Aristotle on Knowledge and Learning: The Posterior Analytics by David Bronstein

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The flood of attention paid to Aristotle's *Posterior Analytics* in recent years has led to much progress in our understanding of this challenging and important work. Among other advances, old concerns that the work lacked internal consistency and was irrelevant to, or even in conflict with, other parts of the corpus have largely been left behind. No longer do scholars ask if the account in book B of the 'things we seek' is inconsistent with the theory of demonstration in book A, or if the theories of the *Post. An.* were for some reason abandoned prior to Aristotle's scientific investigations (or perhaps were formulated only after his empirical investigations were completed). Much good work has shown how the parts fit together into a consistent theory of unqualified scientific knowledge (ἐπιστήμη ἁπλῶς), and how the theory actively shapes Aristotle's practices in treatises ranging from the physical and biological to the ethical and metaphysical.

To be able to say that the different parts of the work are consistent and that the *Post. An.* influences other areas of the corpus in specific ways constitutes definite progress. But scholarship has paid much less attention to the question of what might be called the internal dynamics of the *Post. An.* itself: how one part of Aristotle's presentation leads to the next. Granting that the account of demonstration is consistent with the theory of definition, are there philosophical grounds according to which the exposition of one account motivates and moves toward the other; and if so, does the latter lead in a similarly sequential way to the concluding chapter on induction (ἐπαγωγή)? Can the work as a whole, in other words, be read as something more than a desultory collection of treatments of topics? Is there an overall plan?

These, in effect, are the questions that David Bronstein seeks to answer in his book *Aristotle on Knowledge and Learning: The* Posterior Analytics.

Bronstein approaches Aristotle's *Posterior Analytics* as a 'coherently and elegantly structured work' [3] organized around the two themes announced in his title, knowledge and learning. According to Bronstein, there are three distinct types of learning for Aristotle: learning by demonstration, learning by definition, and learning by induction. Not only does each type yield a different kind of knowledge and occupy a different moment in an Aristotelian scientific inquiry, there is a logical priority among the three types of learning that stands behind Aristotle's order of presentation in the *Post. An*.

Aristotle begins with the expert scientist, who learns through demonstrations (the subject of *Post. An*. A). He then moves 'backwards' to the two types of prior learning that must be undertaken if one is to become an expert in the first place, both involving the acquisition of non-demonstrable principles. Demonstration depends on definitions. Therefore, learning by definition must precede learning by demonstration. This kind of learning is explored in the first 18 chapters of *Post. An*. B. But definitions in turn depend on acquiring knowledge through induction of preliminary accounts of the things to be defined. Learning by induction is the subject of the work's final chapter, B.19. Bronstein contends that each stage of the unfolding exposition is a progressively deeper exploration of the epistemological foundations of scientific knowledge.

As is appropriate given his thesis, Bronstein follows (for the most part) Aristotle's order in the *Post. An*. rather than, say, assembling passages from different parts of the work according to topic (e.g., on the different types of principles). And despite his concern with the composition of the whole, he does not discuss every chapter of the *Post. An*.: many chapters in the first book, for instance, receive little or no attention. Nor does he raise every issue pertaining to the passages that he does discuss (for example, the relationship between Aristotelian principles and Greek mathematics). This, in other words, is not a commentary. Instead, Bronstein concentrates on those chapters most crucial to making his case—mainly A.1–4, B.1–10 and 13, and B.19—drawing in passages from other chapters as needed, often in footnotes.

The book is laid out over 13 chapters divided into three 'parts'. These follow a substantial introduction that includes an extended discussion of the Meno paradox as a background to Aristotle's concerns. The three main parts are of quite unequal length. Part 1 devotes 35 pages across three chapters to the question of learning by demonstration. The bulk of the book is formed by the

eight chapters and almost 160 pages of part 2, 'Learning by Definition'. The concluding part 3 treats learning by induction in a single chapter of just over 20 pages, devoted essentially to *Post. An.* B.19. As its much greater length suggests, part 2 contains the linchpin of Bronstein's thesis, though none of the parts (including the introduction) is without interest or controversial claims.

Part 1 considers learning by demonstration. Against the general run of recent scholarship, Bronstein argues that it is indeed possible to acquire new knowledge through demonstrations, and that both the expert and the student do so, though in different ways. His claim that the expert acquires new knowledge in this way is probably the more controversial. In some cases, the expert deduces new conclusions from known premises. In other cases, the expert is able to grasp an explanatory connection between facts already known. In this case, the demonstration is literally a 'showing forth' of an explanation. In both cases, the expert learns by moving not from ignorance to knowledge but from one sort of knowledge to another. Bronstein is intent on saying that this does not make demonstration a method of discovery. Rather, the theory of demonstration gives an account of what Bronstein calls the 'culminating moment' of the process of discovery. That process is the main subject of *Post. An.* B.

Also iconoclastic is Bronstein's account of non-demonstrative scientific knowledge. He argues at length in his fourth chapter that this kind of scientific knowledge is obtained by νοῦϲ of the definitions that form the starting points of demonstrations. In other words, the definition of scientific knowledge in A.2, 71b9–12 applies to both demonstrative and non-demonstrative (i.e., noetic) knowledge, not just to demonstrative knowledge as is typically maintained. This offers the attractive option that νοῦϲ—Bronstein leaves the term untranslated—is the non-demonstrative knowledge hinted at in the opening lines of A.2, and that it centrally involves knowledge of explanatory definitions, specifically of subject-kinds and their essences.

Part 2 takes up the question of how we acquire knowledge of definitions, the most important kind of scientific principles. Bronstein offers an extended analysis of inquiry in *Post. An.* B. This, by far the longest portion of *Aristotle on Knowledge and Learning,* contains two crucial claims. First, Bronstein contends that we learn principles through definition, not through induction as is typically supposed. Second, he maintains that learning by definition encompasses several more specific methods. To signal the shift from learning

by demonstration to learning by definition and the difference between the prior knowledge involved in each and what is discovered as the result, Bronstein switches from speaking of the expert (as he does consistently in part 1) to speaking of the inquirer, implying that inquiry must be largely completed before one becomes an expert able to engage in demonstration in a scientific field. Through demonstration, the expert's knowledge of the explanatory power of a definition is deepened. In the case of inquiry, the inquirer searches to learn a new definition.

Here I found most interesting his careful delineation of different methods of inquiry in B.8–9 and B.13 depending on the differences between the types of definable entity. Bronstein does an admirable job of unraveling Aristotle's dense and confounding talk in B.8–9 of 'causes that are the same' and 'causes that are different', and takes quite seriously Aristotle's claim in B.8 that, while no definition cannot be demonstrated, a definition of a certain sort can be made clear by demonstration. Demonstration thus becomes the method for seeking definitions of demonstrable attributes. At the same time, division becomes the method by which the essences of species are defined. So, rather than being flummoxed by the apparent inconsistency between B.8–9 and B.13, Bronstein finds a compelling way to make them consistent.

Part 3 turns finally to *Post. An.* B.19 and the account of induction. It is through learning by induction, Bronstein argues, that we acquire not a knowledge of definitions but the prior knowledge of the genera on which definitions are based. These are the entities a prior knowledge of which is necessary for learning definitions as described in part 2. In other words, just as learning by demonstration depends on a prior learning of definitions, so too learning by definition depends on a different kind of learning made possible by induction. Thus, Bronstein is able to identify the philosophical basis for the presentation of the *Post. An.*

Central to Bronstein's interpretation of the *Post. An.* is the claim that all of the work's main concerns point to the influence of Plato, particularly issues brought forward in the *Meno*. This is probably not controversial at least at a general level, and it is certainly no longer equivalent to saying that the *Post. An.* is, therefore, an immature product of Aristotle's academic period. Bronstein develops this theme in two stages. The initial stage takes up the first numbered chapter of Bronstein's book and occupies the majority of the introductory section preceding part 1. It examines the *Meno* paradox both in

its own terms and in connection with Aristotle's only explicit mention of it in the *Post. An.*, in A.1.[1] The second stage amounts to a running engagement with the implications of the paradox for inquiry throughout Bronstein's part 2, including, but not limited to, a chapter (the eighth) devoted to 'The Socratic Picture of the Order of Inquiry'.

Bronstein's tracing of issues in the *Post. An.* to the seemingly aporetic *Meno* strikes me as one of the major accomplishments of the book. This is in contrast to his offhand remark linking Aristotle's work to the *Republic*, when he calls the *Post. An.* 'Plato's allegory of the cave told in reverse'. (Surely the cave stands for the political community much more directly than it does for the scientific community. I shall return to the *Republic* and other Platonic dialogues shortly.) This part of Bronstein's interpretation can be judged independently of his larger view of the *Post. An.*'s unfolding structure, though it stands, of course, as a major feature in that view. Bronstein shows how in book B and especially in its first 10 chapters Aristotle frequently deals with issues going back to the *Meno*: the priority of the question τί ἐcτι;, investigating a thing's attributes, the need to grasp at least hypothetically something of what a thing is if inquiry is to proceed, and the importance of questions pertaining to the relationship between a kind and its varieties.

Given the strength of his case connecting the *Post. An.* and the *Meno*, one cannot help but notice that possible connections with other seemingly relevant Platonic dialogues are not discussed. There is no mention of the *Phaedo*, in which the method of hypothesis receives a more systematic account than the one given in the *Meno*. Besides the questionable connection to the allegory of the cave, there is only one fleeting reference, also in the introduction [8], to the Divided Line. This image seems to me to be at least as relevant to Aristotle's theory of science as the problem of inquiry in the *Meno*, particularly with regard to possible influences and connections between Aristotle's ἐπιcτήμη and νοῦc and Plato's διάνοια and νόηcιc. Similarly, despite Bronstein's identifying division as one of the most important ways Aristotelian definitions are obtained, and despite Aristotle's criticism of Academic division in B.5

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[1] Bronstein consistently speaks of 'Meno's paradox', even though it is Socrates whom Plato has develop the paradox in its full precision and potency out of his interlocutor's lazy attempt to end the inquiry in numbed *aporia*. Bronstein is not, of course, alone in this tendency.

and endorsement of a modified form of division in B.13, none of the Platonic dialogues featuring collection and division is considered except for one footnote late in the book. As for other Academic proponents of division, who in some cases were Aristotle's primary targets in these chapters, Speusippus is mentioned once and Xenocrates not at all.

My criticisms on this point may be unreasonable. I may be asking for a different book than the one Bronstein chose to write, one that would concentrate on the multiple influences of Plato and the early Academy on Aristotle's account of knowledge and its acquisition. Nevertheless, Plato was at least as concerned as Aristotle with the internal dynamics of the acquisition of knowledge—epistemological, psychological, and certainly the expository—and several dialogues besides the *Meno* are relevant to that inquiry. Bronstein's not exploring other aspects of Plato's influence strikes me as a lost opportunity, as it leaves incomplete the picture of what the *Post. An.* was drawing on and responding to.

Another lost opportunity pertains to terminology, though I think it reflects a more fundamental issue. At one or two points, Bronstein seems to prefer the phrase 'learning by defining' in place of 'learning by definition' [4, 70–71], claiming that the former phrase better reflects the process of defining something and, thus, the act of learning. This is a promising idea, but Bronstein makes little use of it. In almost all cases, he sticks with the more static phrase, falling back on it even in the sentences immediately following his drawing of the distinction. This strikes me as another opportunity lost. If νοῦς is a ἕξις, as B.19 clearly states that it is, then it could have been helpful and even illuminating to highlight the activities by which the ἕξις is formed. These are, after all, the activities by which the inquirer is transformed into the expert, which is to say, by which the expert's capacity to demonstrate is formed, which is precisely the mark of the ἐπιστημονικός. This in turn might have prompted Bronstein to draw a parallel distinction between learning by demonstration and learning by demonstrating. This, I think, could have strengthened his point about the pedagogical force of ἀπόδειξις. It is by doing the demonstrating rather than by reviewing a static demonstration laid before one that one learns. (And one might wonder if there is a corresponding distinction to be made between learning by induction and learning by inducing—or perhaps by being induced, as the account in B.19 seems at times almost to make the mind of the learner into a passive receptor.)

My concerns about active *versus* static terminology connect to a larger reservation. I think Bronstein separates too sharply what he terms the 'epistemic conditions' of the expert from those of the inquirer. Though one can easily understand why Aristotle might in his familiar way choose for the sake of analytic clarity to separate his treatment of demonstrating from that of defining, I think there are compelling reasons for not separating them in actual scientific practice. Investigation in any scientific field involves a simultaneous search for new demonstrations along with the definitions that they are derived from. The search, I would say, is a constant back and forth between the two. Both types of searches depend (as I shall explain in a moment) on the constructing of syllogistic deductions. The expert/inquirer begins, as Bronstein says, with certain facts. But whether they are scientific facts remains unclear, just as whether a proffered statement of essence is in fact an explanatory, causal definition. A fact is not known to be scientific, nor a presumed definition to be explanatory, until each becomes part of an actual demonstration.

The only way for a researcher—a term seldom used by Bronstein; I use it to express the combined activities of expert and inquirer—to make a fact part of an actual demonstration is to construct putative demonstrations. The researcher advances what he or she hopes is an explanatory showing. The scientific status of both the familiar facts with which the researcher has begun and the presumed explanatory definitions hypothetically advanced are precisely what is at stake. If the proof sticks, it's a demonstration. Probably.

Or probably at best. No putative demonstrative conveys its scientific status in isolation. It is hard to know that we know, as Aristotle says in *Post. An.* A.5. And because degrees of imprecision (or lack of ἀκριβεία) infect almost all Aristotelian sciences—geometry relative to arithmetic, astronomy compared to biology—very few demonstrations can be known without qualifications made necessary by the object being studied or the beings who study it. Because of this, the work of defining and demonstrating is an ongoing interrelated and provisional activity, which would make the sharp divisions that Bronstein imposes between the types of learning and the stages of inquiry seem questionable as descriptions of actual scientific practice. To say otherwise—to say that demonstrations and the expertise that produces them come only after all or most definitions have been discovered (as Bronstein says on page 75)—is to risk falling back into a version of Barnes's old thesis

that the theory of demonstration was appropriate only for facts already won, in a science nearly complete. Demonstrating is the winning.

Though I cannot argue for it here, the expert's sense of the rightness of an explanation, which Bronstein also speaks of, is a large part of what I think the ἕξις of νοῦς amounts to—the acquired ability to see the cause *as* the cause. The researcher's confidence in its scientific status (recall *Post. An.* A.2, 72a25–32) builds only as the putative demonstration is seen to become a more and more secure part of a comprehensive body of demonstrations.

In terms of the goals that he sets for himself, Bronstein effectively argues that the *Posterior Analytics* is coherently structured, though one might still hesitate to call it elegant. But how thoroughly does he apply his notion of an unfolding exposition to the finer structure of the *Post. An.*? Here, it seems to me, Bronstein's efforts, while suggestive, are far from complete. While the backwards progression he traces through the three types of learning is philosophically plausible, there is little attention paid to moves at a more detailed level of resolution. He does not, for instance, explore how A.1 motivates and leads to A.2, or why A.3 can be seen as the necessary preliminary to A.4–6 and beyond. And while he identifies the main achievements of B.2-10, Bronstein does not attempt to straighten out the often circuitous sequence of arguments leading to them. How, for instance, do the opening lines of B.8 establish an expository connection to B.3 and even B.1? What are the internal dynamics of the unfolding exposition of those chapters? To have traced them out would have required a much longer and more detailed book, so again I may be asking for something Bronstein did not set out to write. Nevertheless, I felt a certain sense of promise unfulfilled, though perhaps Bronstein can be given credit for instilling a desire to have more.

Aristotle on Knowledge and Learning derives ultimately from Bronstein's PhD dissertation (University of Toronto), and parts of chapters 1, 2, and 13 are based on previously published journal articles. The book nevertheless reads well as a whole, in part because of Bronstein's frequent (indeed, perhaps too frequent) summarizing of previous arguments or arguments still to come. Translations are by Bronstein, based on those of Barnes' Revised Oxford *Aristotle* [1984]. Key Greek terms are transliterated when they are used in the main body of the text. The full Greek of each passage is also included in the footnotes.

On the whole, *Aristotle on Knowledge and Learning* is a solid achievement. It offers a host of insights into problematic concepts and passages that merit further debate, and a plausible overall account of the work's internal dynamics. For both these reasons, Bronstein's book should become a departure point for future explorations of Aristotle's ever fascinating account of scientific knowledge and its acquisition.

BIBLIOGRAPHY

Barnes, J. 1984. *The Complete Works of Aristotle.* 2 vols. Princeton, NJ.