one, and it has to satisfy the following conditions – which I put as further specifications that disentangle what is implicit in condition (2) mentioned above:

(2.a) the appropriate cause *B* (as middle term of a first figure syllogism) is a sufficient condition for deducing *C-A* (as conclusion of this syllogism);

¹² I have argued for this interpretation in Angioni [2007]. For brevity's sake, I will just sum up many points that I have carefully discussed in that paper. For alternative views, see Barnes 1993, McKirahan 1992. My view is closer to Burnyeat 1981, but on very different exegetical grounds.

¹³ That Aristotle is talking about knowledge of predicative propositions (or state of affairs which can be referred to in predicative statements) is clear from *APo* II, 1-2, as well as from 71b22. I cannot agree with the claim that Aristotle's syllogistic was a later imposition on a virginal apodeictic – see Barnes 1981: p. 30 ss.

¹⁴ I argue that “*touto*” at 71b12 does not pick up neither “*pragma*” nor “*aitia*”: it rather refers to the causal relation between *aitia* and *pragma* – and nothing prevents us from taking *pragma* as a state of affairs expressed in a predicative statement such as “*C* is *A*”. In fact, what Aristotle says at 71b22 strongly suggests that the *pragma* of which there is a (scientific) cause is what is said in the conclusion.

¹⁵ For the notion of *appropriate cause* (or the equivalent notion of *appropriate principle*), see *APo* 71b22-3, 72a5-7, 76a16-7, 78a 24-6 ff. (*primary cause*).

(2.b) the appropriate cause B , as a true predicate of the term C in the minor premise, is a necessary condition for the truth of the proposition $C-A$ (if $C-B$ were not true, $C-A$ could not be true).

Conditions (2.a) and (2.b) taken together give the requirement that the cause, B , and that of which the cause is cause, A , must be coextensive with each other.¹⁶ However, Aristotle does not reduce the requirements for scientific knowledge to this couple of conditions, since there still is another one:

(2.c) the appropriate cause B should *really explain* why A is attributed to C .

There are many difficulties in condition (2.c), which Aristotle has never explained in a satisfactory way – he has just formulated it and illustrated it with examples without giving further conceptual elucidations about the notion of explanation involved in it.¹⁷ But I need not discuss these difficulties. I will rather consider a third condition involved in the definition of scientific knowledge in 71b9-12. Aristotle does not seem to have formulated this third condition as a separate clause. This third condition follows from a remark Aristotle has made when he had advanced the two conditions mentioned above, i.e., from the remark that scientific knowledge is opposed to sophistic knowledge inasmuch as sophistic knowledge is a *kata sumbebekos* knowledge. This condition can be formulated in the following way:

¹⁶ I have argued for this claim in Angioni 2007. Further evidence comes from *APo* I-13, especially from 78b13-31, where Aristotle focuses on condition (2.b).

¹⁷ See *APo* I-13, 78a26 ff., and II-16, 98a35 ff., as well as *Categories* 14b10-22: Aristotle strongly argues that a cause is coextensive with that of which it is cause, and this amounts to saying that a causal relation cannot be fully understood in terms of entailment of implication. See also 78a6-10: Aristotle says that syllogistic formulation (*analuein*) of scientific knowledge is difficult because bare syllogistic allows for proving a conclusion from false premises, whereas demonstration requires mutual implication between true antecedents and true consequents.

(3) the cause *B* by which one claims to have knowledge of *C-A* cannot be a *sumbebekos*; it cannot be a cause that would give one nothing more than sophistic knowledge.

This condition might sound odd and fictitious to many readers. In order to clarify my claim, let me first say that I take the expression “*kata sumbebekos*” as introducing a way to explain why a given predicative proposition (*C-A*) is the case. Perhaps one might say that this expression introduces a way in which a knower is justified in his or her claim to scientific knowledge, but I prefer to phrase my point in terms of the syllogistic structure which Aristotle has chosen for displaying causal relations in a scientific demonstration. In this picture, the expression “*kata sumbebekos*” is contrasted with “*kath’ hautō*” or some equivalent expression – “*hēi auto*” or “*hēi ekeino*” (see 76a 1-2 ff.) – and refers to the middle term through which one claims to have explained a conclusion *C-A*. Therefore, when Aristotle opposes scientific knowledge to *kata sumbebekos* knowledge, he is concerned with a contrast between two ways of presenting an explanation for a given conclusion.

Thus, the claim that the cause or middle term *B* is not a *sumbebekos* is something very precise in this context. This claim cannot be reduced to the requirement that *B* cannot be an accidental predicate of *C* in the sense in which an accidental predicate is defined in *Topics* 102b6-9 – such a requirement, of course, is true and is part of Aristotle’s theory, but it plays no role in the text I am discussing. The claim that the cause *B* cannot be a *sumbebekos* amounts to saying that *B* cannot be a predicate *irrelevant* to the real explanation of *C-A*. In this context, many kinds of predicates count as *sumbebekos*, even predicates that are not accidental ones. A predicate *B* that is universally true of every *C*, or even that is necessarily true of every *C*, can be a *sumbebekos* (in the relevant sense in this context) if it does not give an appropriate explanation of why *C* is *A*. Even a predicate *B* that is coextensive with *C* will be a *sumbebekos*, if it is irrelevant or inadequate in explaining why every *C* is *A*. Suppose, for instance, that we are looking for an adequate (i.e., scientific in the

Aristotelian sense) explanation of why every man is mortal. One might be tempted to claim that the middle term which explains why every man is mortal is *animal*, but someone might object that such a middle term is rather *mammal*, and still another one might prefer to say that such a middle term is rather *living being*. Now, all three options satisfy condition (2.a) and *living being* further satisfies condition (2.b). All three terms yield true minor premises in *Barbara* arguments concluding that every man is mortal. Nevertheless, no one counts as an appropriate cause for explaining (in the required way for scientific knowledge) why the conclusion “every man is mortal” is the case, even though *living being* is a better candidate because it satisfies a greater number of the relevant conditions.

Even if one agrees with my interpretation, one might still wonder why Aristotle would say that a *kata sumbebekos* knowledge is a sophistic way of knowing. The answer is that the “sophistic way” Aristotle is talking about is defined in terms of a purpose to produce a semblance of scientific knowledge. Sophists are mostly involved in producing fallacious arguments or in producing arguments which, even being sound ones, contain propositions that appear to be well-accepted without being so, or propositions that appear to be true without being so. This is the picture Aristotle puts forward about sophists at the beginning of *Topics* (100b23-101a4). However, one cannot forget that sophistic is also defined in terms of a purpose of life which is directed towards producing a false semblance of philosophical or scientific wisdom.¹⁸ At *Sophistic Refutations* 165a23-4 Aristotle says that sophists *seem* to perform what is the proper function of the wise, and it is natural to assume that one of the functions of the wise is to give adequate explanations in a given field. Now, a sophist who advances sound arguments with well-accepted and true propositions might still be a sophist if he or she claims to have advanced

¹⁸ See *Metaphysics* 1004b22-6; *Sophistic Refutations* 165a19-24; 171b18-32.

appropriate explanations without really doing so.¹⁹ This is what Aristotle had in mind at *APo* 71b9-12: if one claims to have scientific knowledge of *C-A* but advances a (putative) demonstration in which the middle term *B* is a *sumbebekos*, he or she will have displayed just a *semblance* of scientific knowledge. And, for this reason, he or she will have just a sophistic knowledge of *C-A*.²⁰

III

Let me now go back to *APo* I-8. Aristotle says that “there is no scientific knowledge *simpliciter* of corruptible things” (75b24-5). In order to understand what Aristotle means with this statement, let me take a syllogism in which the minor term *C* is a corruptible individual and let me examine in what sense a conclusion with this term *C* would not satisfy the conditions for scientific knowledge Aristotle has expounded in 71b9-12:

“Every man is rational;
Socrates is a man;
Therefore, Socrates is rational”.

Is it right to say that this syllogism (which has a corruptible thing as its subject, Socrates) is not a demonstration *simpliciter*? Such a statement cannot be right except if our syllogism fails to satisfy (at least) one of the conditions mentioned above. Now, which conditions does this syllogism not satisfy? This syllogism seems to satisfy at least the first two conditions. But since condition (1) is vague and can be somehow

¹⁹ Aristotle recognizes this kind of sophist: see *Sophistic Refutations* 171b6-12 ff.

²⁰ I have argued more carefully for this view in my unpublished paper “Seeming to explain without explaining: Comments on the *phainomenos elegkos para to sumbebekos* (SE 168a34-b10)”, presented at Humboldt Universitat, Berlin, in the Conference “Lost in Logical Space”, July 2009.

included in condition (2), which is itself vague, I will concentrate myself on conditions (2.a) to (3).

First of all, it is clear that man, as middle term of this syllogism, satisfies condition (2.a). And since being a man is a necessary condition for being rational at least in the sublunary world,²¹ the condition (2.b) is also fulfilled. Condition (2.c), on its turn, seems to be equally satisfied, since being a man seems to be an adequate explanation for Socrates' being rational. Why, then, would Aristotle say that our syllogism cannot count as a demonstration *simpliciter*, but is only a knowledge such as if it were *kata sumbebekos* knowledge?

Now, if we take condition (2.c) in the light of condition (3), the picture changes considerably. Condition (3) introduces a requirement much stronger than the requirements that result from conditions (2.a) and (2.b) taken together. In *APo* I-9, Aristotle puts forward the stronger claim that “it is not possible to demonstrate each thing except from the principles of it, when that which is the *demonstrandum* is attributed to each thing as this thing is itself” (75b 36-37). This stronger claim amounts to saying that the predicate *A*, which one has to demonstrate about *C* in the conclusion *C-A*, must be attributed to *C* inasmuch as *C* is “itself”, and the expression “itself” in this context refers to some description that, besides other things (like having relevance), must be coextensive with *C*. In other words, the expression “*hēi auto*” in 76a6 advances some requirements for the middle term *B* in its relation to the minor term *C*. The predicate *A* has to be demonstrated about *C* inasmuch as *C*, being *B*, is *A*, and the expression “*hēi auto*” says that the middle term *B* must be coextensive with *C*. Therefore, while conditions (2.a) and (2.b) taken together yield a requirement of coextensiveness between the middle term *B* and the major term *A*, condition (3) adds a stronger requirement of

²¹ Aristotle probably would say that God (the Prime Mover) is rational, and perhaps would say that celestial bodies have rational souls (see *De Caelo* 292a18-22), but I need not discuss these issues, for it is enough to my purposes to say that a sublunary entity cannot be rational unless it is a man.

coextensiveness between the middle term *B* and the minor term *C*. This requirement also results from the claim that the conclusion of a demonstration must display a *katholou* predicate in the strict sense defined in 73b26 ff. Aristotle had advanced such a claim at the end of *APo* I-4 (74a1-3), and his subsequent discussion at *APo* I 5-6 develops some consequences of it in the light of the definition of scientific knowledge given at 71b9-12. One of these consequences is that the middle term *B* which scientifically explains why *C* is *A* must be coextensive with *C* as well as with *A*.²²

There are other requirements for the middle term *B* – intensional requirements related to explanatory relevance. But what I have said so far is enough for showing that syllogisms in which the middle term *B* is not coextensive with the minor *C* do not fully satisfy the stricter conditions for scientific knowledge Aristotle advances at *APo* I 2-6 and *APo* I-9. Consequently, such syllogisms cannot count as a demonstration *simpliciter*.

Now, the predicate man is *true* of Socrates. Perhaps we can say that the predicate man is *necessarily true* of Socrates on some conditions (in the sense that, provided that Socrates exists, it is necessary that Socrates be a man through all its existence). On the other hand, the predicate man is not coextensive with Socrates and, for this reason, it is a *sumbebekos* of Socrates in the sense in which “*sumbebekos*” is understood in this context.²³ For this sense of “*sumbebekos*”, the following passage from *APo*

²² I had carefully argued for that claim in Angioni [2007]. I am now assuming the results of my argument in that paper. For a similar discussion of coextensiveness requirements at *APo* I-5, see Hasper 2006.

²³ One might be surprised with my claim that man is a *sumbebekos* of Socrates, but I hope it is already clear that I am not claiming that man is an accidental predicate of Socrates – for I cannot accept that *sumbebekos* always refers to the notion of accidental predicate (as defined in *Topics* 102b6-9). In *Metaphysics* 981a18-20, Aristotle says that being a man *sumbebēken* to Socrates, which is equivalent to saying that man is a *sumbebēkos* of Socrates. Now, far from being an awkward and unusual terminology, this use of “*sumbebēkos*” just means that man is not the relevant property of Socrates in that particular context.

I-9 is very enlightening: “we know each thing [i.e, the conclusion of a demonstration in the form $C-A$] not *kata sumbebekos* [that is, not through a *sumbebekos*], when we know that A is attributed to that to which it is attributed (namely, to C) through the principles of C qua C ” (76a4-6), that is, when we know that A is attributed to C through a middle term B that is the principle of C – but it is not enough for a principle to be true, undemonstrable and immediate: it must also be coextensive with C .²⁴ By contrast, knowledge through a *sumbebekos* occurs when one of these conditions is not fulfilled. Thus, even when one chooses a principle which is true, undemonstrable and immediate, one might still have a *sumbebekos*, if this principle is not coextensive with C but common to other things besides C – like the principles through which Brisson has advanced his proof of the quadrature of the circle.²⁵

Let us see Aristotle’s illustration: “for instance, we know 2R from the principles of that which in itself has the attribute 2R” (76a6-7). This means that we have scientific knowledge of the conclusion “every triangle has 2R” when we know it through the principles of the triangle (which is the minor term, C), to which A is coextensively attributed.²⁶

Aristotle wishes to elucidate on which condition the statement “the physician heals (a) man” is true *when the physician heals Socrates*, which is a man. His answer is that this statement is true in that circumstance if the statements “the physician heals Socrates” and “Socrates is (a) man” are also true. Now, Aristotle’s reason for saying that man is a *sumbebekos* of Socrates is that Socrates’s relevant property for making the sentence “the physician heals Socrates” true is not being a man, but being sick and curable. Now, being a man is a necessary condition for being-curable-by-the-action-of-a-physician etc., but that does not affect the point – being a man is not the relevant property for understanding that a physician heals Socrates. Therefore, being a *sumbebekos* in such contexts means precisely being a property which is irrelevant for some particular purpose at stake.

²⁴ See *APo* 75b37-40 and 76a16-7, where “*idias arhas*” include the notion of coextensiveness between the principle and that of which it is principle.

²⁵ See *APo* 75b40-76a3.

²⁶ For coextensiveness between triangle and 2R, Aristotle is very clear at 73b32-9 as well as at 74a32-b4.

Now, if there is co-extensiveness between *C* and *A*, there must be co-extensiveness between *C* and *B* too (in the minor premise), although this does not imply that co-extensiveness of the middle term with the extremes is enough for an appropriate explanation. But what is relevant and enough for my point is just this extensional requirement. A demonstration, being scientific knowledge *simpliciter* in opposition to *kata sumbebekos* knowledge, requires coextensiveness not only between *B* and *A*, but also between *C* and the two other terms. The requirement of co-extensiveness between *A* and *B* follows from conditions (2.a) and (2.b) taken together. But, as I am arguing, condition (3) involves a further co-extensiveness requirement about the minor term *C*.

In the light of this, we must consider the following questions: why, and in what terms, does Aristotle deny the title of “scientific knowledge *simpliciter*” to our syllogism about the corruptible Socrates? What does Aristotle mean when he says that such a syllogism about a corruptible thing is knowledge as if it were *kata sumbebekos*? And why does Aristotle consider in the same chapter of *APo* the kind of objects called “*pollakis gignomena*” (75b33), that is, such events like a lunar eclipse, which happen many times, but not all the time? One answer to this last question is to say that such phenomena are not eternal etc. But such an answer is not available to anyone who, like me, is willing to reject the idea that Aristotle requires eternity as one of the features of objects liable to scientific knowledge. I will address these three questions in the remaining sections of this paper.

IV

Let me consider the events that happen many times (*pollakis*), like the lunar eclipse. The example does not seem to be casual: after discussing the case of corruptible things (like Socrates), Aristotle now takes an object that is not *corruptible* in itself (since he believes that celestial bodies exist eternally) and, for that reason, is very different from individuals like Socrates. But the connection between this eternal celestial

body and the property of losing its light *does not hold all the time*. And this restriction in time is a feature which the lunar eclipse shares with the case of Socrates' being a man.

The text runs as follows: "it is clear that demonstrations and scientific knowledge of things which happen many times (for instance, the lunar eclipse) are *always* [true], inasmuch as they are about something of this kind [i.e., something that holds *always*], but they are [true] in part, inasmuch as such kind of things does not happen always" (75b33-5).

The meaning of this passage is clear. Aristotle means that, on the one hand, as these demonstrations involve a causal relation ($B-A$) which, as such, is always true, they are themselves always true at least on this aspect; but, on the other hand, inasmuch as the relation between the thing C and the cause B does not happen all the time, it follows that the relation between C and the property A does not happen all the time either, but it happens only on the condition that the relation between C and B happens, so that it is *not always* true, but is true only "in a part" of the time of C 's existence. One might reasonably argue that such a minor premise $C-B$ (as well as the conclusion $C-A$ which depends on it) is also *corruptible* in the sense that it is not always true.

For the sake of clarification, consider the following syllogism:

"Having the Earth interpolated between itself and the Sun (B) bring about the loss of light (A);

"the Moon (C) has the Earth interpolated between itself and the Sun (B);

"the Moon (C) loses its light (A);²⁷

²⁷ For such a syllogism, see *APo* II-8, 93a30-1, and compare with 90a 15-6.

Now, it is clear that the sentence “*hei men toioud’ eisin*”²⁸ at 75b34 refers to the fact that such a demonstration involves a causal relation of the relevant sort (*toioude*), that is, a causal relation which is “always true” in the sense that it *holds always* for whatever satisfies the antecedent. This relation is introduced in the major premise as a universal formulation which can be rephrased in the following way: whenever x has the Earth interpolated between itself and the Sun, x loses its light.²⁹ This causal relation is universally true, and its truth does not depend on the particular fact that it holds now (or at any given time) of the thing C (the Moon).³⁰ Actually, from this universal truth it does not follow that the Moon loses its light (or is eclipsed) *now*, nor does it follow that the Moon *always* loses its light (that is, all the time it exists) – nor does it follow that the Moon loses its light *at any given time*. The causal relation expressed in the major premise probably could never have been discovered without having been observed in particular instances. Our awareness of this causal relation depends on our awareness of its instances.³¹ From a heuristic point of view, our knowledge of this causal relation depends on its being instantiated. But this does not mean that our knowledge of it involves a determinate knowledge of any of its instances – it only means that our knowledge of it involves the knowledge that it must be

²⁸ This is the reading adopted by Ross, which is attested in one manuscript and in Philoponus. Among all other options, the only one which makes sense is “*hei men toiaid’ eisin*” (attested in just one manuscript). My point will stand the same with this reading: “since [these demonstrations] are of such a quality [i.e., they involve a causal relations which holds always].”

²⁹ For a similar use of “*aei*” in the sense of “true for whatever case satisfying the relevant description”, see *Categories* 13b1, 2-3, 15, 21, 28. It is “always true” that Socrates is either seated or is not seated, although it does not follow that Socrates is always seated, nor does it follow that Socrates is always not-seated.

³⁰ Of course, the causal relation expressed in this premise was probably assumed as true by Aristotle in face of the theories available at his time.

³¹ Perhaps just one instance would be enough, see *APo* II-2, 90a26-30.

instantiated sometimes.³² Therefore, from the fact that the major premise of our syllogism expresses a causal relation which (in Aristotelian terminology) is “always true”, it does not follow that the conclusion refers to a necessary and eternal fact, which would be the case all the time (be “always true”).

On the other hand, the sentence “*hei d' ouk aei?*” at 75b35 makes an allusion to the minor premise (or even to the conclusion) of the syllogism above, which reports a fact that satisfies the antecedent of the causal relation expressed in the major. This antecedent says “whenever x has the Earth interpolated between itself and the Sun”. The minor premise adds that the Moon satisfies this description, but as Aristotle remarks: “not always”. In fact, it is not always true that the Moon has the Earth interpolated between itself and the Sun. The same holds of the conclusion too: it is not always true that the Moon loses its light and is eclipsed. In this sense, the conclusion of our syllogism is not true *except “kata meros”*, and this means that it is not true that the Moon displays the property of losing its light *in all the time of its existence*. It is only *in some part of its existence* that the Moon displays that property. Thus, “always true” applied to the major premise means that the causal relation is true for whatever case in which the antecedent is satisfied – without implying any determination about actual instances of time in which the antecedent will be satisfied. On the other hand, when Aristotle denies that the minor premise is “always true”, he means that this premise is not true in all actual instants of time (and the same holds of the conclusion).³³

³² Aristotle is very clear about this point in his discussion of our knowledge of the proposition “every triangle has 2R” in *APo* 71a19-b5. Universal knowledge of the causal relation between being a triangle and the property 2R does not involve determinate knowledge of its actual instances.

³³ One might be inclined to charge Aristotle of confusing two different senses of “always true”. But I argue that he is not making a confusion, quite to the contrary: Aristotle is aware of the necessity of distinguishing between a “complete proposition” (like our minor premise) and an “inferential rule” (like our major premise): the former has its truth-value directly referred to the actual

Now, Socrates, being a corruptible thing, can be squared with the case of lunar eclipse? There are many differences between the two cases. On the one hand, the Moon is a celestial body which exists eternally and is not liable to generation and corruption, whereas Socrates does not exist eternally. Further, for the Moon, which exists eternally, the property of having the Earth interpolated between itself and the Sun is not always verified, whereas for Socrates, which exists only for a limited time, it is true to say that he has the property of being a man during all the time he exists. What is not true about Socrates is that he has the property of being a man *all the time simpliciter* (not the time of his existence), and this point depends on the more basic fact that Socrates (differently from the Moon) does not exist all the time *simpliciter*. This feature brings to light a similarity with the lunar eclipse: the Moon does not have the property of being screened by the Earth *all the time simpliciter*, although the ground for this is quite different from the reason explaining why it is not true *all the time simpliciter* that Socrates is a man. Now, I argue that Aristotle is interested in stressing a common feature of both cases, in spite of their differences. The common feature is the following. Take the two propositions below, which are respectively the minor premises of the syllogisms I have introduced:

“the Moon has the Earth interpolated between itself and the Sun”.
“Socrates is a man”.

Consider “always”(in “*ouk aei*” at 75b35) as *all the time simpliciter*, and “in part” (*kata meros* at 75b35) as *in a part of the whole time simpliciter*. On these conditions, Aristotle might say that *both* propositions are not *always* true, but are true only *in part*. The reasons by which each of them is not

instants of time, whereas the latter is rather like a rule for dealing with propositions which satisfy (at a given instant of time) the descriptions of the antecedent and the consequent. I am suggesting that Aristotle might have had in mind something similar to Ryle’s view as developed in Ryle 1950.

always true are not the same. But even so, in spite of these different reasons, Aristotle might be concerned with bringing to light the fact that both have a common feature. And this common feature is squared with Aristotle's explanation of why a corruptible minor premise falls short of being universal.

Thus, let me return to 75b28-9, where Aristotle advances such an explanation. One might say that the premise "Socrates is man" is not universal because, among all the instants of time to which one might refer it, it will be true in some instants, but not be true in others. In this sense, "*ep' hōn*" at 75b29 might be taken as a reference to *C* in all possible instants of time. And the dative expressions "*tōi men*", "*tōi de*" will refer to two particular instants among all instants of time. In favour of this interpretation, one might point to Aristotle's emphatic phrasing in the sequence, when he says that "one cannot reach a universal conclusion, but only a conclusion that *now it is the case*" (75b29-30), that is, a conclusion that Socrates is rational *now* (i.e., in a given instant in which Socrates exists).

Now, we can reach the same results with a different – and more interesting – exegetical path, accepting another reading at 75b29 – "*to men/ to d*" in the nominative, not in the dative – which is attested in some manuscripts and in Philoponus. The expression "*ep' hōn*" in Aristotle frequently refers to the things to which terms (of a given sentence or of a given syllogism) are applied.³⁴ In this direction, "*to men/ to de*" might refer to the pair of terms in a given corruptible premise, so that Aristotle's sentence might be understood in the following way: "amongst the two items to which the terms of the minor premise of such a syllogism refer, one may be the case [*to men estai*] while the other may not be the case [*to d' ouk estai*]". Now, to say that one term may be the case and the other may not be the case amounts to saying that it is possible that one of them be the case without the other being the case.

³⁴ See *Prior Analytics* 44a13-4, *APo* 82a25, 86b16, 89b16, 93a30-1, 94a29-30, 95a17-8, 98b5-7.

And this amounts to saying that there is no relation of reciprocal implication between these two terms, so that they are not co-extensive with each other.³⁵ Let us apply this to the syllogism about the corruptible individual Socrates. First, let me remark that, for a universal term like man, “being the case” amounts to being instantiated in an individual. In this perspective, one might say that man can be the case without Socrates being the case in the sense that the property of being a man can be instantiated in a given existing individual without Socrates’ existing. Being Socrates implies being a man, but being a man does not imply being Socrates. A similar situation holds of the terms in the premise “the Moon (C) has the Earth interposed between itself and the Sun (B)”. It is possible for one term to be the case without the other being the case. The Moon can exist without instantiating the property of having the Earth interposed between itself and the Sun, as well as this property can be instantiated in another celestial body even without being instantiated in the Moon. Thus, there is no mutual implication between the terms of this premise, and this explains why it cannot be counted as a universal premise in the relevant sense (73b26ff.). And one might reasonably argue that this premise is also *corruptible* in the sense that it is not true *all the time simpliciter*.

Therefore, there is no co-extensiveness either between “Socrates” and “man” or between “Socrates” and “rational”, as well as there is no co-extensiveness either between “the Moon” and “having the Earth interposed between itself and the Sun” or between “the Moon” and “loosing its light” – and this is the way in which Aristotle explains that neither the minor premise nor the conclusion about a corruptible thing is

³⁵ For such relations of mutual implication, see *Categories* 14a29-35, in which Aristotle formulates a test in terms of “implication of being the case” (*akolouthêsis tou einai*). See also *Metaphysics* V-11, 1019a2-4, in which a test for priority between A and B is formulated in terms of “A being the case without B and vice-versa”. This allows us to take “*estat*” in 75b29 in the context of a similar test.

universal. In this context, “universal” has the strict sense that Aristotle had advanced in 73b26 ff., which involves, besides other things, the notion of an attribute coextensive with the subject to which it is attributed. In fact, co-extensiveness between the terms of a syllogism is a necessary requirement for a *haplôs* demonstration, as I have argued in section III. Therefore, not only the syllogism about the corruptible Socrates but also the demonstration about lunar eclipse seem to fall short of being a demonstration *simpliciter*.

V

Let me take up the questions I have formulated before: (1) why, and in what terms, does Aristotle deny the title of “scientific knowledge *simpliciter*” to our syllogism about the corruptible Socrates? (2) What does Aristotle mean when he says that such a syllogism about a corruptible thing is knowledge as if it were *kata sumbebekos* knowledge? (3) Why does Aristotle consider in *APo* I-8 such events like a lunar eclipse, which happen many times, but not all the time?

Let me first address the second question. I argue that the expression “*boutôs hōsper*” at 75b25 works as an attenuation of the comparison: Aristotle means that there is just *some similarity* between a syllogism about a corruptible thing and a piece of *kata sumbebekos* knowledge. Now, from the fact that they have a common feature or a similarity it does not follow that all their features are the same. Syllogisms displaying *kata sumbebekos* knowledge are not scientific knowledge because they do not satisfy at least one of the conditions (2.b), (2.c) or (3) – their middle term is not coextensive with the major, or it lacks explanatory relevance, or it is not coextensive with the minor. On the other hand, a syllogism about a corruptible thing does not satisfy the co-extensiveness requirement implied in condition (3), but Aristotle does not say that such syllogisms do not satisfy conditions (2.b) or (2.c). Actually, it seems that the only relevant characteristic for determining a syllogism about corruptibles is the fact that its minor term introduces a

corruptible thing. But it is clear that conditions (2.b) and (2.c) might be satisfied, as they seem to be in my example involving man, rational and Socrates. Now, some cases of *kata sumbebekos* knowledge might be syllogisms in which the major and the middle, even being co-extensive with each other, are not co-extensive with the minor, so that Aristotle has some ground for stressing some similarity between *kata sumbebekos* knowledge and syllogisms about corruptibles. But the similarity does not go beyond this formal feature.

Let me address the third question: why does Aristotle consider in the same chapter of *Posterior Analytics* corruptible things and the kind of objects called “*pollakis gignomena*”? My answer presupposes that the notion of scientific demonstration defined in *APo* I-2 and developed in the subsequent chapters requires co-extensiveness between the three terms of the syllogism. I am just saying that this requirement is a *necessary* (but, obviously, not sufficient) condition for a scientific demonstration *simpliciter*. Now, in *APo* I 7-8 Aristotle considers the cases that brings difficulties to his picture: (i) syllogisms about corruptible things; (ii) demonstrations of things that happen “many times”, like the lunar eclipse; (iii) the subordinated sciences (in chapter 7). All three cases have a common feature: they present a minor term *C* which does not satisfy the co-extensiveness requirement. In the case (i), the minor term introduces an individual which does not exist all the time. In case (ii), the minor term introduces an entity that, although it exists always and eternally, does not display the property introduced with the major term during all its existence; (iii) in the subordinate sciences, the minor term refers to a natural object, which is not coextensive either with the major or with the middle, since these latter introduces mathematical items, which are not restricted to natural entities.

We can understand why Aristotle has taken (i) and (ii) together in chapter 8 and has taken (iii) apart, in chapter 7. The common feature of the three cases has to do with the fact that the co-extensiveness requirement about the minor term is not satisfied. This is explained by

Aristotle in terms of *non-universality* in 75b28-29. However, only cases (i) and (ii), but not case (iii), involve “corruptible premises” in the sense described in 75b27-28, even though in different senses of “corruptible”. A common feature of both senses of “corruptible” is that a corruptible premise *is not true all the time simpliciter*. The reason why each sort of corruptible premise is not true all the time *simpliciter* is different – the corruptible premise about the Moon is not true *all the time simpliciter* because the Moon does not display the relevant property all the time of its existence (which coincides with all the time *simpliciter*, since the Moon is eternal), whereas the corruptible premise about Socrates is not true *all the time simpliciter* because Socrates does not exist all the time *simpliciter* (even if he displays the relevant property all the time he exists). But, despite these differences, Aristotle is concerned with the feature both sort of corruptible premises share in common. In contrast, the minor premise of a subordinated science relates a natural thing taken as a kind (as minor term) to a mathematical property (as middle term) which is relevant to explain why that natural thing has another mathematical property (the major term). Now, it is not true about natural kinds that they are corruptible in the sense in which Socrates is corruptible. Even if Aristotle does not believe that “species are eternal”, he can claim that natural kinds are such that their existence is not limited in time in the way in which the existence of a corruptible individual is limited. On the other hand, natural kinds have some sets of properties for all the time of their existence – and some mathematical properties are included in such sets of properties. Even if natural kinds have these properties only “for the most part” (*hós epi to polu*, cf. 87b 20 ff.), this temporal restriction is quite different from the restriction about the Moon’s property of having the Earth interposed between itself and the Sun.

At last, let me address now the first question: why, and in what terms, does Aristotle deny the title of “scientific knowledge *simpliciter*” to our syllogism about the corruptible Socrates? I argue that Aristotle is not claiming that such a syllogism about a corruptible thing has no

explanatory power. He rather says that such a syllogism does not deserve to be called “scientific knowledge *simpliciter*” because it introduces predicative relations that are not always true, so that it does not satisfy the co-extensiveness requirements that characterizes a demonstration *simpliciter*. Now, to say that a syllogism is not a demonstration *simpliciter* does not amount to saying that it is not a demonstration *at all*. Perhaps all Aristotle wants to say is that syllogisms which are not demonstrations *simpliciter* are not *primary* demonstrations – they are not the most relevant demonstrations capable of grounding a series of derivative demonstrations. But, in this perspective, syllogisms about corruptibles are not so far from the case in which the theorem “every triangle has 2R” is taken as major premise and “isosceles” is taken as minor term (see 74a 2-3, 85b 5-7).

I believe that Aristotle is interested in these three cases because they force him to a certain flexibility in his theory. Aristotle is compelled to say: a scientific demonstration has to satisfy the stronger co-extensiveness requirement about the minor term *except for these three special cases*. Aristotle does not deny the title of “scientific knowledge” to cases (ii) and (iii). In *Metaphysics*, Aristotle seems to deny this title to case (i),³⁶ but nothing compels us to ascribe to Aristotle the stronger claim that case (i) does not count even as a *correct application of scientific knowledge*.

Appendix

My reader might be wondering why I have not discussed the first sentence of *APo* I-8, i.e, the passage 75b21-4. My reason is a very simple one, and I have purposely postponed a discussion of it to this appendix. First, I argue that “*idion*” is a much more suitable reading at 75b22 than “*aidion*”, although it is not grounded on the best authorities of the manuscript tradition. Second, I suggest that the passage 75b21-4 rather belongs to the previous chapter of *APo*, which, with “*idion*”, gives a

³⁶ This will be a subject to another paper.

remarkable coherence to Aristotle's itinerary. He had discussed in *APo* I-7 how the requirement that propositions must be *per se* predications is related to the requirement that terms of a demonstration must belong to one single genus. In this perspective, to recapitulate that premises (or propositions) must be *katholou* (in the stricter sense as defined at 73b26 ff.) gives a good ground from concluding that the conclusion of a demonstration must display an *idion* predicate – a predicate which, besides other things, is coextensive with its subject. After this conclusion, Aristotle begins a new line of argument with “*ouk estin ara apodeixis tôn phthartôn*” at 75b24, an expression which is very closely (or almost identical) with the opening sentence of his previous chapter, “*ouk ara estin ex allou genou*” (75a38). I suggest that this juncture is the beginning of *APo* I-8. Now, at *APo* I 4-6 Aristotle had argued that the premises of a demonstration must present a middle term (designed to give an adequate explanation of why the conclusion is the case) which is coextensive with the extremes (specially with the major) and is related to the extremes “*di' hautô*” (see 75a35-7, which concludes *APo* I-6). From this it follows two corollaries, which Aristotle presents in different chapters, introduced with almost the same words (“*ouk ara estin*” at 75a38, “*ouk estin ara*” at 75b24): (i) it is not possible to have a demonstration if the terms do not belong to the same genus; (ii) it is not possible to have a demonstration *simpliciter* of corruptible items.

Of course, this is no more than a suggestion.

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