Epagōgē as a way of grasping a syllogism

Joshua Mendelsohn – Reasoning and Inquiry in Ancient Philosophy

The *Posterior Analytics* opens with the statement that "all teaching and learning of an intellectual sort" comes about from "what we already know."[1] But Aristotle quickly goes on to qualify this claim:

> It is possible to acquire knowledge when you have acquired knowledge of some items earlier and get knowledge of the others at the very same time (e.g. items which in fact fall under a universal of which you possess knowledge). Thus you already knew that every triangle has angles equal to two right angles; but you got to know that this figure in the semicircle is a triangle at the same time as you were performing *epagōgē* (ἐπαγόμενος). (71a.17–21)[2]

Not all learning takes place on the basis of strictly prior knowledge. Sometimes, learning takes place on the basis of facts that you only come to know at the very same time you learn what follows from them. As an example, Aristotle describes someone – a student of geometry, say – who already knows that the

[1] πᾶσα διδασκαλία καὶ πᾶσα μάθησις διανοητικὴ ἐκ προϋπαρχούσης γίνεται γνώσεως (71a.1–2)

[2] Ἔστι δὲ γνωρίζειν τὰ μὲν πρότερον γνωρίσαντα, τῶν δὲ καὶ ἅμα λαμβάνοντα τὴν γνῶσιν, οἷον ὅσα τυγχάνει ὄντα ὑπὸ τὸ καθόλου οὗ ἔχει τὴν γνῶσιν. ὅτι μὲν γὰρ πᾶν τρίγωνον ἔχει δυσὶν ὀρθαῖς ἴσας, προῄδει· ὅτι δὲ τόδε τὸ ἐν τῷ ἡμικυκλίῳ τρίγωνόν ἐστιν, ἅμα ἐπαγόμενος ἐγνώρισεν. For the *Posterior Analytics*, I provide Ross's text (Ross 1949) and Barnes's translation (Barnes 1993), in places modified.

internal angles of any triangle sum to two right angles (71a.20), a property which I will refer to following the literature as "2R". The geometer examines or constructs a geometrical diagram containing a triangle in a semicircle.[3] On the basis of her knowledge (1) that all triangles have 2R, and (2) that there is a triangle in the semicircle, the geometer learns (3) that this particular triangle has 2R. She knows (1) strictly prior to learning (3). On the other hand, she only learns (2) at the same time as learning (3). That is, she learns (2) at the very same time she learns something else on its basis.

Aristotle goes on to analyze the mental state of the student before learning (3). He begins this discussion as follows: "Before the student performs *epagōgē* (ἐπαχθῆναι), i.e. before the student gets a deduction (λαβεῖν συλλογισμόν), the student should perhaps be said to understand it [sc. (3)] in one way–but in another way not". My interest here will not be in the distinction between senses of *epistasthai* that Aristotle is drawing here.[4] Instead, I am interested in the relationship between *epagōgē*, usually translated as "induction", and *syllogismos*, usually translated as "deduction", implied in these passages.[5] The student's reasoning lends itself to being represented as a syllogism in Barbara:

1. Every triangle has 2R (premise)

[3]Aristotle does not make clear here whether the person initially fails to be aware of the triangle because she has not yet constructed it (and hence because it does not yet exist), or whether it is already drawn but, perhaps owing to complexity of the diagram, hiding in plain sight. However, if Aristotle has in mind the same construction as *Met.* Θ.9, then he must have in mind the former, since he makes clear there that if the triangle "had been constructed (ἦν διηρημένα)", it would have been "evident (φανερὰ)" (1051a.23; see also 1051a.25–26). This counts against the reading of McKirahan (1983) (see below), who takes Aristotle's case to be one in which the geometer sees the triangle, but fails to see it *as* a triangle, since his reading presupposes that the triangle has already been drawn and therefore visible but not yet recognized as such. Heath (1949, 39), however, takes *Met.* Θ.9 to be referring to a different construction. Byrne (1997, 109–12) provides a third possibility.

[4]On this, see Morison (2012).

[5]The modern convention of translating συλλογισμός as "syllogism" seems to have been established by Barnes (1981, 22–23). *Epagōgē* as "induction" goes back to the Latin rendering of *epagōgē* as *inductio*, as McKirahan (1983, 1) notes.

2. This figure in the semicircle is a triangle (premise)
3. Therefore, this figure in the semicircle has 2R (conclusion)

This is what Aristotle seems to be registering when he describes it as "acquiring a syllogism" (λαβεῖν συλλογισμὸν) at 71a.25. Why, then, does Aristotle describe the student as performing *epagōgē* (ἐπαγόμενος, 71a.21, ἐπαχθῆναι, 71a.24)? Usually, Aristotle contrasts *syllogismos* and *epagōgē* as two opposed forms of reasoning.[6] *Epagōgē* is an ascent from the particular to the universal; *syllogismos* is a descent from the universal to the particular.[7] But here, Aristotle seems to take them to be compatible. What licenses him in this apparent conflation? Does the fact that the minor premise and the conclusion of the syllogism are learned simultaneously imply that this instance of syllogistic reasoning is also somehow an instance of *epagōgē*? How can this be?

Ross and Barnes propose to solve this puzzle by denying that the language of *epagōgē* is being used with its technical meaning here. Barnes takes Aristotle to be using ἐπαχθῆναι in its non-technical sense of being "led on" (Barnes 1993, 85), while Ross takes it to be employed in a non-standard way as a synonym for "syllogizing" (Ross 1949, 506). In this non-standard or non-technical usage, Ross and Barnes claim, ἐπαχθῆναι is compatible (Barnes) or even identical (Ross) with syllogizing. They read the ἤ at 71a.25 as an epexegetic, and maintain that Aristotle is describing a case of ordinary syllogistic reasoning, despite the fact that Aristotle describes it in terms of *epagōgē*.[8]

Perhaps this solution would be credible if Aristotle's technical notion of *epagōgē* were first developed only later in the *Analytics*. We could then believe that

[6] The passages here are too numerous to list: See the references in Hamlyn (1976, 168 n. 3) and Smith (1989, 220).
[7] Cf. *Top.* A12, 105a.13–16, *An. Post.* A1, 71a.7–9, A18, 82a.40f.
[8] "the reasoning referred to is an ordinary syllogism" (Ross 1949, 506). Barnes (1993, 86) has a similar reading.

Aristotle is here, in an endoxical tone, using the term with a loose or everyday sense and will only later employ it as a technical contrast to syllogizing. What makes this view untenable, however, is that *epagōgē* has already been used in an incompatible sense just a few lines earlier.[9] Barnes' reading would therefore require Aristotle to have switched from using the vocabulary of *epagōgē* in its technical sense to using it in a looser sense in the space of a few lines, while Ross's reading would, even less plausibly, have Aristotle suddenly switching the meaning of ἐπαχθῆναι to that of συλλογίσασθαι.

In the face of these textual difficulties, Gifford (2000, 163) concludes that *Posterior Analytics* A1 "simply cannot have come from Aristotle without having suffered significant editorial modification". I argue that the use of *epagōgē* in *Posterior Analytics* provides no evidence for this conclusion.[10] Rather than "needlessly contradict[ing] the central and explicit rules governing their standard usage" (Gifford 2000, 165), Aristotle's wording in this chapter is in fact carefully chosen and consonant with ideas about syllogism and *epagōgē* that he develops in *Prior Analytics* B23.

In arguing this, I will not aim to give a general account of what Aristotle means by *epagōgē*, which would require a much more space than I have here. Instead, I will develop a suggestion due to McKirahan (1983), which I turn to now.

[9] It is contrasted with syllogistic reasoning in the first paragraph (71a.6), where Aristotle explains that *epagōgē*, rather than treating the student as one who already understands (ὡς ξυνιέντων, 71a.7), shows the universal (δεικνύντες τὸ καθόλου, 71a.8) by way of a clear particular case of it (τοῦ δῆλον εἶναι τὸ καθ' ἕκαστον 71a.8–9). The sentence immediately preceding (71a.5–9) also states that the learning in question lacks a characteristic feature of syllogistic learning (that it proceeds through a middle term) and possesses a characteristic feature of learning via *epagōgē* (that it takes place on the basis of particulars, not universal truths; cf. *Pr. An.* B23, 68b.30–32).

[10] Gifford cites other lexical problems as well, which I will not deal with here.

1 McKirahan's reading of *Posterior Analytics* A1

McKirahan proposes that *epagōgē* "is a matter of *coming to see* individuals not simply as individuals or individuals of some sort or another, but as *individuals of a particular sort*" (McKirahan 1983, 10). We engage in *epagōgē* when see, for instance, an animal as a meerkat, or a sketched figure as a rabbit – or, a figure in a diagram as a triangle. Such recognition can take place, McKirahan points out, either when we already know some universal fact and perceive its application after reflection on a specific case (as in *Post. An.* A1, and also *Pr. An.* B21), or when we learn a new universal fact. To borrow Aristotle's example: We might learn what occurs in any lunar eclipse by perceiving an eclipse on a clear night, and observing that the eclipse comes about due to the earth acting as a screen between the moon and the sun.[11] By seeing the moon as screened by the earth, we learn the nature of lunar eclipses in general, and hence we learn the universal fact that every lunar eclipse is caused by the earth acting as a screen. Alternatively, we might only come to see something as falling under a universal after having amassed experience with particulars of that kind, as in *Posterior Analytics* B19, where a number of individual cases are implied.[12]

McKirahan makes the suggestion that Aristotle's expression "πρὶν δ' ἐπαχθῆναι ἢ λαβεῖν συλλογισμὸν" does not refer to drawing a syllogistic inference. It refers to coming to be "in a position to form the deduction" (McKirahan 1983, 5) described above, viz.:

1. Every triangle has 2R (premise)
2. This figure in the semicircle is a triangle (premise)
3. Therefore, this figure in the semicircle has 2R (conclusion)

[11]See *Post. An.* B2

[12]For details on his proposal, see McKirahan (1983), 9.

The *epagōgē* supplies the student with the minor premise by making her aware that the triangle in the semicircle exists.[13] Since the student already knew the major premise (71a.20), the student has both premises of this syllogism at the termination of her *epagōgē*. On McKirahan's reading, Aristotle is not saying that she draws the inference, but only that she is in a position to do so.

This reading also has the advantage of accommodating Aristotle's exact wording in *Post. An.* A1.[14] Aristotle does not say say that you understand in one way and not another "before you perform an *epagōgē* or *syllogize*" (which would be πρὶν δ' ἐπαχθῆναι ἢ συλλογίσασθαι). He says "before you perform an induction or *get a syllogism*" (πρὶν δ' ἐπαχθῆναι ἢ λαβεῖν συλλογισμὸν). Commentators have not, it seems to me, paid sufficient attention to the difference between "syllogize" (συλλογίσασθαι) and "accept a syllogism" (λαβεῖν συλλογισμόν). Gifford, for example, notes that "all [commentators] agree that with λαμβάνειν συλλογισμόν Aristotle is signalling the process of 'acquiring' the simple syllogism under discussion and hence the process of performing the syllogistic inference itself."

But to "acquire" a syllogism and to "perform the syllogistic inference itself" are not the same. Συλλογίσασθαι, as Aristotle uses it, almost without exception refers to the performance of some inference or piece of reasoning.[15] On the other hand, λαμβάνειν, used in logical and epistemic contexts, usually refers to the adoption of a belief or attitude.[16] By saying that the learner λαβεῖν

[13]See LaBarge (2004, 205–6) for an interesting discussion of the role that imagination (φαντασία) might play in this process.

[14]It is not clear whether McKirahan (1983) recognizes this advantage; at any rate, he does not mention it.

[15]In the *Analytics*, συλλογίσασθαι can mean "to deduce by means of a syllogistic argument" (e.g. 24a.27, 40b.30), although not necessarily by means of one in the three figures (on the distinction see Barnes 1981). Aristotle also uses the verb to mean "infer" or "reason" more broadly, where the reasoning is not or not necessarily deductive. Within the *Analytics*, see A29, 45b.22 and B23, 68b.16. *Poet.* 4, 1448b.16, and 16, 1455a.10 provide representative examples of these usages in a non-logical context. The only exceptions, as far as I have been able to ascertain, are those where Aristotle uses συλλογίζεσθαι to mean "to take into account" (*Nic. Eth.* A11, 1101a.34 and *Met.* H1, 1042a.3).

[16]Bonitz (1870, 422) lists Aristotle's usage at 71a.25 together with λαμβάνειν ὑπόληψιν

συλλογισμόν, Aristotle is not saying that she learns by *making* a syllogistic inference. He is saying that she comes to know premises (1) and (2) to be true, and hence comes to be in a position to offer the deductive argument from (1) and (2) to (3). But she comes into this position *as a result* of her learning by *epagōgē*, not by performing a syllogistic inference from (1) and (2) to (3).

Perhaps commentators have not paid attention to this distinction because it seems to generate textual problems of its own. Why should performing *epagōgē* place one in a position to formulate any particular syllogism? Yet there is evidence that this is a feature of *epagōgē* as Aristotle conceives it.

2 *Epagōgē* and *syllogismos* in *Prior Analytics* B23

Like *Post. An.* A1, *Pr. An.* B23 contains both a close association of and sharp distinction between syllogism and *epagōgē*. Aristotle opens the chapter by declaring that not only dialectical and apodeictic arguments take place through the three figures, but "every form of conviction" (πίστις) in "every discipline" (μέθοδον, 68b.12). As evidence for this, he cites the fact that we are "convinced" (πιστεύομεν) of everything either by *syllogismos* or by *epagōgē* (68b.14).

Yet in the next paragraph, where Aristotle goes on to define *epagōgē*, he glosses it with the queer phrase "the syllogism from *epagōgē*" (ὁ ἐξ ἐπαγωγῆς συλλογισμὸς, 68b.15), seeming to undermine the distinction which he has just drawn. Aristotle defines *epagōgē* as form of reasoning in which we infer (συλλογίσασθαι) "one extreme to belong to the middle through the other extreme" (68b.16–17). Since the middle term never occurs in the conclusion of a syllogism, Aristotle's claim

(*Rhet.* Γ6, 1417b.10) and λαμβάνειν πίστιν (*Meteor.* A3, 270b.33), locutions in which λαμβάνειν indicates the acquisition of a belief. See also 24b.10, 40b.33, 71b.1, 80a.32, 77a.12, and 91b.9. On Galen's reading, the locution λαμβάνειν συλλογισμόν also occurs in the *Sophistical Refutations* 165b.27–30, with the meaning "to find an argument". See Galen, *De sophismatis.* We find the same usage in other commentators. See e.g. Philoponus, *In An. Post.*, 13,3.5.5 and Pseudo-Alexander 2, *In Soph. El.* 18.24.

entails that *epagōgē* infers a premise, rather than the conclusion, of a syllogism (68b.16–17).

As an example, Aristotle describes an argument with terms the terms A="long-lived" (μακρόβιον, 68b.19), B="not containing bile" (τὸ χολὴν μὴ ἔχον, 68b.19) and Γ="the particular long-lived thing, for example man or horse or mule."[17] Both the term "not containing bile" and "long-lived" are taken to be predicated of Γ (68b.21–23). An instance of the form of argument Aristotle is describing is thus the following

1. Long-lived (A) holds of (a particular) horse (Γ)
2. Not containing bile (B) holds of (a particular) horse (Γ)
3. Long-lived (A) holds of everything not containing bile (B)

This argument is not a syllogism as it stands. But Aristotle has us suppose that Γ "converts" (ἀντιστρέφει, 68b.23) with B, that is, that the converse proposition

4. (Γ) holds of everything not containing bile (B)

is also true. Under this assumption, the conclusion would then be rendered "necessary" (68b.24) by a syllogism in Barbara:

5. Long-lived (A) holds of all (Γ)
6. (Γ) holds of not containing bile (B)
7. Long-lived (A) holds of not containing bile (B)

The textual problem raised by this passage is that the conversion Aristotle performs here does not seem to be licensed by the premises of the argument. Why is the learner then warranted in performing the conversion?

[17] τὸ καθ' ἕκαστον μακρόβιον, οἷον ἄνθρωπος καὶ ἵππος καὶ ἡμίονος, 68b.20–21. The singular μακρόβιον requires taking the καὶ disjunctively, as Smith does. Aristotle's expression is ambiguous between the particular species and the particular individual (cf. Barnes 1993, 83).

The reading of Ross (1949, 486–87), which has become standard, circumvents this problem by taking Aristotle not to be describing a case of *epagōgē* proper, but rather reasoning by "perfect induction", which involves inferring a universal claim on the basis of an exhaustive list of its instances. But there are a number of serious problems with this reading. The first is textual: Aristotle defines Γ as the particular long-lived *thing* (τὸ καθ' ἕκαστον μακρόβιον), in the singular, rather than the particular long-lived *things*, as this reading would require.[18] Second, as Ross (1949, 486) notes, this would be to restrict induction to its "least interesting and important kind", to consider only the case where all instances of a kind have been observed and induction merely summarizes these observations.[19] Third, the subsequent paragraphs refer to familiar features of Aristotle's notion of *epagōgē* in the *Posterior Analytics* – that it provides a means of knowing immediate propositions and makes what is better known in itself better known to us – thus indicating that his topic here is not separate from the notion of *epagōgē* he will go on to develop.[20]

Although McKirahan (1992, 251) follows the traditional reading of B23, the interpretation of *epagōgē* due to McKirahan (1983) provide us with a more satisfactory alternative. We can understand Aristotle's συλλογισμὸς ἐξ ἐπαγωγῆς to be a two-stage form of reasoning which involves *both* an *epagōgē* in the strict sense, and a subsequent syllogistic inference. The *epagōgē*, strictly speaking, is only the perceptual recognition that licenses the conversion of (2). The student must come to see the long-lived individual under consideration in a very particular way. She comes to see it as an arbitrary representative of bileless creatures

[18] All the manuscripts confirm this reading, except for manuscript *n*, which reads the plural (τὰ καθ' ἕκαστα μακρόβια).

[19] Ross (1949, 486) suggests that Aristotle is forced to restrict his attention in this way by his attempt to subsume induction under the theory of the syllogism he has developed in the preceding chapters.

[20] *Pr. An.* B23, 68b.30–32, 68b.35–37. Cf. *Post. An.* A2, 72b.28–30, B19, 99b.20–21, 100b.34. Smith (1989, 221) notes this as well.

in general. That is, she must recognize that it is not *qua* horse that the horse is long-lived, but *qua* bileless, and that for this reason "horse" is interchangeable with any bileless creature. By coming to see the horse in this way, she comes she comes to understand (νοεῖν, 68b.27) the (Γ) term as if it were "composed" (συγκείμενον, 67b.28) of all bileless creatures. This means that she is able not only to think of bileless as predicated of the horse, but also to think of the horse as, in a certain way, predicated of bileless. The horse is predicated of bileless in so far as it is as an arbitrary stand-in for any bileless creature. This is what allows her to "convert" the predication (B) of (Γ).[21] As a result of this conversion, she is now supplied with the premises for a syllogism in Barbara, and can go on to deductively infer that all bileless creatures are long-lived.

Pr. An. B23 therefore presents a composite form of reasoning which involves *both* the performance of an *epagōgē* in the strict sense, and the subsequent formulation of a syllogism on the basis of this *epagōgē*. While *epagōgē* itself does not involve making a syllogistic inference, it supplies the reasoner with premise which may then be employed in a syllogistic argument. The *epagōgē* is, strictly speaking, limited to the noetic comprehension of the horse as an arbitrary bileless creature, but this act of *epagōgē* puts her in a position to convert the minor premise and hence to formulate the syllogism.

3 *Post. An.* A1 again

Now consider again *Posterior Analytics* A1. As we discussed above, commentators have noted that it would violate Aristotle's usage to describe the geometer as simultaneously performing *epagōgē* and making a deductive inference. But

[21] For a similar reading, see Groarke (2009, 130f.). I agree with Groarke that this chapter does not describe a case of perfect induction, although I do not follow his suggestion that "conversion" here does not require the truth of the converted proposition.

where there is an incompatibility between making a deductive inference and performing *epagōgē*, there is a natural fit between ἐπαχθῆναι (performing *epagōgē*) and λαβεῖν συλλογισμόν (coming to be in a position to formulate a syllogism). The student reasons by *epagōgē*. But, like in B23, the student becomes able to formulate a particular syllogism as a result of this reasoning.

In fact this is a very apt description of the scenario. Call the triangle in the semicircle T. The learner is not initially able to formulate the deduction "All triangles have 2R; T is a triangle; therefore, T has 2R." She is not able to do so because she does not know that T exists. Consequently, she does not know anything about T.[22] In particular, she does not yet know that it is a triangle, and so she has no reason to think the minor premise is true.

Now imagine she comes to see the figure in the diagram as a triangle. The figure jumps out at her from the tangle of lines and it at once becomes clear to her that it is a triangle. This is her *epagōgē*. Since she knows that all triangles have 2R, she is simultaneously made aware that the figure in the semicircle has this property. At this point, she knows three things: "All triangles have 2R," "this is a triangle", and "this has 2R". She knows these, however, not as three disconnected facts which she happens to have gotten to know at the same time. She understands their logical connection: She knows that the triangle *must*, as such, have 2R, since this is true of all triangles. The fact that she knows them as a logically connected triad is evidenced by her ability to offer the following deductive argument: "All triangles have 2R; this is a triangle; therefore, this has 2R." But she did not get to be in a position to do so by *deducing* that the triangle had 2R. All that was required was seeing a figure in a certain way, while simultaneously drawing on knowledge that she already had.[23] Hence she

[22]Aristotle, at least, seems to assume that we need to know the existence of something before we can know anything about it (cf. A1, 71a.26–27, also B1).

[23]Compare McKirahan (1983, 9–11). As I have noted, my reading broadly follows his, at

comes to be in a position to formulate a syllogism involving a particular triangle, something which she couldn't do before, not by engaging in syllogistic inference but by engaging in *epagōgē*.

There is nothing contradictory, then, in saying that the geometer comes to "acquire a syllogism or [equivalently] engage in *epagōgē*" (71a.25). These are, as Ross (1949, 506) says, both "ways of referring to the same thing". Yet that same thing is, as Aristotle says, a process of engaging in *epagōgē*, not a process of deduction as most commentators have assumed. It is an argument by *epagōgē* in just the sense Aristotle defines in the first paragraph of A1. The universal (that all triangles have 2R) is shown by the clarity of the particular triangle (δεικνύντες τὸ καθόλου διὰ τοῦ δῆλον εἶναι τὸ καθ' ἕκαστον, 71a.8). The universal is shown by the particular not in the sense that it is proven, but in the sense that the particular's appearing as a triangle is what shows the student that it has 2R (something which it can only do, of course, because she already knows that all triangles have 2R).[24]

It makes sense, then, that Aristotle would describe this event as "ἐπαχθῆναι ἢ λαβεῖν συλλογισμὸν" (71a.24f.). "ἐπαχθῆναι" describes what the learner does: She learns by making an *epagōgē*. She does not learn by *reasoning through* the syllogism above (not δι' συλλογισμοῦ, in Aristotle's language): She cannot, because she doesn't yet know both of its premises (she only learns the minor at the very same time as the major).[25] But she nevertheless comes to acquire

least in the centrality it accords to seeing the triangle *as a triangle*. Unlike McKirahan (1983, 10), however, I do not think that these cases involve "reflecting on or reasoning about one or more perceived instances," at least if this means that some additional mental effort is required over and above the act of seeing the triangle as such. Instead, I am arguing that the learner's seeing the triangle as such can be viewed as a process of accepting a syllogism *without* "reflecting on or reasoning about one or more perceived instances."

[24]Cf. Byrne (1997, 112): "In this act of recognition [by *epagōgē*], we not only understand the diagram in a new way, but in so doing we simultaneously recognize that the theorem, which expresses the universal (*katholon* [sic.]) in this case, is applicable."

[25]Hence she could not be treated by a teacher ὡς ξυνιέντων ("as one who already knows

(λαβεῖν) this syllogism by performing her *epagōgē*.

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