ARISTOTLE ON PREDICATION AND DEMONSTRATION*

_____

DAVID BRONSTEIN
https://orcid.org/0000-0001-8041-637X
University of New South Wales
School of Humanities and Languages
Sydney, New South Wales
Australia
d.bronstein@unsw.edu.au

Abstract: I argue against the standard interpretation of Aristotle's account of 'natural predication' in *Posterior Analytics* 1.19 and 1.22 according to which only substances can serve as subjects in such predications. I argue that this interpretation cannot accommodate a number of demonstrations Aristotle sanctions. I propose a new interpretation that can accommodate them.

INTRODUCTION

In *Posterior Analytics* (henceforth *APo*) 1.19 and 1.22 Aristotle distinguishes between predicating "accidentally" or "not without qualification" and predicating "non-accidentally" or "without qualification". Scholars since

antiquity have called the latter "natural predication".[1] In these chapters Aristotle also claims that the premises and conclusions of all demonstrations are natural predications. To understand Aristotle's theory of demonstration, therefore, we need to understand his account of natural predication. This is not an easy task. The relevant passages are difficult and have attracted comparatively little discussion. What we might nonetheless call the standard interpretation is as follows:

(1) If A is B, then 'A is B' is a natural predication if and only if A is the underlying subject (*hupokeimenon*) for B.

(2) A is the underlying subject for B only if A is a (*Categories* primary or secondary) substance.

Therefore,

(3) If A is B, then 'A is B' is a natural predication only if A is a (*Categories* primary or secondary) substance.[2]

---

[1] Philoponus *in An Post* 218.24.

[2] See Barnes (1993, p. 176; see also pp. 114–17), Bostock (2004, p. 149), and Hamlyn (1961, pp. 117, 121–3). Philoponus (*in An Post* 219.7–10, 235.29–236.8) has a more expansive view. He thinks natural predications include cases in which an accident is predicated of an accident, such as 'white is a colour', so long as the two accidents are in the same category and the predicate is

According to D.W. Hamlyn (1961, p. 121), "genuine [i.e., natural] predications can be distinguished from … accidental [i.e., unnatural] predications in that the former must have substances as their subjects". And again, "the rule which distinguishes a proper predication … from an accidental predication is that the subject expression must refer to a genuine *hypokeimenon*, i.e. a substance." (Hamlyn 1961, p. 123) Similarly Jonathan Barnes (1993, p. 176) writes that, since every scientific proposition is a natural predication, Aristotle's "thesis amounts to the claim that the subject-term of any scientific proposition will denote a substance". So on the standard interpretation, to use Aristotle's examples, the sentence 'the log is white' is a natural predication and 'the white is a log' is not because in the first sentence but not in the second the item signified by the subject term is (a) a substance and (b) the underlying subject for the item signified by the predicate term.

In this paper I argue against the standard interpretation.[3] I first argue that the view has problematic consequences for Aristotle's theory of demonstration. I then argue that in *APo* 1.19 and 1.22, Aristotle accepts (1) but rejects (2) and (3). To be a subject term in a natural predication a term must signify an "underlying subject", but not all underlying subjects are substances. Aristotle has a more expansive conception of subjecthood: all underlying subjects are essences but not all essences are substances.[4] On my reading, the class of sentences Aristotle regards as natural

---

more universal than the subject. I too argue for a more expansive view, but a different one.

[3] For other attempts to do the same, see Angioni (2006) and (2007), Crager (2015, pp. 127–57), and Breno Zuppolini's contribution to this volume.

[4] For this view see also Crager (2015, pp. 133–4, 148–50).

predications is considerably larger than it would be if the standard interpretation were right—and large enough to accommodate the premises and conclusions of demonstrations sanctioned elsewhere in the *APo* but rendered illegitimate by the standard view.

A caveat. I take a narrow approach, focusing on Aristotle's remarks about predication in just a few lines in two chapters of the *APo.* A fuller account than I can offer here would consider other discussions of predication in the *Analytics*, *Categories*, *Metaphysics*, and elsewhere.[5] Even within *APo* 1.19 and 1.22 I do not consider the contribution the concept of natural predication makes to Aristotle's arguments in these chapters.[6] He introduces the concept in preparation for his arguments for the finitude of certain predicational chains. Does natural predication, as I interpret it, serve Aristotle's argumentative purposes? I believe it does, but I ignore that.[7] Outside of 1.19 and 1.22, the concept implicates large parts of Aristotle's metaphysical project. I ignore that too and settle for a modest aim: to defend an interpretation that makes Aristotle's account of natural predication consistent with some of the canonical examples of demonstrations in the *APo.* Especially in

---

[5] In the *Analytics*, *Prior Analytics* 1.27, 43a33–6 and *APo* 1.4, 73b5–10 are especially relevant. For discussions of predication in Aristotle see Bäck (2000), Bostock (2004), Hamlyn (1961), Lewis (1991) and (2011), and Malink (2013). I have profited especially from Malink's discussion of predication, which is focused on the *Topics.*

[6] For discussions that do consider this, see Crager (2015, pp. 127–57) and Zuppolini's contribution to this volume.

[7] For a different view, see Zuppolini's contribution to this volume. His reconstruction of one of Aristotle's arguments in 1.22 depends on an interpretation of natural predication inconsistent with the view I defend here.

discussing demonstration I am more dogmatic than I would like; I leave to another occasion a fuller defense of my views.

A note on terminology. For Aristotle, predication is both a linguistic relation that holds between terms and a metaphysical relation that holds between things.[8] Take the sentence 'the human is white'. Aristotle uses 'predicated of' both for the linguistic relation that holds between the terms 'the human' and 'white' and for the metaphysical relation that holds between the subject (the individual human) and the attribute (white or whiteness). What makes a sentence a natural predication has to do with the metaphysical relation that holds between the items signified by the sentence's terms. As Jonathan Lear (1980, p. 31) says, it is only "predications which reveal metaphysical structure" that are natural. Like Aristotle, I use 'predication' and 'predicated of' for both the linguistic and the metaphysical relation. I use 'subject term' and 'predicate term' for the two terms in a linguistic predication and 'subject' and 'predicate' (sometimes 'attribute') for the items they respectively signify. I also use 'predication' for the propositions that result from an act of linguistic predication. Thus 'predication' in the sense just stated, 'proposition', and 'sentence' are synonymous in my usage.

1. DEMONSTRATION, PREDICATION, AND THE STANDARD INTERPRETATION

Let me begin by briefly reviewing the evidence that Aristotle thinks that the premises and conclusions of all demonstrations are natural predications.

---

[8] Commentators accordingly distinguish between 'linguistic predication' and 'metaphysical predication'. See, e.g., Code (1985).

In *APo* 1.19 he makes a distinction between those who demonstrate[9] "according to opinion and only dialectically" and those who demonstrate "in relation to truth" (81b18–23). The latter are concerned with "what [actually] belongs" (81b23). Unlike in dialectical arguments, in demonstrative arguments if 'A belongs to all B' is a premise or conclusion, then A does in fact belong to all B and is not merely reputed to do so. Aristotle then further specifies what's required of 'A belongs to all B' if it is to feature in a demonstration: the predication must be formed "non-accidentally" (81b23–29, T1 below); it must be a natural predication. This is confirmed in 1.22, where Aristotle concludes his discussion of natural predication by remarking that "this is how demonstrations demonstrate" (83a20–21).[10]

Let me now consider the consequences of the standard interpretation for Aristotle's theory of demonstration. A demonstration is a deduction by grasping which we have scientific knowledge. For it is a deduction whose premises state the causal explanation of the fact stated in the conclusion, and scientific knowledge involves grasping such causal explanations. Suppose the following syllogism in Barbara is a demonstration:

A belongs to all B
B belongs to all C
A belongs to all C

---

[9] He says "syllogize" not "demonstrate" but it is reasonable to assume that he means demonstrative syllogisms in particular.

[10] See Barnes (1993, pp. 175–6): "demonstration is concerned only with natural predication". See also Crager (2015, p. 148) and Ross (1949, p. 577).

Both premises are natural predications. On the standard interpretation, this means that both the minor 'C' term and the middle 'B' term signify primary or secondary substances. The middle term cannot signify a primary substance because, according to the *Categories*, primary substances are not predicated of anything: they are ultimate subjects of predication. It follows that, on the standard interpretation, the middle term of every demonstration signifies a secondary substance (a species or genus).

As Barnes (1993, p.176) comments, the "constraints which this thesis imposes on the sciences … are severe". He worries that certain mathematical and geometrical terms such as 'triangle' cannot serve as the subject terms of demonstrative propositions, given that the subject term of every demonstrative proposition must signify a substance, which 'triangle' presumably does not. The constraints are more severe than this, however. Imagine the middle term of every demonstration in biology signifies a secondary substance. This would severely impoverish the science. All that biological demonstrations could reveal is that attributes belong to species or genera in virtue of their membership in other species or genera or that species or genera are members of other species or genera in virtue of their membership in still other species or genera. Now imagine all the sciences are like this. This would spell disaster for Aristotle's theory.

There is a further problem, internal to the *APo*. Elsewhere in the work Aristotle sanctions a number of demonstrations in which the middle term does not signify a secondary substance. Here are four, all widely recognized by scholars:[11]

---

[11] I ignore serious difficulties with how the premises and conclusions should be formulated. I use 'A belongs to all B' rather than 'all B is A' as this is Aristotle's practice and the propositions are easier to formulate (in English) this way. In my discussion of predication below, I usually employ the copula in

Non-twinkling belongs to all near
Near belongs to all planet
Non-twinkling belongs to all planet[12]

Eclipse belongs to all screening of the sun by the earth
Screening of the sun by the earth belongs to all moon
Eclipse belongs to all moon[13]

Thunder belongs to all extinguishing of fire
Extinguishing of fire belongs to all cloud
Thunder belongs to all cloud[14]

Leaf-shedding belongs to all coagulation of sap
Coagulation of sap belongs to all broad-leafed plant
Leaf-shedding belongs to all broad-leafed plant[15]

If the standard interpretation is right, then the major premises of these demonstrations are not natural predications, given that the subject terms do not signify substance. If they are not natural predications, then they cannot serve as scientific propositions. The standard interpretation makes these demonstrations illegitimate.

I want to explore this problem in more detail by introducing Aristotle's account of per se predication in *APo* 1.4. It is reasonable to assume that all per se predications are natural. At least, Aristotle seems to hold that all

---

formulating the relevant sentences. I trust the reader to make the necessary changes.

[12] *APo* 1.13, 78a22–b4.

[13] *APo* 2.2, 90a15–18, 2.8, 93a29–b7, 2.16, 98a35–24.

[14] *APo* 2.8, 93b7–14, 2.10, 94a3–9.

[15] *APo* 2.17, 99a23–29.

demonstrative propositions are both per se and natural. In 1.4 he identifies two forms of per se predication that feature in demonstrations:

> A belongs per se_1 to B if and only if A belongs to B and A is (part of) the essence of B

> A belongs per se_2 to B if and only if A belongs to B and B is (part of) the essence of A

In per se_1 predication, the predicate is essential to the subject. In per se_2 predication, the subject is essential to the predicate. In *APo* 1.6 (74b5–12) and 1.22 (84a11–17) Aristotle claims that in every demonstration, both premises and the conclusion are per se_1 or per se_2 predications. Let's see how this applies to the four demonstrations above.

Let's start with the last three. Aristotle claims that in each case the demonstration is, or provides the basis for, the definition of the demonstrable attribute.[16] These definitions state the demonstrable attributes' essences. The essence of eclipse is a loss of light from the moon because of screening of the sun by the earth.[17] The essence of thunder is noise in the clouds because of fire extinguishing.[18] The essence of leaf-shedding is coagulation of sap in broad-leafed plants.[19] It follows from this that the major premises and conclusions of the three

---

[16] See *APo* 2.2, 2.8, and 2.10, with Bronstein (2016, pp. 89–107).

[17] *APo* 2.2, 90a15–18, 2.8, 93a29–b7, 2.16, 98a35–b24. 'Eclipse' and 'loss of light' can be substituted for each other in the demonstration without altering its explanatory content.

[18] *APo* 2.8, 93b7–14, 2.10, 94a3–9. 'Thunder' and 'noise' can be substituted for each other in the demonstration without altering its explanatory content.

[19] *APo* 2.17, 99a23–29.

demonstrations are per se$_2$ predications. In each case one item is said to belong to a second item that is part of the first item's essence. Eclipse belongs to screening of the sun by the earth and screening is part of eclipse's essence. Eclipse belongs to the moon and moon is part of eclipse's essence.

What about the minor premises of these three demonstrations? They are either per se$_1$ or per se$_2$ predications. They do not seem to be per se$_1$ predications: it does not seem that the predicate is essential to the subject. They seem rather to be per se$_2$ predications in much the same way that the conclusions are. Indeed, they seem to be demonstrable propositions: conclusions of other demonstrations. In each case the relevant demonstration would be, or provide the basis for, the definition of the demonstrable attribute, which in the original demonstration is signified by the middle term. If so, then, for example, screening of the sun by the earth is not only an item that is part of eclipse's essence, it too has an essence, one that includes the moon and whatever item causes their connection.[20]

If my interpretation is right, then in the last three demonstrations, both premises and the conclusion are per se$_2$ predications. This means that both the major term and the middle term signify items that have essences. The essence of the demonstrable attribute signified by the major includes the cause signified by the middle and the subject signified by the minor. The essence of the cause signified by the middle includes the subject signified by the minor. Essential to the demonstrable attribute is its cause and its subject. Essential to the cause is that same subject.

Now let's consider the first demonstration. While the last three appear in the *APo* 2 discussion of the relationship

---

[20] See Bronstein (2016, pp. 43–50).

between demonstration and definition, this one appears in the *APo* 1.13 discussion of two kinds of deduction, one "of the fact that" and another "of the reason why", which is the one we have here. I suggest that this demonstration has a different structure than the other three: the major premise is a per se_2 predication and the minor premise is a per se_1 predication. So, according to the major premise, near is part of the essence of non-twinkling; and according to the minor premise near is part of the essence of planet. (I also suggest that the conclusion is a per se_2 predication but that is unimportant.) Nothing in my argument hangs on this being true. All I want to claim is that Aristotle could sanction a demonstration with this predicational structure and that this demonstration can plausibly be taken to illustrate it.

Let's now return to the problems raised by the standard interpretation for Aristotle's theory of demonstration. In *APo* 1.22 (83a24–25), he states that

(4) If 'A' signifies substance, then 'A' (and the substance it signifies, A) is predicated essentially of whatever it is predicated.

Since terms that signify secondary substances signify substance, they are predicated essentially of whatever they are predicated. Aristotle's claim poses two problems for his view of natural predication as standardly interpreted.

The first problem has to do with Aristotle's theory of demonstration. As we have seen, on the standard interpretation the middle term of every demonstration signifies a secondary substance. It follows from (4) that the middle term is predicated essentially of the demonstration's minor term. So on the standard interpretation, the minor premise of every demonstration is a per se_1 predication. However, as we just saw, the minor premises of several

demonstrations that Aristotle sanctions in the *APo* are per se$_2$ predications.

The second problem is internal to Aristotle's account of predication in *APo* 1.22. In 84a7–28, he argues that every chain of per se$_2$ predication is finite. For example, the chain 'A belongs per se$_2$ to B, B belongs per se$_2$ to C, C belongs per se$_2$ to D, …', must terminate after a finite number of steps. Aristotle's argument rests on two main claims: (i) chains of per se$_2$ predication are transitive and (ii) no item has an infinite number of items in its essence. If the above chain of predication were infinite, then there would be an infinite number of items in the essence of A. The important point for our purposes is that Aristotle seems to assume that each predication in the chain is natural. For if this were not so, it's unclear why Aristotle would consider the problem of infinite chains of per se$_2$ predication in the first place—he could simply rule them out for running afoul of his constraints on natural predication, constraints introduced earlier in the same chapter. But now consider the chain 'A belongs per se$_2$ to B, B belongs per se$_2$ to C'. Since the first predication is natural, the standard interpretation holds that 'B' signifies a substance. If 'B' signifies a substance, then, given (4), 'B' is predicated essentially of whatever it is predicated. But in 'B belongs per se$_2$ to C', 'B' is not predicated essentially of 'C'—in per se$_2$ predication, the predicate belongs accidentally (necessarily but not essentially) to the subject. So something has to give: either Aristotle does not hold (4), the claim that terms signifying substance are predicated essentially of whatever they are predicated, or the standard interpretation is wrong and he does not think that the subject term of every natural predication signifies a substance. Aristotle's commitment to (4) is clear. So there is good reason to think the standard interpretation is wrong.

In sum, the standard view of natural predication entails three problematic consequences for Aristotle's theory of

demonstration. First, the middle term of every demonstration signifies a secondary substance. The four demonstrations seem to be exceptions to this claim. Therefore, on this view their major premises are not natural predications. Second, the minor premise of every demonstration is a per se₁ predication. Three of the four demonstrations seem to be exceptions to this claim. Third, the standard view makes the motivation for one of Aristotle's own arguments in *APo* 1.22 very difficult to understand. So, we have good reason for rejecting this view. The challenge, then, is to find an alternative to the standard interpretation. In particular, the challenge is to find an interpretation on which the major premises of the four demonstrations are natural predications.

2. NATURAL PREDICATION IN *APO* 1.19

In *APo* 1.19–23 Aristotle revisits a claim he first advances in 1.3: not every proposition in a science is demonstrable. In each science there are first principles, propositions that are such that, while other propositions can be demonstrated from them, there are no propositions from which they can be demonstrated. There are demonstrations all of whose premises are indemonstrable first principles. Or again, there is no demonstrative chain of infinite length.

This provides the context of Aristotle's discussion of natural predication. He first discusses it in 1.19, where he says the following about the kind of predication that features in demonstrative propositions:

T1 since there is that which itself is predicated of another non-accidentally—by 'accidentally' I mean for example when we say 'that white is a human', not saying in the same way too 'the human [is]

white'; for the one [i.e., the human] is white not by being something different, but the white [is a human] because it is accidental to the human that it is white. And so there are some things that are such that they are predicated per se.[21] (81b24–29)

Aristotle discusses two sentences:

    S1:   'That white is a human'
    S2:   'The human is white'

S1 is the result of predicating "accidentally"; it is an unnatural predication. S2 is the result of predicating "non-accidentally"; it is a natural predication. Predicating accidentally is not the same thing as predicating an accident:[22] S2 predicates an accident of a subject, but it predicates it non-accidentally. In unnatural predication, accidentality is a feature of the predication itself, not of what is predicated. Predicating accidentally is also not the same thing as forming a false predication: unnatural predications can be true; the problem is that they are somehow malformed.

    I'll first explain what I think Aristotle means in T1 by unnatural predication and then I'll move to natural predication. He begins with natural predication, which he immediately begins explaining in terms of unnatural predication as exemplified by S1. He then switches back to natural predication and, having introduced S2, indicates why it is natural: the item signified by the subject term (i.e., the individual human) takes as an attribute the item signified by the predicate term (i.e., white) without "being something different". The way in which the human is white

---

[21] All translations are my own.
[22] See Hamlyn (1961, p. 118).

is different from the way in which the white is a human: the human is white "not by being something different", whereas the white is a human "because it is accidental to the human that it is white".

Aristotle seems to be saying two things about unnatural predication (I argue below that this is confirmed by *APo* 1.22). First, the subject takes the predicate by being something different from itself: unlike the human, which is white not by being something different from itself, the white is a human by being something different from itself, namely, by being a human. Second, this different item takes the subject as an accidental predicate: "it is accidental to the human that it is white". Aristotle's thought, then, seems to be that in S1 the white is a human only in virtue of an accidental connection that obtains between the white and an item different from the white: a human. With respect to S1, we start with the question, 'how is it that the white is a human?', and Aristotle's answer is that there is an item, namely, a human, with the following three features: (i) it is different from the white; (ii) it is accidentally white; and (iii) it is a human.

Aristotle's analysis of S1 is a bit confusing because the item that is different from and connected accidentally to the subject is identical to the predicate: a human. Here is a clearer example (from 1.22):

S3:   'The musical is white'

Assuming the musical is white, then there is an item different from the musical—say, a human—with the following features: (i) it is different from the musical; (ii) it is accidentally musical; (iii) and it is white.

It might seem that (i) and (ii) are the same, but they are not. To see this, consider the phrases "(not) by being something different" and "accidental to" in T1. To say that A is B "not by being something different" is to say that A is

B not in virtue of something inessential to A.[23] In S2 the human is white not in virtue of something inessential to the human. This suggests that in unnatural predication A is B in virtue of something inessential to A: in S1 the white is a human in virtue of something inessential to the white, namely, a human. Likewise, in S3 the musical is white in virtue of something inessential to the musical, namely, a human. So in an unnatural predication of the form 'A is B', there is a C such that C is inessential to A. (For C to be inessential to A is for C not to be (part of) A's essence. In that case, if A is C, then A is accidentally C.) But now consider the phrase "accidental to": "the white [is a human] because it is accidental to the human that it is white." Here the point is not that the human is inessential (accidental) to the white; rather, the white is inessential (accidental) to the human. So the claim here is that in S1 the white is a human in virtue of something that is accidentally white: a human. Likewise in S2 the musical is white in virtue of something that is accidentally musical: a human. So in an unnatural predication of the form 'A is B', there is a C such that C is accidentally A.

Although Aristotle is less clear than we would like, he is not confused between two characterizations of unnatural

---

[23] I follow Crager (2015, p. 133) in taking the participle in the phrase "(not) being something different" to mean "(not) *by* being", which I then render with the phrase "(not) in virtue of". In my usage (I am not certain about Crager's), this phrase is metaphysically innocent. For example, it does not pick out any of Aristotle's four modes of causation (although it could perhaps be cashed out in those terms). To say in this context that A is B in virtue of C is to say that C gives us at least part of the reason A is B or at least some of the grounds for A's being B, where 'reason' and 'grounds' are, again, metaphysically innocent and presuppose no heavy theoretical machinery. I am grateful to Lucas Angioni for pushing me to clarify this point.

predication. Rather, he identifies different necessary conditions for being one:

(5) If A is B, then 'A is B' is an unnatural predication if and only if there is a C such that (i) C is not (part of) the essence of A and (ii) C is accidentally A (i.e., C is A and A is not (part of) the essence of C) and (iii) C is B.

In S1 the white is a human because there is an item, a human, with the following features: it is not (part of) the white's essence; it is accidentally white; and it is human. In S3 the musical is white because there is an item, a human, with the same features: it is not (part of) the musical's essence; it is accidentally musical; and it is white. What makes a predication unnatural is that the predication holds in virtue of an accidental connection that obtains between the subject and an item that is distinct from the subject's essence and in which the predicate inheres.

Here it is instructive to consider Barnes' discussion of unnatural predication. He first offers an interpretation very similar to my own:

> If A is B, then 'A is B' is an unnatural predication if and only if there is a C such that (i) C is distinct from A, (ii) it happens that C is A, and (iii) C is B. (Barnes 1993, p. 115)[24]

Barnes takes 'C is distinct from A' as I do: it means that C is not (part of) A's essence. He also seems to take 'it happens that C is A' as I do: he says it means that "it is not

---

[24] This is a paraphrase not a direct quotation. My changes are for the sake of clarity and consistency with my own style of presentation and do not alter the content of what Barnes says (or at least not in ways relevant to my discussion).

essential that" C is A (Barnes 1993, p. 115), which presumably means that C is accidentally A. But Barnes then concludes puzzlingly that, given that it happens that C is A (i.e., that C is accidentally A), the stipulation that C is distinct from A "is otiose" (Barnes 1993, p. 115). However, it is not otiose. To say that C is accidentally A neither means nor entails that C is not (part of) A's essence. It only means that A is not (part of) C's essence. C can be accidentally A while being (part of) A's essence. This is true of every per se$_2$ predication: the predicate is accidental (necessary but non-essential) to the subject and the subject is essential to the predicate. For example, the moon is accidentally (necessarily but non-essentially) eclipsed and part of eclipse's essence. Clouds accidentally (necessarily but non-essentially) emit thunder and are part of thunder's essence. So while Barnes comes close to the right view, he misses a key point: Aristotle distinguishes between two conditions required for a predication to be natural—there is an item that is not (part of) the subject's essence and that takes the subject as an accidental predicate.

This, then, is how I read the key part of T1:

> I mean for example when we say 'that white is a human', not saying in the same way too 'the human [is] white'; for the one [i.e., the human] is white not by being something different, but the white [is a human] because it is accidental to the human that it is white (81b25–29).

The phrase "the one [i.e., the human] is white not by being something different" identifies a sufficient condition for a predication to be natural. 'The human is white' is a natural predication because the human is white not in virtue of something inessential to the human. The phrase therefore identifies a necessary condition for a predication to be unnatural: the subject takes the predicate partly in virtue of

something that is inessential to the subject. The next phrase identifies another one: "the white [is a human] because it is accidental to the human that it is white". 'The white is a human' is an unnatural predication partly because the white is a human in virtue of an item, namely, a human, that is accidentally white: the subject takes the predicate partly in virtue of something to which the subject is inessential. 'Partly' here might seem misplaced: Aristotle might seem to be identifying the whole reason the predication is unnatural. It might seem that we can do without the other condition, namely, that this item that is accidentally white is also different from the white, i.e., inessential to it, not (part of) its essence. Admittedly Aristotle could be clearer. However, as I have argued, the two conditions are different and both are required: to say that the third item is accidentally the subject neither means nor entails that it is inessential to the subject, but its being inessential to the subject is a feature of all unnatural predications (or so T1 and as I shall argue T2 both suggest).

T1 indicates, and it is widely agreed, that a predication is natural just in case it is not unnatural:

(6) If A is B, then 'A is B' is a natural predication if and only if there is no C such that (i) C is not (part of) the essence of A and (ii) C is accidentally A (i.e., C is A and A is not (part of) the essence of C) and (iii) C is B.[25]

Aristotle says that S2 is natural because the human is white "not by being something different". As I just noted, this means that there is no item inessential to the human in

---

virtue of which it is white. What makes a predication natural is that it is not the case that the predication holds in virtue of an accidental connection that obtains between the subject and an item that is distinct from the subject's essence and in which the predicate inheres.

So far Aristotle's account of natural predication makes no mention of substance. It does not seem to restrict the subjects of natural predications to substances. It is also a complete characterization of natural predication, in so far as it identifies severally necessary and jointly sufficient conditions a sentence must satisfy in order to be one. One interesting feature of (5) and (6) is that we cannot know whether a predication is (un)natural in isolation from all other relevant predications. We need to know some of these. This will be important when we return to demonstration below.

3. NATURAL PREDICATION IN *APO* 1.22

I will now argue that Aristotle provides the same account of predication in 1.22, though enriched by the concept of an underlying subject (*hupokeimenon*), which I examine in the next section.

Aristotle begins with the main claim of the chapter: "if it's possible to define or if the essence is knowable and it's not possible to go through an infinite number of things, then it's necessary that the things predicated in the what it is be limited." (82b38–83a1) Since Aristotle affirms the antecedent, he accepts the consequent. He thus spends part of 1.22 arguing that the items in the essence of an object are necessarily finite. As a first step in his argument, he returns to the topic of natural predication (for ease of reference I have divided the text into different sections):

T2   (a) it is possible to say truly that the white is walking and that that large is a log, and again that the log is large and the human is walking. To speak in the latter way and [to speak] in the former way are different. (b) For whenever I say that the white is a log, then I mean that the thing that is accidentally white is a log, but not that the white is the underlying subject for the log; for in fact it [i.e., the white] came to be a log neither by being white nor by being just what is some particular white, so that it [i.e., the white] is not [a log] except accidentally. (c) But whenever I say that the log is white, I don't [mean] that something different is white and that thing is accidentally a log, such as when I say that the musical thing is white (for then I mean that the human, which is accidentally musical, is white), but [I mean that] the log is the underlying subject, which indeed is just what came to be [white] not by being something different than just what is a log or [just what is] some particular log. (d) If then it's necessary to legislate, let speaking in the one way be predicating and in the other way either not predicating at all or predicating not without qualification but accidentally. And the thing predicated is as the white, and the thing of which it is predicated is as the log. (e) Let it be supposed that the thing predicated is always predicated without qualification of the thing of which it is predicated and not accidentally. For this is how demonstrations demonstrate. So that whenever one thing is predicated of another, either it is in the what it is, or [it indicates] that it is a quality or a quantity or relative to something or doing something or undergoing something or at some place or at some time. (83a1–14)

Aristotle discusses seven sentences:

S4:	'The white is walking'	unnatural
S5:	'That large is a log'	unnatural
S6:	'The log is large'	natural
S7:	'The human is walking'	natural
S8:	'The white is a log'	unnatural
S9:	'The log is white'	natural
S10:	'The musical is white'	unnatural

Two features stand out. First, these are all singular propositions. Second, the subject terms of the natural predications signify substances. Since not all scientific propositions are singular propositions (maybe none are) but all scientific propositions are natural predications, we should not infer from these examples that all natural predications are singular propositions. Similarly, we should not infer that the subject terms of all natural predications signify substances. Aristotle's examples have these features because, presumably, they clearly display the core idea of natural predication. The question is what the core idea is.

T2 seems to make the same claims as T1. Consider (b). He characterizes 'the white is a log' (S8) in exactly the same way he characterizes 'the white is a human' (S1) in T1. There is an item, a log, that has these three features (following their order in the text): it "is accidentally white"; it "is a log"; and the white is it "neither by being white nor by being just what is some particular white". I agree with Barnes (1993, p. 176) and others that this last phrase signifies what white is essentially, white's essence.[26] Thus the item's third feature is that it is inessential to the white, not (part of) its essence; as he immediately goes on to say:

---

[26] See also Malink (2013, p. 166), who cites several other authors with the same view.

'so that it [i.e., the white] is not [a log] except accidentally.' So Aristotle's claim is that S8 is an unnatural predication because there is an item, a log, that has these features: it is not (part of) the white's essence; it is accidentally white; and it is a log—precisely the account of unnatural predication in (5).

We find the same thing in (c). Aristotle begins with the natural predication 'the log is white' (S9) about which he says: "I don't [mean] that something different is white and that thing is accidentally a log". The predication is natural because there is no item C with these three features (following their order in the text): it is "something different" than (i.e., inessential to, not (part of) the essence of) the log; it "is white"; and it "is accidentally a log"— precisely the account of natural predication in (6).

Unnatural predications are such that the subject takes the predicate in virtue of a third item that bears no essential connection to the subject: it is inessential to the subject and the subject is inessential to it. They are fundamentally different and connected merely accidentally. Every unnatural predication is supported by a merely accidental connection between the subject and this third item. Natural predications are such that it is not the case that the subject takes the predicate in virtue of a third item that bears no essential connection to the subject. No natural predication is supported by a merely accidental connection of this sort.

This entails at least three ways for a natural predication to occur. First, the subject takes the predicate directly without the intervention of a third item. Second, the subject takes the predicate in virtue of a third item to which the subject is essential. Third, the subject takes the predicate in virtue of a third item that is essential to the subject.

Natural Predication 1:   A is B and there is no C such that C is A and C is B.

Natural Predication 2:   A is B and there is a C such that A is (part of) the essence of C and C is B.

Natural Predication 3:   A is B and there is a C such that C is (part of) the essence of A and C is B.

     The natural predications in T2 (S6, S7, and S9) seem to be of the first sort. I will argue below that the major premise of the 'non-twinkling' demonstration is a natural predication of the second sort and that the major premises of the remaining demonstrations are natural predications of the third sort.

     In considering Aristotle's account of predication in (5) and (6), we can see how, for any proposition such as S6, S7, or S9 in which the subject term signifies a substance and the predicate term signifies one of its predicates, it is a natural predication. There is no item that is (i) distinct from the substance's essence, (ii) accidentally that substance, and (iii) such that the predicate inheres in it. Every such proposition is guaranteed to be natural in virtue of the fact that the second condition required for unnatural predication is never met. As we saw in (4), substances are predicated essentially of whatever they are predicated. Therefore, if A is a substance, then there is no C such that C is accidentally A. A fortiori there is no C distinct from A's essence such that C is accidentally A and C is B. Therefore, no proposition in which the subject term signifies a substance and the predicate term signifies one of its predicates is an unnatural predication—all such predications are natural. However, this does not mean that in all natural predications the subject term signifies substance. To show this, I'll first complete my reading of T2 by explaining Aristotle's concept of "underlying subject", arguing against the standard interpretation

according to which only substances can play this role. I'll then turn back to our four demonstrations, arguing that their major premises are natural predications even though the subject terms signify nonsubstances.

4. THE UNDERLYING SUBJECT IN *APo* 1.22

I have argued that in T2 Aristotle remains committed to his T1 account of unnatural and natural predication in (5) and (6). He also makes a new claim:

> (7) If A is B, then 'A is B' is a natural predication if and only if A is an underlying subject for B.[28]

In T2b Aristotle says that when I form an unnatural predication such as 'the white is a log' I do not mean that the subject term signifies the underlying subject of the item signified by the predicate term. In T2c he says that when I form a natural predication such as 'the log is white' I *do* mean that the subject term signifies the underlying subject of the item signified by the predicate term. In T2d he says that in every natural predication "the thing predicated is as the white, and the thing of which it is predicated is as the log", meaning, presumably, that the subject term always signifies an underlying subject for the item signified by the predicate term. What we need to understand, then, is what Aristotle means by "underlying subject".

Aristotle discusses underlying subjects in two passages in *APo* 1.22: T2 and 83b17–22 (T3). Let's begin with T2. He takes two passes at explaining the concept, first in (b)

---

[28] The importance of the indefinite article ('*an* underlying subject') will come out below: a predicate can have a plurality of underlying subjects. I am grateful to Adam Crager for making this point to me in private correspondence.

then in (c). In (b) he says (discussing S8, 'the white is a log'):

> [I do] not [mean] that the white is the underlying subject for the log; for in fact it [i.e., the white] came to be a log neither by being white nor by being just what is some particular white, so that it [i.e., the white] is not [a log] except accidentally.[29] (83a6–8)

The white fails to be the underlying subject for the log because it is not the case that the white is a log in virtue of something essential to the white. We can say truly that the white is a log. Even so, the white gets to be a log only in virtue of its connection to something inessential to the white, namely, the log. So it is not the underlying subject for the log.

Aristotle might be read as identifying a sufficient condition for an item A to fail to be an underlying subject for another item B: if A is B but there is no C such that A is B in virtue of A's being essentially C, then A is not the underlying subject for B. However, he should not be read this way. For if this is sufficient for failing to be an underlying subject, then, given (7), it is sufficient for generating an unnatural predication. If so, Aristotle's view would be:

> (8) If A is B, then 'A is B' is an unnatural predication if there is no C such that (i) A is essentially C (C is (part of) the essence of A) and (ii) C is B.

However, Aristotle does not accept (8). Recall his account of unnatural predication:

---

[29] I ignore difficulties posed by "came to be". For a very useful discussion, see Angioni (2006, p. 122) and (2007, p. 111).

(5) If A is B, then 'A is B' is an unnatural predication if and only if there is a C such that (i) C is not (part of) the essence of A and (ii) C is accidentally A (i.e., C is A and A is not (part of) the essence of C) and (iii) C is B.

(i)–(ii) in (8) are neither equivalent to nor entail (i)–(iii) in (5). (i)–(ii) in (8) can be read as saying that there is no item essential to A in virtue of which it is B. (i)–(iii) in (5) can be read as saying that there is an item inessential to A in virtue of which it is B. However, to say that there is no item essential to A in virtue of which it is B neither means nor entails that there is an item inessential to A in virtue of which it is B. For example, Aristotle may think that the human is rational without their being an item essential to the human in virtue of which it is rational. But this neither means nor entails that there is an item inessential to the human in virtue of which it is rational. On the other hand, (i)–(iii) in (5) do entail (i)–(ii) in (8). First, if A is B in virtue of an item C that is inessential to A, then C cannot also be essential to A. Second, it does not seem reasonable to think that A could be B in virtue of two items, one inessential and the other essential to A. So if there is an item inessential to A in virtue of which it is B, then there is no item essential to A in virtue of which it is B.

In T2b, therefore, Aristotle should not be read as identifying a sufficient condition for failing to be an underlying subject. Rather, he identifies a necessary one, which is entailed by the necessary conditions for unnatural predication in (5):

(9) If A is B, then A is not an underlying subject for B only if there is no C such that C is (part of) the essence of A and C is B.

In T2c Aristotle next says this about the underlying subject (discussing S9 'the log is white'):

> [I mean that] the log is the underlying subject, which indeed is just what came to be [white] not by being something different than just what is a log or [just what is] some particular log. (83a12–14)

The log succeeds in being the underlying subject for the white because the log is white not in virtue of being something different than what it essentially is. Aristotle seems to identify a sufficient condition for an item A to succeed in being an underlying subject for another item B:

> (10) If A is B, then A is an underlying subject for B if there is no C such that A is accidentally C (i.e., A is C and C is not (part of) the essence of A) and C is B.

(9) can be read as saying that, assuming A is B, A is an underlying subject for B if A is B in virtue of A's being essentially C. (10) can be read as saying that, assuming A is B, A is an underlying subject for B if it is not the case that A is B in virtue of A's being accidentally C. These are two separate sufficient conditions for A's being an underlying subject for B.

Aristotle returns to the topic of subjecthood a little after T2:

> T3 It's established that one thing is predicated of one thing, and that whichever things [are] not what [something] is are not predicated of themselves. For they are all accidental, but some [are predicated] in themselves, and others [are predicated] in a different way. And we say that all these things are predicated of some underlying

subject, and that which is accidental is not an underlying subject. (83b17–22)

He makes a mutually exclusive and jointly exhaustive division among all items. Some items are "what something is". Call these 'essences':

(11) A is an essence if and only if there is a B such that A is (part of) what B is.

All other items are nonessences, and all nonessences are accidents. Aristotle makes two further claims: all nonessences (all accidents) are predicated of an underlying subject and no nonessence (no accident) is an underlying subject. It follows (as Aristotle notes in the first sentence) that no nonessence (no accident) is predicated of itself (or of any other accident). It further follows that every underlying subject is an essence:

(12) If A is B, then A is an underlying subject for B only if A is an essence.

(9) and (10) in T2 and (12) in T3, then, give us the following:

(13) If A is B, then A is an underlying subject for B if (i) A is an essence and either (ii) there is a C such that C is (part of) the essence of A and C is B or (iii) there is no C such that A is accidentally C (i.e., A is C and C is not (part of) the essence of A) and C is B.

In T2c Aristotle claims that in S9 'the log is white', the log is an underlying subject for white by meeting condition (iii). Given T3 and (12), then, he is also committed to the claim that the log is an essence. It is not clear how to make

sense of this. Given (11), perhaps his idea is that there is an item such that the log is what it is: the log itself.

In any case, for our purposes, there are five important points to make about (13).

First, it leaves open that there may be other ways, in addition to (ii) and (iii), for an item to be an underlying subject.

Second, (ii) and (iii) are separate sufficient conditions for subjecthood, and neither is necessary. It's particularly important that (iii) is not necessary. For if it were, then, for example, the moon would not be an underlying subject for eclipse. For there is an item, namely, screening of the sun by the earth, with the relevant features: it belongs to the moon but not as part of its essence and eclipse belongs to it. Surely the moon is an underlying subject for eclipse. So (iii) is merely a sufficient condition for subjecthood.

Third, (13) is not an account of ultimate subjecthood.[31] It allows a single predicate to have multiple underlying subjects, which is why I have insisted on the indefinite article. Looking ahead, in the sentence 'eclipse belongs to all screening of the sun by the earth', screening seems to meet conditions (i) and (ii). First, screening is essential to eclipse (eclipse is predicated per se$_2$ of screening), so it is an essence. Second, the moon is essential to screening (screening is predicated per se$_2$ of the moon) and eclipse belongs to the moon. So, screening is an underlying subject for eclipse. But there is at least one other: the moon.

Fourth, (13) fits with Aristotle's account of predication in (5) and (6):

---

[31] Crager (2015, p. 133) puts it well: "*Posterior Analytics* I.22 83a1–17 does use a notion of metaphysical subject-hood to articulate an account of genuine predication. But *ultimate* metaphysical subject-hood is not at issue." Peramatzis (2010, pp. 158–9) makes a similar point about *APo* 1.4, 73b5–10.

(5)   If A is B, then 'A is B' is an unnatural predication
if and only if there is a C such that (i) C is not
(part of) the essence of A and (ii) C is accidentally
A (i.e., C is A and A is not (part of) the essence
of C) and (iii) C is B.

(6)   If A is B, then 'A is B' is a natural predication if
and only if there is no C such that (i) C is not
(part of) the essence of A and (ii) C is accidentally
A (i.e., C is A and A is not (part of) the essence
of C) and (iii) C is B.

(7) says that 'A is B' is a natural predication if and only if A
is an underlying subject for B. We can see how items that
meet conditions (i) and (ii) or (i) and (iii) in (13) can serve as
subjects in natural predications. Take 'the log is white'. As I
noted above, the log seems to meet conditions (i) and (iii)
in (13): we can assume it is an essence; also, there does not
seem to be an item that is accidental to the log and that is
white. It follows that there is no item that meets conditions
(i)–(iii) in (5). The predication is natural. Now take a
sentence in which the subject term signifies an item that
meets conditions (i) and (ii) in (13): 'eclipse belongs to all
screening of the sun by the earth' ('all screening … is
eclipse'). As I suggested just above, screening meets (i)
because it is essential to eclipse. It also meets (ii) because
the moon is essential to it and eclipse belongs to the moon.
It follows that, substituting 'screening' for A and 'the
moon' for C, although the moon satisfies (ii) and (iii) in (5),
it does not satisfy (i): it is part of the essence of screening.
So screening is an underlying subject for eclipse and the
predication is natural: the moon doesn't meet all the
requirements for rendering 'all screening ... is eclipse'
unnatural, and no other item seems to either.
    Finally, my previous two points entail that (13) does not
commit Aristotle to the view that only substances are

underlying subjects. In the major premises of the four demonstrations, because the premises are per se$_2$ predications, each subject is part of the essence of the predicate. So each subject is an essence and thus eligible to be an underlying subject. But none of these subjects are substances. So some nonsubstances are eligible to be underlying subjects.

Aristotle, then, does not have the view the standard interpretation attributes to him. He thinks that the subject term of every natural predication signifies an underlying subject and he thinks that every underlying subject is an essence. But he does not think that all essences are substances. So he does not think that every underlying subject is a substance nor that the subject term of every natural predication signifies a substance. Aristotle has a more expansive conception of subjecthood and thus of natural predication.

5. NATURAL PREDICATION AND DEMONSTRATION

I have argued that 1.19 and 1.22 offer the same complete characterizations of unnatural and natural predication. The core idea of unnatural predication is that the subject takes the predicate in virtue of an accidental connection that obtains between the subject and an item that is distinct from the subject's essence and in which the predicate inheres. The core idea of natural predication is that the subject takes the predicate not in virtue of such a connection. Let me now complete the task, which I started at the end of the previous section, of showing that Aristotle's account of natural predication, so understood, can accommodate the four demonstrations. If it can, then, since the subject terms in the major premises do not signify substance, we have confirmation that the standard interpretation is wrong.

The challenge was to see how the major premises could be natural predications. Let's start here:

Non-twinkling belongs to all near
<u>Near belongs to all planet</u>
Non-twinkling belongs to all planet

I have suggested that the major premise is a per se$_2$ predication and the minor premise is a per se$_1$ predication. If so, the minor premise and conclusion tell us that there is an item, planet, that is distinct from near's essence and that takes near and non-twinkling as predicates. (Planet is distinct from near's essence because near is essential to planet, so planet cannot be essential to near.) However, this item takes near as an essential (per se$_1$) predicate: planets are essentially near. So the second necessary condition for unnatural predication in (5) is not met. So the major premise is a natural predication; specifically, Natural Predication 2. It's true that the predication holds in virtue of an item, planet, distinct from the subject's essence. However, it does not hold in virtue of an accidental connection that obtains between these two items. Rather, it holds in virtue of an essential connection that obtains between them. So it is the status of the minor premise as a per se$_1$ predication that underwrites the status of the major premise as a natural predication.

Note the claim is *not* that there is a demonstrative deduction of the major premise from the minor and conclusion—in any case a deduction so formed would be invalid.[35] The claim is that in the major premise the subject takes the predicate in virtue of the fact that there is an item,

---

[35] In *APo* 1.13 Aristotle claims that if the major premise is converted, then there is a deduction of the new major from the same minor and the old conclusion (now serving as major).

planet, that also takes the predicate and that takes the subject as an essential predicate.

Now consider the eclipse demonstration. I argued that both the major and the minor premises are per se$_2$ predications. There does not appear to be an item with the three required features: (i) inessential to screening, (ii) such that screening belongs as an accident to it, and (iii) such that eclipse belongs to it. There is an item to which both screening and eclipse belong nonessentially and thus as accidents: the moon. However, this item is essential to screening, for screening is predicated per se$_2$ of it. This means that it is not the case that screening takes eclipse as a predicate in virtue of its accidental connection to something inessential to itself. Rather, screening takes eclipse as a predicate in virtue of its accidental connection to something essential to itself: the moon. So the first necessary condition for unnatural predication in (5) is not met. The major premise is a natural predication; specifically, Natural Predication 3.

To say that an item has an 'accidental connection to something essential to itself' may sound paradoxical, but for Aristotle it is not: it is precisely his conception of per se$_2$ predication, where a predicate belongs necessarily but not essentially (and so in that sense accidentally) to an item that inheres in its essence. In the eclipse demonstration, it is the status of the minor premise as a per se$_2$ predication that underwrites the status of the major premise as a natural predication.

Note that the claim is not that the moon undergoes screening in virtue of being eclipsed. Aristotle explicitly denies this: the moon is eclipsed in virtue of being screened. The claim is rather that screening is an eclipse in virtue of the moon—that is, in virtue of the fact that the moon is eclipsed and that the moon is essential to screening. Here the subject takes the predicate in virtue of a

third item, which has the following features: the subject and predicate both inhere in it and it is essential to the subject.

This account of the major premise of the eclipse demonstration holds for the major premises of the thunder and leaf-shedding demonstrations. The naturalness of these predications depends on the minor premises and conclusions and in particular on the status of the minor premises as per se$_2$ predications. In each case it is true that there is an item (cloud, broad-leafed plant) to which the subject (fire extinguishing, coagulation of sap) and the predicate (thunder, leaf-shedding) belong as accidents. However, this item is essential to the subject, for the subject is predicated per se$_2$ of it in the minor premise. So in each major premise it is not the case that the subject takes the predicate in virtue of its accidental connection to something inessential to itself. Rather, it takes the predicate in virtue of its accidental connection to something essential to itself. These predications, then, are natural.

The challenge was to show that the major premises of the four demonstrations are natural predications, despite the fact that the subject terms signify nonsubstances. I submit that the challenge has been met.

REFERENCES

ANGIONI, L. *Introdução à Teoria da Predicação em Aristóteles*. Campinas: Editora da Unicamp, 2006.

ANGIONI, L. "Aristóteles e a Noção de Sujeito de Predicação (*Segundos Analíticos* I 22, 83a1–14)". *Philósophos*, 12, pp. 107–29, 2007.

BÄCK, A.T. *Aristotle's Theory of Predication*. Leiden: Brill, 2000.

BARNES, J. *Aristotle: Posterior Analytics*. Translated with a commentary. Second edition. Oxford: Clarendon

Press, 1993.

BOGEN, J. and McGUIRE, J.E. *How Things Are*. Dordrecht: Reidel, 1985.

BOSTOCK, D. "An Aristotelian Theory of Predication?". *Oxford Studies in Ancient Philosophy*, 27, pp. 141–75, 2004.

BRONSTEIN, D. *Aristotle on Knowledge and Learning: the* Posterior Analytics. Oxford: Oxford University Press, 2016.

CODE, A. "On the Origins of Some Aristotelian Theses about Predication." In *How Things Are*, J. Bogen and J.E. McGuire (eds.) (1985), pp. 101–31, 323–6.

CRAGER, A.D. *Meta-Logic in Aristotle's Epistemology*. PhD Dissertation, Princeton University, 2015.

HAMLYN, D.W. "Aristotle on Predication". *Phronesis*, 6, pp. 110–26, 1961.

LEAR, J. *Aristotle and Logical Theory*. Cambridge: Cambridge University Press, 1980.

LEWIS, F.A. *Substance and Predication in Aristotle*. Cambridge: Cambridge University Press, 1991.

LEWIS, F.A. "Predication, Things, and Kinds in Aristotle's *Metaphysics*". *Phronesis*, 56, pp. 350–87, 2011.

MALINK, M. *Aristotle's Modal Syllogistic*. Cambridge, Mass.: Harvard University Press, 2013.

PERAMATZIS, M. "Essence and *Per Se* Predication in Aristotle's *Metaphysics Z* 4". *Oxford Studies in Ancient Philosophy*, 39, pp. 121–82, 2010.

PHILOPONUS. *Ioannis Philoponi in Aristotelis Analytica Posteriora Commentaria cum Anonymo in Librum ii* (*in An Post*). Ed. By M. Wallies. Berlin: Reimer, 1909.

ROSS, W.D. *Aristotle's Prior and Posterior Analytics: A revised text with introduction and commentary*. Oxford: Clarendon Press, 1949.