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The Origin and Aim of *Posterior Analytics* II.19

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Abstract
In *Posterior Analytics* II.19 Aristotle raises and answers the question, how do first principles become known? The usual view is that the question asks about the process or method by which we learn principles and that his answer is induction. I argue that the question asks about the original prior knowledge from which principles become known and that his answer is perception. Hence the aim of II.19 is not to explain how we get all the way to principles but to defend the claim that our knowledge of them originates in perception. Aristotle explains how we learn principles earlier in book II, in his account of definitional inquiry. In II.19 he explains how we reach by induction the preliminary accounts necessary for such inquiries.

Keywords
first principle, perception, induction, universal, inquiry, *Posterior Analytics*

Introduction

A science, according to the *Posterior Analytics*, is a hierarchically organized series of demonstrations (or explanatory syllogisms). The highest demonstrations have as their premises the first principles (ἀρχαί) of the science. First principles are indemonstrable: everything else in the science is deduced and explained from them; they are not deduced or explained from anything. Since we cannot acquire knowledge of first principles by demonstration the question arises, how do we learn them? The final chapter of the *Posterior Analytics*, II.19, aims to help answer this question. My main claim in this paper is that it aims to provide a much smaller part of the answer than commentators usually think.

I begin (in sections 1-4) with an overview of my interpretation. I then turn (in sections 5-14) to a close analysis of the text, focusing on the first

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three quarters of the chapter (99b15-100b5). Here Aristotle poses a question about our acquisition of first principles, raises a puzzle that develops the question, and then answers the question and solves the puzzle in four difficult, closely packed bits of text.

1. Opening Moves and Overview

In the opening lines of *Posterior Analytics* II.19 Aristotle summarizes what he takes himself to have accomplished thus far in the *Analytics*:

> **[A]** So it is clear concerning syllogism and demonstration what each is and how each comes about, and so too concerning demonstrative scientific knowledge [ἐπιστήμης ἀποδεικτικῆς]; for these are the same.[1] (99b15-17)

He then announces the two questions he intends to address:

> **[B]** But concerning the principles [περὶ δὲ τῶν ἀρχῶν], how they become known [πῶς τε γίνονται γνώριμοι] and what is the state that knows them [τίς ἡ γνωρίζουσα ἕξις], this will be clear from what follows after we have first set out the problems. (99b17-19)

The chapter's structure falls easily out of this sentence. Aristotle begins by raising a series of puzzles (99b20-32). He then tackles the first of his two questions – how do the principles become known? (99b32-100b5) And he concludes by answering the second – what is the state (ἕξις) that we are in when we know them? (100b5-17)

Despite its structural clarity, the details of II.19 are notoriously difficult to work out and a variety of interpretations have been defended. In recent decades, however, there has emerged widespread agreement about what Aristotle's account looks like in broad outline: the way principles become known is by ἐπαγωγή (induction), and the state that knows them is νοῦς (mind or intellect).[2] From here interpretations diverge widely – especially, but not only, over the question of what role, if any, νοῦς plays in induction.

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[1] Translations from the *Posterior Analytics* are my own, although I draw from Barnes (1993).

[2] See Barnes (1993), 268-9, Engberg-Pedersen (1979), 317, Kosman (1973), 385-6, Modrak (1987), 158, 172-4.

A traditional view is that induction alone is necessary but not sufficient for reaching knowledge of first principles; induction must be aided in this endeavour by the intuitive activity of νοῦς[3] – in particular, by the so-called agent νοῦς of *De Anima* III.5.[4] An alternative view, defended by Jonathan Barnes, is that induction is sufficient for reaching principles; νοῦς is the outcome of induction and plays no role in it.[5] Despite this disagreement between what Barnes calls the 'easy rationalist' and 'honest empiricist' ways of reading the chapter,[6] at least this much seems clear: induction (with or without νοῦς) answers Aristotle's first question, νοῦς his second.

In this paper I will argue that, contrary to the prevailing view, induction is not Aristotle's answer to the first question in II.19. My claim is not that the chapter presents a different answer to this question; rather, my claim is that it presents an answer to a different question from the one usually supposed. Commentators generally believe that when Aristotle asks 'how do the principles become known?' he is concerned to identify, in Barnes's words, '*the process or method by which we gain knowledge of first principles*'[7] – namely, induction. I will argue instead that the question concerns *the original prior knowledge from which first principles become known* – namely, perception. For Aristotle, all learning requires prior knowledge[8] and different types of learning require different types of prior knowledge. A natural way for him to answer the question of how first principles become known is for him to identify the prior knowledge from which they first begin to become known: perception. Perception, of course, is not all that is required for getting to know principles, nor is it all Aristotle discusses in II.19. It is, however, his primary focus, the central concept around which the argument of the chapter is organized.

My reading departs from the usual view of II.19 according to which Aristotle's main concern in answering the first question is to explain how we reach knowledge of first principles. On this view, Aristotle identifies

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3) See Bayer (1997), Irwin (1988), 134-7, 531-2.

4) See Kahn (1981), 397-414.

5) See Barnes (1993), 267-70. Lesher (1973) strikes a middle ground, arguing that induction involves low-level noetic activity (what Aristotle elsewhere in the *Posterior Analytics* calls νόησις (I.31 88a7, 16)) – in particular the recognition of a universal in one or more particular instances (see also Engberg-Pedersen (1979), 307-11, Modrak (1987), 160-1).

6) Barnes (1993), 259, 270.

7) Barnes (1993), 268 (my emphasis).

8) *Posterior Analytics* I.1 71a1-2.

cognitive states necessary (perhaps even sufficient) for acquiring knowledge of first principles (perception, memory, experience, and so on) and the reasoning by which we acquire it (induction, with or without νοῦς). The view I wish to propose finds in II.19 a more modest project. Aristotle's aim is to explain and defend his radical, anti-Platonist claim that our knowledge of first principles originates in perception. He does so in two ways: (1) he identifies the cognitive states that first emerge out of perception (memory, experience, and so on) and that mark the early stages in our intellectual development; and (2) he argues that induction, starting from perception, is the means by which we reach one of these early stages – namely, the grasp of a certain kind of universal. Everyone agrees that II.19 explains at least part of our intellectual development. The question is, how much?

2. Motivation

One way to motivate my reading is to consider an interpretive problem with II.19, one that arises on the usual way of understanding Aristotle's first question. Commentators often note that when Aristotle addresses the first question (99b32-100b5) his account seems to vacillate.[9] At the start (99b32-100a14) he seems intent on explaining how we acquire knowledge of first principles, in particular definitions, which are the most important type of principle.[10] But then in the final part of his account (100a14-b5), which contains the chapter's only explicit reference to induction (100b4), he seems to revert to explaining something much more basic: how we acquire, by induction, ordinary concepts such as 'human being' and 'animal.' Since definitions are propositions but concepts are not, Aristotle looks confused about a rudimentary philosophical distinction.[11] But more significantly, since νοῦς is the state that knows first principles (100b5-17),

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[9] See Barnes (1993), 259, Modrak (1987), 161, Scott (1995), 110.

[10] Aristotle calls definitions 'the ἀρχαί of demonstration' (II.3 90b24). In *Posterior Analytics* I.3 (72b23-4) he states that the ἀρχή of ἐπιστήμη (i.e. νοῦς) is that by which we know the definitions. Definitions are the immediate premises (II.19 99b21, 22) of the demonstrations that occupy the highest reaches of a science. They are immediate because there is no middle term that explains why the predicate (the definiens, the essence) belongs to the subject (the definiendum). As such they are indemonstrable.

[11] See Barnes (1993), 271, Kahn (1981), 389-90, Ross (1949), 675. For further discussion see n63 and n67 below.

and since having noetic knowledge of a scientific definition is much more cognitively demanding than grasping an ordinary concept, he seems confused about fundamental differences in levels of learning, switching problematically from an account of scientific learning to an account of ordinary learning with no apparent notice. To overcome this problem it is tempting to adopt a deflationary strategy and downgrade the earlier section (99b32-100a14) – the one apparently concerned with learning definitional principles – to the level of ordinary learning, in line with the passage on induction (100a14-b5). The problem now is that Aristotle seems to fail to answer his first question, which, as it is usually understood, demands an account of high-level, scientific learning, not (or at least not only) low-level, ordinary learning. However, if, as I wish to argue, the first question does *not* ask about the process by which we learn principles but about the origin of our knowledge of them, then Aristotle is *not* obliged to discuss high-level learning. And if he is not so obliged, then the deflationary strategy can be consistently deployed – or so I hope to show.

A second way to motivate my reading is to consider the disagreement I mentioned above between the 'rationalist' and 'empiricist' interpretations of the chapter. Neither option is particularly attractive. Induction, for Aristotle, is the means by which we move from a grasp of several particulars to a universal proposition that identifies something they share in common.[12] From perceiving that Socrates is two-legged, and Callias, and Plato, and so on, I grasp that all humans are two-legged. The rationalist worries that induction, so conceived, is too weak to get us to knowledge of first principles. And rightly so. To know first principles is to grasp the highest, most explanatory truths in a science and to grasp them *as such*. Are we really to suppose that we reach this exalted state by a simple process of generalization over particulars? The rationalist's solution is to appeal to νοῦς as a faculty of intuitive discovery, which takes us from the results of induction to knowledge of principles properly speaking. The empiricist, on the other hand, worries that this saddles Aristotle with a mysterious view, one that has little basis in his texts. And rightly so. Aristotle is clear that νοῦς is the state we are in when we *know* first principles, not the faculty by which we *get to* know them.[13] There is truth on both sides: induction is too weak to get us to first principles, but νοῦς is not part of

[12] See e.g. *Topics* I.12 105a13-14.

[13] *Posterior Analytics* I.3 72b18-25, II.19 100b5-17. For discussion, see Barnes (1993) 167-70, Kosman (1973).

Aristotle's explanation. The solution I wish to propose is, again, a simple one. We should stop looking to II.19 for Aristotle's account of the process or route by which we reach first principles. The chapter addresses a different and more basic question: where does the route begin?

3. The Origin of *Posterior Analytics* II.19

If II.19 is not the text in which Aristotle explains how we reach first principles, then what is? And if induction is not the method by which we reach them, then what is? There is good reason to think that Aristotle explains how we reach first principles earlier in book II, especially in chapters 1-10 and 13, in his account of scientific inquiry into essence and definition – what in the *Metaphysics* he calls 'learning by defining' (992b29-33).[14] Terms for inquiry, discovery, and knowledge acquisition occur frequently in *Posterior Analytics* II.1-10, 13.[15] The what it is (or essence) is one of the things we seek in an inquiry, and, if our inquiry is successful, it is one of the things of which we have ἐπιστήμη (scientific knowledge).[16] The essence of a thing is what gets expressed in its definition. A definition is a first principle in a science. When we have ἐπιστήμη of a definitional principle as explanatory of some fact, we have demonstrative ἐπιστήμη. When we have ἐπιστήμη of a definition in its own right, we have non-demonstrative ἐπιστήμη – that is, νοῦς. (Indeed having νοῦς of definitional principles in their own right is a requirement for having demonstrative ἐπιστήμη.) Since *Posterior Analytics* II.1-10 and 13 explain how we seek and acquire knowledge of essence-stating definitions, which are first principles, there is good reason to suppose that these chapters explain how we come to have νοῦς of first principles. As Aristotle says in the *Topics*, we get to know first principles by means of defining.[17]

In *Posterior Analytics* II.8 Aristotle says that our search for the essence of a thing is facilitated by our prior grasp of 'something of the essence'

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[14] 'By defining' renders the Greek noun in the dative: ὁρισμῷ (*Metaphysics* I.9 992b32). See also *Posterior Analytics* II.7 93b38, *Topics* VIII.3 158b4.

[15] See especially *Posterior Analytics* II.1-2 and 8 for frequent occurrences of ζητεῖν (to inquire, to search), εὑρίσκω (to discover), and γνῶναι (to get to know). For similar vocabulary see also II.13 96a22, 97a16, 97b7.

[16] *Posterior Analytics* II.1 89b23-5.

[17] *Topics* VIII.3 158b1-4.

(93a29) or 'something of the object itself, for example, thunder, that it is a certain noise in the clouds, and eclipse, that it is a certain loss of light, and human being, that it is a certain kind of animal, and soul, that it moves itself.' (93a22-4) These are examples of what I will call 'preliminary accounts.' A preliminary account identifies a non-accidental property of a kind whose essence we wish to discover. It thereby facilitates our search, which we conduct according to one or the other of the two methods Aristotle explains: demonstration (II.8) and division (II.13).[18]

Aristotle's lengthy discussions of definitional inquiry earlier in *Posterior Analytics* II provide the background against which I propose interpreting II.19. It is a mistake to read the chapter as a quasi-independent treatise – *On Coming to Know First Principles* – cut off, as it were, from the rest of book II.[19] By the time we reach II.19 Aristotle has told us a great deal about how we come to know first principles. What he has not explained is how we acquire the preliminary accounts necessary for definitional inquiry. My suggestion is that it is part of the task of II.19 to do exactly this. Aristotle's claim, I will argue, is that we acquire preliminary accounts by induction, to which he devotes a section of the chapter.[20]

There is, however, another question for Aristotle to confront in II.19, another task left over from previous chapters. Imagine a Platonist who believes that the soul possesses latent innate knowledge of first principles.[21] The problem is that Aristotle's account of inquiry in *Posterior Analytics* II.1-10 and 13 does not rule out this view. The Platonist could follow Aristotle every step of the way, agreeing about the methods by which we come to know definitional principles but all the while believing that the

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18) The previous two paragraphs summarize several chapters of a larger work in progress entitled *Aristotle on Learning: the* Posterior Analytics. I give a brief account of the role of preliminary accounts in scientific inquiry in section 9 below. For further discussion see Charles (2000). (What I call 'preliminary accounts' Charles calls 'Stage 1 accounts' and 'accounts of what terms signify').

19) For example, Barnes (1993), 271 speculates (needlessly, in my view) that II.19 'began life as an independent essay... and was at some later stage tacked on to the discussions of II.1-18.'

20) Tuominen (2010) also argues that II.19 explains how we come to know 'starting-points for inquiry' (121) and that in this respect the chapter is congruent with what Aristotle says about inquiry elsewhere in *Posterior Analytics* II. In my view, however, she spoils her good thought by adopting the more usual line, arguing that II.19 also explains how we reach first principles.

21) For an interesting discussion of the Platonic background of II.19 see Adamson (2010).

basis of our search is latent innate knowledge of the very principles we seek. The Platonist's view is a thesis about origin, not about method; it tells us where our explicit knowledge of principles comes from, not the process by which we acquire it. Aristotle, who rejects innatism, faces a question: what *is* the origin of our knowledge of first principles? If it is not from latent innate knowledge of the principles themselves, then *how do they become known* (πῶς γίνονται γνώριμοι)? His answer to this question – his first in II.19 – is: from perception.

There is good textual evidence for this interpretation. Near the beginning of the chapter, just after he states his two questions, Aristotle raises a puzzle: '[we might wonder] also whether the states [in which we know the first principles], not being present [in us], come about [in us] or rather are present [in us] without being noticed.' (99b25-6) The puzzle, which I will examine in more detail below, concerns the first question: how do the principles become known? In fact, it poses a prior question: *do* they *become* known? Perhaps they are *already* known – perhaps, as the Platonist thinks, latent knowledge of first principles is in us innately. Aristotle thinks principles do become known; he is not an innatist. His question is, *how* (πῶς) do they become known? That is, *from what origin*?[22] If the principles become known, they become known from some prior knowledge. But from what *original* prior knowledge? It will not do for Aristotle to identify some more proximate starting-point, since the Platonist can always claim that behind this lurks our latent innate knowledge. To counter the Platonist, Aristotle must go right back to the beginning, back to the original knowledge from which first principles begin to become known. His view, which he actually states twice in the chapter (99b32-5, 100a10-11), is that (in his second formulation) 'the states [in which we know principles] neither inhere [in us] in a determinate form nor come about [γίνονται] from other states which are more knowing;[23] *rather, [they come about] from perception* [ἀπὸ αἰσθήσεως] (100a10-11).'

[22] My claim is that the interrogative πῶς asks after the manner in which the principles become known and that one way of answering this is by stating the origin from which they become known. This is not the only way of answering the question, but it is the appropriate way given the context in which the question is placed – namely, the puzzle about the origin of our knowledge of principles.

[23] I take it that for one state (ἕξις), *x*, to be more knowing than another, *y*, is for *x* to be a dispositional capacity for a higher grade or level of knowledge than the knowledge for which *y* is a dispositional capacity.

These lines state what I take to be the central claim of (the first three quarters of) II.19: knowledge of first principles originates in perception. Aristotle presents the claim as a solution to the puzzle about the origin of first principles. But this puzzle, I have argued, is simply an elaboration of the chapter's first question. So when Aristotle asks 'how do the principles become known?' he in effect asks 'how do they *begin* to become known?'. And when he solves the puzzle by adverting to perception we should hear in this his answer to the first question. In other words, in the context of II.19 *from perception* is *how* the principles become known. The noun αἴσθησις (perception) and the verb αἰσθάνεσθαι (to perceive) occur ten times in the chapter; by contrast ἐπαγωγή (induction) occurs just once, at the very end of Aristotle's account (100b4). Since perception is not a method by which we learn principles but the knowledge from which they originate, there is yet more reason to believe that the usual way of interpreting the first question is mistaken.

4. The Aim of *Posterior Analytics* II.19

So far I have argued that Aristotle has two tasks in II.19, both of which grow out of his account of definitional inquiry earlier in book II: (i) identify the *original* prior knowledge from which principles become known (perception); (ii) identify the means by which we reach the preliminary accounts that form the *proximate* prior knowledge required for learning principles properly speaking (induction). These tasks are related. If Aristotle can show that induction, starting from perception, leads us to preliminary accounts, then not only will he have completed his explanation of how we learn principles, he will also have made a strong case for his claim that perception is their origin. Perception is the origin because it gives rise, via induction, to the proximate prior knowledge required for learning principles properly speaking – that is, according to the methods set out in II.1-10, 13. If this is right, then Aristotle is neither a naïve inductivist nor a mysterious intuitionist (as the empiricist and rationalist readings of II.19 respectively portray him). Instead, his account of learning first principles appeals to the standard practices of Aristotelian science: explaining and defining.[24]

[24] For a similar claim, see Charles (2000), 269. While I am indebted to Charles's account, I disagree with his reading of II.19. See below n71.

We can divide the whole process by which first principles become known into two main parts: (1) the move by induction from perception (and memory and experience) to the grasp of a preliminary account; (2) the methods of inquiry set out in II.1-10 and 13 (namely, demonstration and division), which begin with a preliminary account and end with noetic knowledge of a first principle. (1) is a case of learning – namely, learning by induction. On its own, however, it does not count as learning a first principle properly speaking. (1) is low-level, ordinary learning; (2) is high-level, scientific learning. We may proceed through (1) without any inkling of the existence of first principles, let alone a desire to learn them. We may reach a preliminary account and go no further. Learning first principles properly speaking begins only when we launch a deliberate search – that is, it begins only with (2). If this is right, then in II.19 Aristotle does tell us *one part* of the process by which first principles become known – the *first* part. He does so partly to complete the account of learning from earlier in book II and partly to support his principal aim in (the first three quarters of) II.19, which is to answer the first question by locating the origin of our knowledge of principles in perception.

5. Puzzle and Solution

As we saw above, Aristotle begins his approach to the first question by raising a puzzle (the first lines of which I have already quoted):

> [C] [we might wonder] also whether the states [in which we know the first principles], not being present [in us], come about [in us] or rather are present [in us] without being noticed. If we have [such states], it's absurd; for then we have pieces of knowledge [γνώσεις] more exact than demonstration without its being noticed. But if we acquire [them] without possessing [them] earlier, how would we acquire knowledge and learn from no pre-existing knowledge [ἐκ μὴ προϋπαρχούσης γνώσεως]? For this is impossible, as I said in connection with demonstration. It is clear, then, both that we cannot possess [these states] and also that they cannot come about [in us] when we are ignorant and possess no state [οὔτ' ἀγνοοῦσι καὶ μηδεμίαν ἕξιν ἐγγίγνεσθαι]. (99b26-32)

I suggested above that the beginning of this passage gives us reason to doubt the usual way of taking Aristotle's first question. Now consider how he argues in the rest of the text. First he dismisses the Platonic view that we have knowledge of first principles innately. Then he dismisses the suggestion that we learn them starting from no prior knowledge – that is, from a

condition of ignorance.[25] Innate knowledge and ignorance are not rival methods of acquiring knowledge but rival (and equally problematic) candidates for its origin. Hence Aristotle's puzzle: where does our knowledge of first principles come from? Since such knowledge can neither *already be* in us nor *come to be* in us if we do not possess any prior knowledge, one of two things must be the case: (1) either we cannot know the principles or (2) we do in fact possess some prior knowledge from which they can originate.

Understood in this way, the puzzle brings into relief Aristotle's task in (the first three quarters of) II.19. In order to steer between the twin dangers of Platonic innatism (we already know first principles) and scepticism (we can never know them) Aristotle must show that first principles *can become* known, that we *can begin* acquiring them. And to do this he needs to identify a type of knowledge (γνῶσις) that falls between ignorance and knowledge of principles and is a suitable origin for them.

His solution takes exactly this form (I quote starting from the end of passage C):

> It is clear, then, both that we cannot possess [these states] and also that they cannot come about [in us] when we are ignorant and possess no state. We must therefore possess some sort of capacity [τινα δύναμιν], but not one that will be more valuable than these states in respect of exactness. And this is clearly true of all animals: they have an innate discriminatory capacity, which is called perception [δύναμιν σύμφυτον κριτικήν, ἣν καλοῦσιν αἴσθησιν]. (99b30-5)

Perception meets all the demands for a solution to the puzzle: Aristotle considers it a type of knowledge (γνῶσις);[26] it exceeds total ignorance but falls short of knowledge of principles; and he is confident that it is a suitable

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[25] Aristotle can move from 'no pre-existing knowledge' (μὴ προϋπαρχούσης γνώσεως, 99b29) to 'ignorance,' even 'total ignorance' (ἀγνοοῦσι καὶ μηδεμίαν ἕχουσιν ἕξιν ἐγγίγνεσθαι, 99b31-2) because he uses the term 'knowledge' (γνῶσις) to cover a very wide range of cognitive states, from perception of particulars to νοῦς of first principles. Hence to say in this context that we have no knowledge is to make a very strong claim: it is to deny that we have anything from this broad range of cognitive states. If we have no knowledge it also seems to follow that we have no opinion (δόξα), even though opinion does not seem to be a type of knowledge. For if we have no knowledge (including no perception) then we have nothing on which to base an opinion. (I am grateful to Gail Fine for helpful discussion of these points.)

[26] See *De Memoria* 1 450a11-12, *Metaphysics* I.1 981b10, *Generation of Animals* I.23 731a31-3, *Posterior Analytics* II.19 99b38-9.

origin from which first principles can begin to become known. One reason for his confidence in perception will become clear below: he believes that although we perceive particulars, not universals, the faculty of perception is receptive of the universals that particulars instantiate, and these universals, once grasped, allow us to seek and learn first principles. Another reason for his confidence is that perception presupposes no other knowledge. He holds that all learning requires prior knowledge, but to avoid regress he must deny that all knowledge requires prior learning. At some point we must hit bedrock, and this is perception.[27]

6. Perception and *Logos*

Let us continue with Aristotle's account.[28] His puzzle and solution lead directly to a discussion of cognitive development (I quote starting from the second sentence of the previous passage):

> **[D]** We must therefore possess some sort of capacity, but not one that will be more valuable than these states in respect of exactness. And this is clearly true of all animals: they have an innate discriminatory capacity, which is called perception. Given that the capacity to perceive is present in [them], some animals retain what they have perceived, and others do not. Those [animals] that do not [retain it] have no knowledge [γνῶσις] when they are not perceiving (either in general or about the things they do not [retain]). But those [animals] that do [retain what they have perceived] still have [it] in their soul even after perceiving. When many such things are [retained] there is then a further difference: some animals come to have reason [*logos*][29] from the retention of such things, and others do not. (99b32-100a3)

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[27] As I suggested above it is best to think of perception as providing the *original* prior knowledge from which principles become known and not the *proximate* prior knowledge from which we learn them properly speaking. II.19 also aims to explain how we reach such proximate prior knowledge; it does so with a view to defending the claim about perception.

[28] I divide the remaining parts of the chapter I will examine as follows: D: 99b34-100a3, E: 100a3-9, F: 100a-10-14, G: 100a14-b5.

[29] Some commentators take *logos* to mean 'account' – that is, a definition. (E.g. Barnes (1993), 264, Engberg-Pedersen (1979), 315-6, Irwin and Fine (1995), 67, Modrak (1987), 162.) The problem is that this gives the impression that knowledge of a definition emerges directly from memory, but this is not Aristotle's view, as the next passage makes clear (100a3-9; text E below). Instead, *logos* looks like a place-holder for the longer list of post-memoric states Aristotle goes on to identify in the next passage: experience, the grasp of a

Aristotle begins by identifying perception, an innate capacity common to all animals, as the origin of our knowledge of principles. He then draws a line between those animals that are capable of retaining perceptual knowledge (that is, those capable of memory) and those that are not. He then draws a second line between those animals that are capable of acquiring reason from memory and those that are not. The second line divides humans from other animals, because reason is available to humans alone. Hence Aristotle lists an ascending sequence of cognitive activities of which a diminishing set of animals are capable: perception, memory, reason.[30]

Aristotle's goal in passage D is to explain the origin of human understanding in the animal world broadly speaking. He advances the striking claim that our unique cognitive abilities emerge from a capacity common even to the lowliest of animals: perception. He does so with a view to defending his solution to the puzzle we have examined: since animal knowledge in general emerges from perception, we have some reason to think the same holds true for human knowledge of first principles in particular. Aristotle does not try to explain the process or method by which we come to know first principles. Instead he provides an argument in support of his claim about where our knowledge originates.

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certain kind of universal, and νοῦς, the state that knows definitions (principles). If this is right, then the term 'reason' captures well what Aristotle is trying to say. (See Aquinas (2007), 339, Gregorić and Grgić (2006), 21-3, Hamlyn (1976), 176-7, Kahn (1981), 403.) My objection to translating *logos* as 'account' or 'definition' also applies to Frede's view (1996), 169 that *logos* stands for νοῦς, given that νοῦς (as 100a3-9 makes clear) does not come directly from memory. One possible point of confusion is that Frede translates νοῦς as 'reason,' which he identifies as our capacity to grasp principles, whereas I use 'reason' more broadly. Gregorić and Grgić (2006), 21-3 helpfully distinguish between basic and noetic rationality, arguing, correctly in my view, that *logos* in passage D refers to basic rationality.

30) My interpretation finds support in the parallel account in *Metaphysics* I.1. Here Aristotle says that memory comes to be from perception (980a28-9), and he goes on to discuss the different cognitive abilities of animals on either side of this divide (980b21-5). He then contrasts those animals that live by perception and memory (and who have, he says, a small share of experience) with humans, who are capable of reasoning (λογισμός) and craft (τέχνη) (980b25-8). We find, then, the same sequence of states in the two passages: perception, memory, reason.

7. Perception to Νοῦς

The next passage focuses more specifically on the question of our knowledge of first principles:

> **[E]** And so from perception there arises memory, as we say, and from memory (when it occurs often in connection with the same thing) experience; for many memories form a single experience. And from experience, or [rather] from the entire universal that has come to rest in the soul (the one apart from the many, whatever is one and the same in all those things), [there arises] a principle of craft or science [τέχνης ἀρχὴ καὶ ἐπιστήμης] – of craft if it concerns what comes to be, of science if it concerns what is. (100a3-9)

The interpretation of this passage I defend is as follows. Aristotle identifies four stages prior to νοῦς, the state that knows first principles, which he here calls the ἀρχή of τέχνη and ἐπιστήμη:[31] perception, memory, experience, and the grasp of 'the entire universal.' We reach this universal by induction, which he discusses two passages below (100a14-b5, text G).[32] However, grasping this universal is not equivalent to reaching a first principle. Aristotle is clear that νοῦς, the state that knows first principles, comes *after* the universal, for he says that the ἀρχή of τέχνη and ἐπιστήμη (that is, νοῦς) arises *from* the universal (ἐκ...τοῦ καθόλου, 100a6-7).[33] Nor is it the case that we reach knowledge of first principles *directly* from the universal. Rather, the universal we reach by induction is a preliminary account required for launching a scientific inquiry (for example, eclipse is a certain loss of light; human being is a certain kind of animal (*Posterior Analytics* II.8 93a22-4, quoted above)). Aristotle omits important stages between the universal and νοῦς, and so there is a gap in his account. However, this gap is

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31) See *Posterior Analytics* I.33 88b36: 'by νοῦς I mean the ἀρχή of ἐπιστήμη;' II.19 100b15: 'νοῦς is the ἀρχή of ἐπιστήμη.' See also I.3 72b24.

32) Aristotle says repeatedly that induction is the route from particulars to the universal. E.g. *Posterior Analytics* I.1 71a8-9, *Topics* I.12 105a13-14.

33) Contra Lesher (1973), 59, who identifies the universal at 100a6-7 with the ἀρχή of ἐπιστήμη and τέχνη. For a convincing criticism of this view, see McKirahan (1992), 303 n23, 306 n95. Tuominen (2010), 125 and Salmieri (2010), 179-84 make the same mistake as Lesher, conflating what on grammatical grounds alone we must take to be two distinct stages (ἐκ...τοῦ καθόλου...τέχνης ἀρχὴ καὶ ἐπιστήμης). I discuss Salmieri's view in Bronstein (2010).

not filled by further inductive activity or by the intuitive activity of νοῦς; rather, it is filled by the methods of inquiry he sets out earlier in book II.

I now want to defend the interpretation of passage E I have just sketched. First, however, let me state what I take the argument of the passage to be. In passage D Aristotle says that knowledge of first principles originates in perception. In E he continues to defend this claim by explaining how it is that perception, our lowliest cognitive ability, can play such a significant role. The explanation is that perception gives rise to memory, which leads to experience, which leads to a universal, from which the search for explanatory principles can properly begin, according to the methods outlined earlier in book II. Aristotle does not trot out a series of cognitive states with the hope of convincing us that this is a complete explanation of how we traverse the huge gulf from perception to νοῦς. Rather, he starts to fill the gap between them with a reasonable progression of increasingly sophisticated cognitive states, which mark the early stages – but only the early stages – in our intellectual development. In this way he once again defends his anti-Platonist answer to the first question and his solution to the puzzle that develops it.

8. Experience

Let us look more carefully at passage E, and in particular at the role of experience in our ascent to first principles. My main goal is to explain the contribution induction makes to our learning, but it will take a bit of time to get there.

The first two stages in our ascent – perception and memory – are familiar from passage D (Aristotle discusses them in more detail in passage G below). We perceive particulars – for example, particular human beings, Socrates and Callias. Our perceptions leave traces in the form of images in the perceptual part of the soul. Such images (φαντάσματα, *De Anima* III.3 428a1) serve as the basis for imagination (φαντασία) and memory, both of which consist in the cognition of an image representing an object of a past perception.[34] In *De Memoria* Aristotle distinguishes between imagination

[34] *De Memoria* 1 450a25ff.

and memory.[35] In II.19 he does not.[36] He focuses instead on what memory gives rise to: experience.

The role Aristotle attributes to experience in our ascent to νοῦς is not easy to understand. One phrase in particular requires close attention: 'from experience or [rather] from the entire universal that has come to rest in the soul.' I have rendered the 'or' as a corrective,[37] indicating that the universal is its own stage distinct from experience. Some commentators disagree and take the 'or' epexegetically to mean 'that is.'[38] On this view the phrase 'the entire universal' describes what we grasp at the level of experience.

It is hard to decide this dispute on the basis of passage E alone,[39] but a glance at a parallel discussion in *Metaphysics* I.1 clearly tips the balance in favour of the 'corrective' reading I have opted for. Aristotle says:

> To have a judgment that when Callias was ill of this disease this did him good, and similarly in the case of Socrates and in many particular cases, is a matter of experience; but to judge that it has done good to all persons of a certain constitution, marked off in one class, when they were ill of this disease, for example to phlegmatic or bilious people when burning with fever, this is a matter of craft.[40] (981a7-12)

He goes on to say that 'experience is knowledge (γνῶσις) of particulars' as opposed to craft (τέχνη), which is of universals (981a15-16), and just before our passage he says that a single universal judgment about similar objects comes to be from experience (981a5-7). This provides strong support for the corrective reading, which draws a clear line between experience and the grasp of a universal that emerges from it.

In both *Posterior Analytics* II.19 and *Metaphysics* I.1 Aristotle says that (1) many memories of the same thing (τοῦ αὐτου: 100a4, 980b29) give rise to, or constitute, a single experience and that (2) experience gives rise to a grasp of a universal. How are these two moves meant to work? Con-

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35) 450b20-451a2: imagination and memory cognize the same image but in different ways. In imagination one cognizes the image of Socrates as an image or picture. In memory one cognizes it as a copy or representation of Socrates himself.

36) Unlike *Metaphysics* I.1 980b26.

37) See Bayer (1997), 124 n38, Charles (2000), 149-51, Irwin and Fine (1995), 67, Lesher (1973), 59 n38, McKirahan (1992), 243.

38) See Barnes (1993), 264, LaBarge (2006), 38, LeBlond (1996), 129 n1, Ross (1949), 674.

39) See LeBlond (1996), 129 n1 for a survey of views.

40) Trans. Ross in Barnes (1971), altered slightly.

sider the case of curing fevers. Aristotle's idea seems to be that we have several memories of the same kind of curing process occurring in several different patients.[41] We remember that applying leeches to the patient's skin cured Socrates of fever, and Callias, and so on, and together these memories produce one experience. The experience is single, I suggest, because it is of a single phenomenon expressed in a single predicate – 'cured of fever by applying leeches.' At the same time, experience does not consist in a properly universal judgment because the predicate is attached to a plurality of individual subjects (Socrates, Callias, and so on) considered as individuals and not as belonging to a single kind or class. What experience does allow are correct judgments that apply the predicate to other individuals not included in our memories. Because we remember Socrates, Callias, and others being cured of fever by applying leeches, and because these memories form a single experience of fever-curing, we can judge correctly that, for example, Coriscus too will be cured in this way.[42] Hence experience takes us beyond memory and allows for new judgments about, and effective interventions in, those aspects of the world that fall under our concern.

We take the first step beyond experience and toward scientific understanding when we grasp that the individuals familiar from experience form a single kind, which is unified by a common, salient feature: being phlegmatic. At this point we judge that a single predicate belongs universally to a kind: all phlegmatics are cured of fever by applying leeches. In doing so we grasp the real-world, ontological basis of our previous experiential judgments – the feature that was working in the background, so to speak, and guiding our practices all along. Moving beyond experience requires finding the right unifying features, and the right unifying features are those that point the way forward for causal investigation.

This account, drawn largely from Aristotle's discussion in *Metaphysics* I.1, fits nicely with passage E from *Posterior Analytics* II.19. Aristotle identifies two stages: experience and the grasp of a universal. He characterizes the universal as 'the one apart from the many, that which is one and the same in all those things' (100a7-8). The referent of 'all those things' is 'the

41) When Aristotle says that we have many memories of the same thing I take it he means the same *kind* of thing (e.g. a certain kind of cure for a certain kind of illness) and not the same *particular* thing (e.g. Socrates).

42) See Charles (2000), 151-2.

many memories' that are said at 100a5-6 to form a single experience. Aristotle's point is that to move from experience to the universal we must see what is common to all of the memories constituting our experience – we must see, for instance, that it was being phlegmatic that was common to Socrates, Callias, and so on, who, we remember, were cured of their fevers by applying leeches. This interpretation helps make sense of the curious phrase 'the entire universal.' This is Aristotle's way of signaling that the universal emerges from, and comprehends, the whole of our previous experience, and in particular all of the memories that help constitute it, a point he emphasizes in the bracketed bit.

9. Experience, Induction, and Inquiry

The move from experience to the grasp of a universal, explained and illustrated in *Metaphysics* I.1 and summarized in *Posterior Analytics* II.19, is an example of induction. Although Aristotle does not use this term either in passage E or in *Metaphysics* I.1, what he describes in the *Metaphysics* fits the bill exactly. Induction, he says in *Posterior Analytics* I.1, is 'revealing the universal through the particular's being clear' (71a8-9). In the *Topics* he defines it as 'the advance (ἔφοδος) from particulars to universals' (105a13-14).[43] Although he uses the term in other ways,[44] throughout the *Posterior Analytics* and the *Topics* it usually signifies (as I mentioned above) the means by which we move from a grasp of several particulars to a universal proposition that identifies something they share in common.[45] As we have seen, this is just what occurs in the move from experience to the universal.

The universal we grasp by induction (for example, all phlegmatics are cured of fever by applying leeches) is not a definition or first principle of any science or craft. Being cured of fever in a particular way is not what it is to be phlegmatic. It might turn out that the predicate expresses a consequence of what it is to be phlegmatic (a per se accident), but the inquirer

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43) See also *Posterior Analytics* 81b2, 92a37-b1, *Topics* 108b11, 156a4-5, 156b14, *Sophistical Refutations* 174a34.

44) See Ross (1949), 47-51, 481-3, Engberg-Pedersen (1979). Induction sometimes consists in seeing a particular in light of a universal; see *Posterior Analytics* I.1 71a21 and *Prior Analytics* II.21 67a23.

45) See Engberg-Pedersen (1979), 304-5.

who grasps the proposition does not know that at this stage. Instead, the universal is a preliminary account useful for scientific inquiry. The account is useful because it identifies a *candidate explanandum* whose genuineness the inquirer will seek to confirm. She hypothesizes that there is a non-accidental connection between being phlegmatic and being cured of fever by applying leeches, and she goes out into the world to test her hypothesis against the particular facts of her experience. If her search is successful, she will know that it is not by chance that this cure is effective for phlegmatics; she will know that there is a cause, an explanatory middle term, that links subject and predicate in her initial judgment.[46] At this point in her search she knows the fact that such a connection exists, but she does not yet know the cause, the reason why (though crucially she does know that there *is* a cause).[47] She is, however, in an excellent position to seek the cause, because she can return to the particulars she knows through experience and investigate what it is about being phlegmatic that makes members of that kind susceptible to this cure. If her search is again successful, she will eventually arrive at the essence of being phlegmatic – what being phlegmatic is and what explains its other necessary properties (perhaps it is a certain balance of the four elements). In other words, she will arrive at a definition, a first principle.

10. Objection and Response: Experience, Universals, and First Principles

At this point someone might object that Aristotle's account in *Metaphysics* I.1 does not support the interpretation I have defended. I have argued that when we move, by induction, from experience to a universal judgment, we do not acquire knowledge of a cause or even a genuine

[46] See Charles (2000), 157-70. For a different account, see Gregorić and Grgić (2006) and LaBarge (2006).

[47] This follows the proper order of inquiry, according to *Posterior Analytics* II.1: first we seek the fact that, then we seek the reason why. According to II.2, to seek the fact that is to seek whether there is a cause, and to seek the reason why is to seek what the cause is. In my view we seek whether there is a cause by seeking whether a given phenomenon (e.g. phlegmatics being cured of fever by applying leeches, the full moon losing its light) is a genuine explanandum. This requires that we begin our search with a candidate explanandum, which is identified in what I have been calling a preliminary account.

explanandum – we arrive at what I have called a candidate explanandum. However, someone might point out that in the *Metaphysics* passage I quoted above (981a7-12), Aristotle says that the universal judgment that emerges from experience 'is a matter of craft (τέχνη)' (981a12). Just before this he says that craft and science come about through experience when it gives rise to universal judgments of this sort (981a5-7). And later in the chapter he says that the craftsperson (τεχνίτης) is wiser than the person of experience 'because the person of experience knows the fact that but not the reason why, whereas the craftsperson knows the reason why and the cause' (981a25-30). All of this suggests that the move from experience to the universal is the move from the fact to its cause. This means that already at the level of experience we grasp certain phenomena as explananda, and that the first step beyond experience is to grasp their causes, the highest of which are first principles. Since induction is our route to the first stage after experience, induction takes us much further than I have allowed. In fact, since it now seems that explanatory first principles emerge directly from experience, induction takes us all the way to first principles after all.[48]

Aristotle's account in *Metaphysics* I.1, however, is more nuanced than my objector lets on. Immediately after lining up experience with knowledge of the fact that and craft with knowledge of the reason why, Aristotle distinguishes between the 'manual craftsperson' (χειροτέχνης) and the 'master craftsperson' (ἀρχιτέκτων) (981a30-1). The master craftsperson is wiser because he knows the causes of the things that are done within the craft, whereas the manual craftsperson acts from habit without such explanatory knowledge (981b1-5). It is a mistake, in my view, to assimilate the manual craftsperson to the person of experience. Aristotle distinguishes very clearly between experience and craft, and he is also clear that the manual craftsperson falls within the scope of craft – he is, after all, a manual *crafts*-person, a χειρο-*τέχνης*. The fact that he acts from habit (δι' ἔθος, 981b5) is telling in this regard. In the *Nicomachean Ethics* Aristotle indicates that with regard to virtue we get to know the fact that something is good by habituation, and that such factual knowledge serves as the basis for ethical inquiry into the reason why.[49] We can infer that in *Metaphysics* I.1 the

48) See Frede (1996), 161, 164-5, Butler (2003), 333.

49) See *Nicomachean Ethics* I.4 1095b2-13 and I.7 1098a33-b4, with comments in Burnyeat (1980), 71ff.

manual craftsperson who acts from habit does so with knowledge of the fact that. He differs from the person of experience, I suggest, because his knowledge of the fact is universal, whereas experiential knowledge is particular. When Aristotle says that the universal judgment that comes after experience is a matter of τέχνη, and that τέχνη comes about from experience, he is using τέχνη in the broad sense to cover the knowledge and practice of both the manual and the master craftsperson. Speaking precisely, experience gives rise to knowledge of the universal fact (the knowledge of the manual craftsperson), which then sets the stage for the emergence of knowledge of the reason why (the knowledge of the master craftsperson). Aristotle sets out a more fine-grained sequence than our objector lets on. In this way my interpretation of *Metaphysics* I.1 holds up.[50]

11. Passage E: Final Remarks

To sum up my interpretation of passage E in II.19: from Aristotle's account in *Metaphysics* I.1 we learn that experience gives rise via induction to universal judgments (that is, preliminary accounts) useful for scientific inquiry, as described earlier in *Posterior Analytics* II. These judgments are useful because they identify candidate explananda from which our causal investigations can depart. Hence the move from experience to the universal is not, as scholars often suppose, the move from facts to causes,[51] but the move from particular to universal facts for which we then seek causes (by first confirming that they *have* causes). In this way, and as I suggested above, the sequence Aristotle sets out in passage E – perception, memory, experience, the universal – tells the pre-history of scientific inquiry by identifying the cognitive states that precede the search for causes, definitions, and first principles as discussed earlier in *Posterior Analytics* II.

Passage E ends with the claim that νοῦς emerges from the grasp of 'the entire universal.' This too is compatible with the account of inquiry

50) It is true that on my interpretation the sequence is even more fine-grained than the one I have argued we find in *Metaphysics* I.1, for I have suggested that there should be a stage between experience and knowledge of the universal fact, namely, knowledge of a preliminary account or candidate explanandum (what *Posterior Analytics* II.19 calls 'the entire universal,' 100a6-7). Although Aristotle makes no explicit mention of such a stage in *Metaphysics* I.1, his account leaves room for it.

51) See McKirahan (1992), 240-3.

earlier in book II. If my interpretation is right, then νοῦς emerges only *indirectly* via the methods set out in II.1-10 and 13. There is, therefore, a significant gap between the universal and νοῦς, just as there is a gap between the first three quarters of II.19 and the final section, where Aristotle identifies νοῦς as the state that knows principles. This gap is filled by the II.1-10, 13 account. But this methodological story is the background to II.19, not its subject-matter. The chapter's goal is instead to secure perception as the capacity from which it all begins.

12. The Rout Simile

Aristotle's account in II.19 continues:

> **[F]** Thus the states [in which we know principles] neither inhere [in us] in a determinate form nor come about from other states that are more knowing; rather, [they come about] from perception, as in a battle when a rout has happened, first one [soldier] makes a stand, then another does, and then another until a starting-point [ἀρχήν] is reached. And the soul is the sort of thing that is capable of undergoing this. (100a10-14)

Aristotle begins by repeating what I have argued is the central claim of (the first three quarters of) the chapter, namely, that knowledge of first principles originates in perception. It is striking that two of the three main passages in II.19 in which Aristotle is commonly taken to be explaining the process by which we reach first principles (passages D and E) are book-ended by the central claim. This suggests, as I argued above, that the main purpose of D and E is not to explain how we get all the way from perception to νοῦς, but to argue in support of the central claim. Below I will argue that the same is true of the main passage in II.19 on induction (G): Aristotle's view is that the fact that induction, by which we reach preliminary accounts, begins in perception is evidence that perception is where knowledge of first principles originates.

Aristotle illustrates the central claim with an image of an army recovering from a rout. On one commonly accepted view the image illustrates the manner in which perception of particulars gives rise to knowledge of first principles that are universal in nature.[52] Just as the perception of, for

[52] See Modrak, 169-170, Wheeler (1999), 21-2.

example, many individual human beings generates a grasp of the relevant universal principle, so too an army recovers from a rout when many soldiers take a stand together. In support of this view commentators look to the passage that follows (100a14-b5; passage G below), where Aristotle speaks of different universals 'making a stand' in the soul. Since he mentions induction in this context (100b4), commentators conclude that passage F also describes the inductive process in which the soul moves from particulars to a universal – that is, a first principle. Understood in this way, these lines seem of a piece with Aristotle's alleged attempt to show that we learn first principles by induction.

There is, however, another way of understanding the simile, one that has a different set of implications from the view I just described.[53] It may be that the cognitive analogues of the individual soldiers making a stand are the individual states (ἕξεις) of knowing first principles coming to be in the soul. And it may be that the cognitive analogue of the starting-point (ἀρχή) the soldiers reach is the general cognitive condition of knowing first principles, the ἕξις of νοῦς, which Aristotle calls an ἀρχή only five lines above. On this interpretation the rout simile represents, not the manner in which (knowledge of) a single universal principle emerges from (perception of) several sensible particulars, but the way in which νοῦς as a whole emerges from our knowledge of several individual principles. Let me explain.

On the reading I am proposing, Aristotle's principal claim in this passage is that the several states (ἕξεις, note the plural) in which the first principles of a science or craft are known are in a process of developing (γίνονται) in the soul until the point at which the single state responsible for knowing principles – νοῦς, the ἀρχή of ἐπιστήμη and τέχνη – comes to be present. The development of such states starts from perception and ends with νοῦς – this much we know from passage E. In this way passage F summarizes the previous account. But this is not all it does, for it also introduces a new and important idea, one illustrated in the rout simile. Each science has several first principles (ἀρχαί). Each scientist has within her or his soul several items of knowledge (ἕξεις) corresponding to these principles. Aristotle's preferred way of expressing this is to say that the scientist has νοῦς of the first principles of her science; that is, she has the ἕξις of νοῦς. His point in passage F is that the scientist does not possess νοῦς until she knows a plurality of her science's principles, perhaps all of them;

53) For other alternatives, see Lesher (2010b) and (2011).

in addition, she lacks full noetic knowledge of any given principle until she acquires νοῦς. Just as the virtues of character must all be present in the agent's soul, together with practical wisdom (φρόνησις), in order for them to count as virtues properly speaking,[54] so too the states in which first principles are known continue to be in a state of development, and fail to count as items of noetic knowledge properly speaking, until the point at which a sufficient number of them exist together and νοῦς is achieved. To have νοῦς it is not enough to know one or two principles in isolation; the scientist must have a synoptic understanding of the whole range of principles governing her science. This is what the rout simile illustrates. The soldiers taking a stand represent, not particulars grasped by perception, but the items of knowledge (the ἕξεις) that develop out of it. Like soldiers taking a stand one by one until they reach a unified starting-point from which to make their retreat, the soul acquires knowledge of one principle, and then another, and then another, until νοῦς – the acquired, dispositional capacity to exercise knowledge of each of the principles of a science – comes to be present.

13. Perception and Induction: Preliminaries

We now arrive at our last passage:

> **[G]** **[1]** Let us say again what we have said just now but not said clearly. **[2]** When one of the undifferentiated things [τῶν ἀδιαφόρων ἑνός] makes a stand, there is a first [*prôton*] universal in the soul; for although one perceives the particular, perception is of the universal, for example of human being, not of Callias the human being. **[3]** Again a stand is made among these things, until things that are partless and universal make a stand. For example such-and-such an animal [makes a stand], until animal does; and with animal [a stand is made] in the same way. **[4]** Thus it is plain that we must get to know *ta prôta* by induction; for in fact perception instils the universal in this way. (100a14-b5)

This is the passage that would seem to provide the strongest support for the view I have been arguing against – namely, that Aristotle's aim in *Posterior Analytics* II.19 is to advance the claim that induction is the method by which we acquire knowledge of first principles. He says that we get to

54) *Nicomachean Ethics* VI.13 1144b3-1145a6.

know *ta prôta* ('the first things') by induction. Since he uses '*prôton*' and 'principle' (ἀρχή) inter-changeably throughout the *Posterior Analytics*,[55] and since νοῦς is the state that knows first principles, it seems to follow straightforwardly that, according to passage G, we reach νοῦς of first principles by induction.

However, this reading is not a happy one. There are three main worries. The first, which I discussed above, is that induction is too weak to get us to νοῦς.[56] First principles are the most explanatory entities in a science, and to grasp them by νοῦς – to know first principles *as* principles – requires seeing them in their capacity to explain. But induction, while sufficient for yielding knowledge that a certain universal covers a range of particular cases, is incapable of identifying which universals are explanatorily basic – that is, first principles. How, then, could it get us to νοῦς? The second worry is about definition. If Aristotle is saying that we first learn the definition of human being and then the definition of animal, then he has reversed the proper order of learning, which should go from the genus, animal, to the species, human being.[57] Even if it were possible to learn the definition of human being without complete knowledge of the definition of animal, learning the former would seem to require some grasp of the latter. For how can you get to know what a human being is without some grasp of what an animal is? And yet passage G gives the impression that the universal 'human being' emerges well before the universal 'animal' enters the scene. The third and final worry has to do with perception: it seems to be doing all the work. Aristotle says that it 'instils the universal' (100b5) and that it is 'of the universal' (100a17). If these universals are first principles known by νοῦς, he seems to be saying that we move in one leap from perception to νοῦς. But we know that this is not the case.

The interpretation of II.19 I have defended points toward a different and, I believe, more satisfying reading of the passage. It is uncontroversial to say that the passage describes how we acquire a grasp of certain universals. I suggest that these are the same universals Aristotle discusses in passage E ('the entire universal,' 100a5-6): the preliminary accounts that emerge from perception, memory, and experience. But what, then, are we to make of the claim in G4 that we get to know *ta prôta* by induction? In

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55) See *Posterior Analytics* I.2 71b21, 72a6-7, I.3 72b5, I.6 74b24-5, I.9 76a30.

56) See Bayer (1997), 130-2.

57) *Topics* VI.4 141b25-34. See Bolton (1991), 8.

G2 Aristotle speaks of our acquisition of a *prôton* ('first') universal. I suggest that *prôta* in G4 picks up *prôton* in G2. Aristotle's claim is that we get to know the *first universals* by induction. 'First' is a fitting term given that these are, as I argued above, preliminary accounts used as starting-points in scientific inquiry. On this reading *ta prôta* are first in the order of learning, not in the order of knowing. Passage E identifies *the states from which* we acquire these first universals: perception, memory, and experience. G supplements this account by identifying *the means by which* we acquire them: induction. In this way G contributes to the main argument of (the first three quarters of) II.19: since induction, starting from perception, gets us to first universals, and since these universals are necessary for scientific inquiry, and since successful inquiry ends with noetic knowledge of a first principle, Aristotle is justified in claiming that our knowledge of first principles originates in perception. This interpretation makes good sense of the last part of G4, where Aristotle explains (γάρ) his remark about induction: 'for in fact perception instils the universal in this way.' The universal perception instils is a *first* universal, a preliminary account closely tied to our perceptual experience; and the way perception instils it is by induction. If this interpretation of *ta prôta* in G4 is right, then passage G does not claim that induction is the way we acquire knowledge of first principles. Instead it claims that induction is the way we get to know the universals that facilitate the search for definitions, which is where the real work of learning first principles takes place.[58] As such, induction is necessary for coming to know first principles, but not sufficient.[59]

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[58] Kahn (1981), 396-7 gestures at an account similar to my own: 'As described in II 19, induction seems to account only for a nominal definition [what I call a 'preliminary account'] of eclipse as darkening of the moon. The gap between this and the scientific account given by Anaxagoras would have to be filled by a much more complex theory of induction and scientific method which Aristotle scarcely attempts.' (396) In my view, II.1-10 and 13 present the method Kahn finds missing.

[59] My interpretation is consistent with Aristotle's three main discussions of induction and first principles outside of *Posterior Analytics* II.19: *Posterior Analytics* I.18, *Nicomachean Ethics* I.7 1098b3-4, and *Nicomachean Ethics* VI.3 1139b28-31. Each of these passages implies the weak claim that induction is necessary for learning principles, not the strong claim that it is sufficient.

14. Perception and Induction: Details

Let us look more closely at passage G – a challenging text on anybody's reading.

G2: 'When one of the undifferentiated things makes a stand there is a first (prôton) *universal in the soul; for although one perceives the particular, perception is of the universal, for example of human being, not of Callias the human being.'*

Aristotle begins to clarify our acquisition of universals by assigning an important role to perception. Most scholars take 'one of the undifferentiated things' to be one of the infimae species[60] – for example, human being – which is undifferentiated because it cannot be sub-divided into further species. The problem with this reading, as Barnes points out, is that the burden of the passage is to explain how we acquire a grasp of such universal species.[61] Far from explaining their acquisition, Aristotle begins the passage by assuming we already have them. A better reading assigns a different meaning to 'undifferentiated.' Aristotle often uses it to refer to particulars (Callias, Socrates, and so on), which are 'undifferentiated [that is, the same, not different] in species'.[62] Aristotle's point is that when a particular human being, for example Callias, 'makes a stand' in the soul, we acquire a 'first universal.' Callias 'makes a stand' in the soul when, as a result of perceiving him, we retain a perceptual image that represents him – that is, a memory.

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[60] See Barnes (1993), 266, McKirahan (1992), 245, Ross (1949), 677.

[61] See Barnes (1993), 266; see also Tredennick's Loeb translation and Bayer (1997), 126.

[62] ἀδιάφορα κατὰ τὸ εἶδός: *Topics* 103a10-11, *Parts of Animals* 644a24, *De Caelo* 277a2. This is exactly how Aristotle uses 'undifferentiated' in *Posterior Analytics* II.13, 97b7-8: he recommends that we examine things that are undifferentiated in species – that is, particulars, as the example he goes on to give makes clear (97b17f). It is also how he defines one of the three types of sameness in *Topics* I.7 (103a10-11): 'There is sameness in species when there are several things undifferentiated in species, e.g., one human and another human, one horse and another horse' (Loeb trans., modified). For a similar interpretation of 'undifferentiated' in G2, see Salmieri (2010), 165-6. For a much different interpretation, see Bolton (1991), 6-9, who takes each of them to be 'a unity composed of (as yet) undifferentiated things' (6) and identifies them with the confused universals discussed in *Physics* I.1. Attractive as this reading is, I have found no other passage in Aristotle where 'undifferentiated' has this meaning, and Bolton cites none, which gives us some reason for doubt.

The next step is to understand how it is that when we retain a perceptual image of a particular we possess a first universal. Suppose I have perceived one human being (Callias) and possess as a result one retained perceptual image of a human being (an image of Callias). I have not thereby reached the universal proposition 'all human beings are two-legged animals' (that is, a preliminary account of human being). However, Callias instantiates a number of universal properties, such as being a human being, being an animal, being two-legged, and so on. In virtue of receiving and retaining a perceptual image of Callias I receive and retain (although I do not yet grasp) the universals encoded in the image. So when Aristotle says that when I retain an image of Callias there is a first universal in my soul, he means there is a first universal in my soul *potentially*. To decode the relevant universals and reach a preliminary account I need to acquire a number of other images of particular human beings and then move inductively to a universal proposition that identifies something they all share in common – for example, all human beings are two-legged animals.[63]

If this interpretation is right, then we can make good sense of Aristotle's otherwise mysterious statement in the second part of G2 that 'although one perceives the particular, perception is of the universal, for example of human being, not of Callias the human being.' When we perceive a particular (for example, Callias) we retain a perceptual image that represents it. The content encoded in this image outstrips what the faculty of perception alone can grasp, since the content includes universals (for example, human being, two-footed) that the perceived particular instantiates. So the faculty of perception is *receptive* of universals, even though it cannot apprehend them as such. This is along the lines of Aristotle's claim in *Metaphysics* VII.11 that animal (the universal) is perceivable (1036b28-9). He does not mean that the universal kind as such is perceivable; rather, he means that animal is a kind whose particular members (this man, that horse) are

[63] It is reasonable to think that in cases of low-level learning such as I discuss here our inductive advance is more or less unconscious and not the outcome of a deliberate inference or search. What Aristotle describes in passage G seems to be a process of basic concept acquisition, although I have characterized it as the acquisition of certain propositions (the line between concept and proposition is difficult to draw in this context; see n67 below). However, in scientific inquiry we can use our inductively acquired concepts as the basis for our preliminary accounts. In other cases our inductive advance may involve a deliberate inference and search: e.g. the case I discussed above in which we grasp that all phlegmatics are cured of fever by applying leeches.

perceivable. Similarly, perception is of the universal, not because the universal is perceivable, but because the universal is instantiated in particulars each of which is perceivable, and in virtue of this fact the universal is encoded in the images we receive when we perceive particulars.[64] Perceiving particulars is necessary but not sufficient for reaching universals. We need the perceptual faculty as a whole (including imagination and memory) and experience, which provide the basis for our advance.

In G4 Aristotle calls the advance to the universal 'induction.' For example, from our grasp – acquired via perception, memory, and experience – that several particular human beings (Callias, Socrates, and so on) are two-footed animals, we grasp that all human beings are two-footed animals. Passage G gives a sketch – but only a sketch – of how this takes place. As a result of perceiving Callias, Socrates, and so on we retain perceptual images – crudely put, mental pictures[65] – representing each of them ('when one of the undifferentiated things makes a stand'). These images resemble each other in some respects and differ in others. We have what Aristotle in passage E calls 'experience' when we take one of these common features – for example, being a two-footed animal – and predicate it individually of each of the particulars represented in our images. So we perceive that Callias is a two-footed animal, and Socrates, and so on, and we apply the same predicate to new particulars we encounter. Induction takes place when we grasp that this common feature holds true of all members of a kind designated by a single term – for example, all human beings.[66] The perceptual

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[64] Compare Aristotle's claim in *Posterior Analytics* I.31 that 'perception (αἴσθησις) is of what is such-and-such (τοῦ τοιοῦδε),' i.e. universal (87b28-9). Here too he insists that we perceive (αἰσθάνεσθαι) particulars and that it is impossible to perceive universals (87b29-31). He clarifies the connection between perception and the universal at the end of the chapter when he says that it is *from*, and not *by*, seeing that we grasp universals (88a12-14). He means, I take it, that on the basis of perceiving particulars we grasp, via induction, the universal. This is the same claim he makes in passage G.

[65] *De Memoria* 1 450a29-30, b16, 21.

[66] *Posterior Analytics* I.31 88a16 gives us some reason to think that Aristotle's term for our grasp of the universals obtained via induction is νόησις. However, contra Lesher (1973), it does not follow that νοῦς is what grasps such universals, nor does it follow that there is no difference between νόησις of such universals and νοῦς of first principles. In the *Posterior Analytics*, νόησις is used for our grasp of any universal connection; νοῦς is reserved for our knowledge of first principles. (Elsewhere in the corpus there is a tighter connection between the two: νόησις is the activity of νοῦς; see *Metaphysics* XII.9 1074b15-35.) See McKirahan (1992), 257-9, whose objections to Lesher's account I take to be decisive.

faculty makes an essential contribution to this, for induction must proceed from particulars our only access to which is through perception (*Posterior Analytics* I.18, 81b5-9). Hence Aristotle can claim in the final clause of G4 that 'perception instils the universal in this way [namely, by induction].' For, however brief and sketchy his account may be, G2-3 does make it clear that the faculty of perception provides the resources for our inductive advance.

The universals we acquire by induction are, as I suggested above, the preliminary (*prôta*) accounts we use to launch our scientific inquiries – the same ones Aristotle has in mind in his discussion of 'the entire universal' in passage E: for example, all human beings are two-footed animals. In *Posterior Analytics* II.8, in the list of preliminary accounts we use to begin inquiring, we find 'human being is a certain kind of animal' (93a23-4). The phrase 'a certain kind' is a placeholder for a quality all human beings share, a quality that, according to passage G, we should be able to access through perception – hence 'two-footed' is a good candidate. This preliminary account serves as the basis for our search for the complete definition, which expresses the complete essence, of human being (for example, 'two-footed terrestrial animal' or 'rational animal').[67]

G3: 'Again a stand is made among these things, until things that are partless and universal make a stand. For example such-and-such an animal [makes a stand], until animal does; and with animal [a stand is made] in the same way.'

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[67] My interpretation is similar to a version of what we might call 'the concept view' of passage G. According to this view Aristotle draws no strict distinction between concepts and propositions because he assumes that grasping concepts involves, or can be cashed out in terms of, grasping propositions, and passage G describes our acquisition of such concepts/propositions. (See Barnes (1993), 271, Bayer (1997), 119 n22, Charles (2000), 264 n37, Hamlyn (1976), 178, Kahn (1981), 393-5, McKirahan (1992), 246-7, Modrak (1987), 162, 164.) For example, grasping the concept 'human being' involves grasping a proposition such as 'human beings are two-footed animals.' The main reason I avoid using 'concept,' preferring instead 'preliminary account,' is that 'concept' risks obscuring what I take to be the central question about passage G: does it describe our acquisition of full-fledged scientific definitions? I say 'no,' but not all defenders of the concept view agree, for some think that grasping a concept involves, or can be cashed out in terms of, grasping a complete definition. (See Charles (2000), 264 n37, Modrak (1987), 164.)

In G3 Aristotle indicates that the inductive process by which we get to low-level universals such as 'human being' repeats itself at higher levels of generality. By 'these things' Aristotle means a plurality of less general universals (for example, human being, horse), and by 'making a stand' he means grasping a feature they share in common. In this way G2 and G3 describe different types of inductive advance. In G2 we move from memories of several particulars to the grasp of a universal that covers them. In G3 we move from the grasp of several universals to the grasp of a more general universal that covers them. Since Aristotle defines induction as the advance from particulars to a universal, the idea in G3 seems to be that first-level universals are treated as if they were particulars, and we move from them to the next level of universality; the process is then repeated: these second-level universals are treated as particulars, and so on. For example, from our grasp that all humans are two-footed animals and all horses are four-footed animals, and so on, we grasp that all footed animals ('animal of such-and-such a kind'...) are of a certain sort (for example, land-dwelling). We are then led to grasp something about all animals, for example, that they are living beings of a certain sort. From 'living being' we eventually grasp something about all substances (one of the 'partless universals'),[68] at which point our ascent comes to a stop.[69] The result of each inductive step is a preliminary account, which can then serve as the basis for an inquiry into the relevant item's essence.

Conclusion

Induction, on the reading of II.19 I have defended, does not have definitional force – its direct outcome is not knowledge of a first principle. The preliminary accounts we acquire by induction do not state the basic essences of the relevant kinds and so they are not full-fledged scientific definitions;[70] rather, they identify features of those kinds that allow us to

[68] I follow Ross (1949), 678 in taking 'the partless things' to refer to the categories of being: substance, quality, quantity, etc.

[69] Compare the similar sequence in *Posterior Analytics* I.22 (83b3-4): 'human being is two-footed, this [i.e. two-footed] is animal, this [i.e. animal] is another thing'.

[70] In *Posterior Analytics* II.7 (92a37-b1) Aristotle remarks that induction does not prove what a thing is but that it is or is not something.

seek the essences.[71] Aristotle does not need induction to contribute anything more to our acquisition of first principles in order for him to answer the first question he raises at the start of II.19 (how do the principles become known?). For, as I have argued, the question concerns the original prior knowledge from which first principles begin to become known, not the whole route we traverse to them.[72]

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71) Charles (2000), 266-9 objects to deflationary interpretations, of the general sort I defend, on the ground that they are not sufficient to rule out a 'Platonist' reading of *Posterior Analytics* II.19, according to which we come to grasp principles by νοῦς, conceived of as a faculty of intuition. (This is what I called the 'rationalist' and 'intuitionist' view above.) I have tried to block this objection by arguing that while there is a gap between the knowledge we gain by induction, as described in II.19, and noetic knowledge of principles as principles, this gap is not filled by the intuitive activity of νοῦς (as Charles worries it will be) but by the account of inquiry earlier in book II, where definition and explanation, not intuition, play central roles.

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References

Adamson, Peter (2010) '*Posterior Analytics* 2.19: a dialogue with Plato?' in *Aristotle and the Stoics Reading Plato* (Bulletin of the Institute of Classical Studies Supplement 107. Ed. V. Harte, MM McCabe, R.W. Sharples & A. Sheppard). London: ICS.

Aquinas (2007) *Commentary on Aristotle's Posterior Analytics* (trans. R. Berquist). Notre Dame: Dumb Ox Books.

Barnes, Jonathan (1971) *The Complete Works of Aristotle* (2 vols.). Princeton: Princeton University Press.

—— (1993) *Aristotle: Posterior Analytics*. Second edition. Oxford: Clarendon Press.

Bayer, Greg (1997) 'Coming to Know Principles in *Posterior Analytics* II 19,' *Apeiron* 30: 109-42.

Bolton, Robert (1991) 'Aristotle's Method in Natural Science: *Physics* I' in *Aristotle's Physics: A Collection of Essays* (ed. L. Judson). Oxford: Clarendon Press.

Bronstein, David (2010) 'Comments on Gregory Salmieri "*Aisthêsis, Empeiria*, and the Advent of Universals in *Posterior Analytics* II 19"' in Lesher, ed. (2010a).

Burnyeat, M.F. (1980) 'Aristotle on Learning to Be Good' in *Essays on Aristotle's Ethics* (ed. Amélie Oksenberg Rorty). Berkeley and Los Angeles: University of California Press.

Butler, Travis (2003) '*Empeiria* in Aristotle,' *Southern Journal of Philosophy* 41: 330-42.

Charles, David (2000) *Aristotle on Meaning and Essence*. Oxford: Clarendon Press.

Engberg-Pedersen, T. (1979) 'More on Aristotelian *Epagoge*,' *Phronesis* 24: 301-19.

Frede, Michael (1996) 'Aristotle's Rationalism' in *Rationality in Greek Thought* (ed. M. Frede and G. Striker). Oxford: Clarendon Press.

Gregorić, Pavel and Filip Grgić (2006) 'Aristotle's Notion of Experience,' *Archiv für Geschichte der Philosophie* 88: 1-30.

Hamlyn, D.W. (1976) 'Aristotelian *Epagoge*,' *Phronesis* 21: 167-84.

Irwin, T.H. (1988) *Aristotle's First Principles*. Oxford: Clarendon Press.

Irwin, Terence and Fine, Gail (1995) *Aristotle: Selections*. Indianapolis and Cambridge: Hackett.

Kahn, Charles (1981) 'The Role of *Nous* in the Cognition of First Principles in *Posterior Analytics* II 19' in *Aristotle on Science: The Posterior Analytics* (Proceedings of the Eighth Symposium Aristotelicum. Ed. E. Berti). Padua: Antenore.

Kosman, L.A. (1973) 'Understanding, Explanation, and Insight in Aristotle's *Posterior Analytics*' in *Exegesis and Argument* (Ed. E.N. Lee, A.P.D. Mourelatos, and R.M. Rorty). Assen: Van Gorcum.

LaBarge, Scott (2006) 'Aristotle on *Empeiria*,' *Ancient Philosophy* 26: 23-44.

LeBlond, J.M. (1996) *Logique et Méthode chez Aristote*. Paris: Vrin.

Lesher, J.H. (1973) 'The Meaning of *Nous* in the *Posterior Analytics*,' *Phronesis* 18: 44-68.

—— ed. (2010a) *From Inquiry to Demonstrative Knowledge: New Essays on Aristotle's* Posterior Analytics (special issue of *Apeiron*). Kelowna, B.C.: Academic Printing and Publishing.

—— (2010b) 'Just as in Battle: the Simile of the Rout in *Posterior Analytics* II 19,' *Ancient Philosophy* 30: 95-105.

—— (2011) 'A Note on the Simile of the Rout in the *Posterior Analytics* II 19,' *Ancient Philosophy* 31: 1-5.

McKirahan, Richard (1992) *Principles and Proofs: Aristotle's Theory of Demonstrative Science*. Princeton: Princeton University Press.

Modrak, Deborah (1987) *Aristotle: The Power of Perception*. Chicago: The University of Chicago Press.

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

Salmieri, Gregory (2010) '*Aisthêsis, Empeiria*, and the Advent of Universals in *Posterior Analytics* II 19' in Lesher, ed. (2010a).

Scott, Dominic (1995) *Recollection and Experience*. Cambridge: Cambridge University Press.

Tuominen, Miira (2010) 'Back to *Posterior Analytics* II 19: Aristotle on the Knowledge of Principles' in Lesher, ed. (2010a).

Wheeler, Mark (1999) 'Concept Acquisition in *Posterior Analytics* II.19,' *Hermathena* No. 167: 13-34.