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

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are quite variable, but each offers an insightful perspective on early modern astronomy, astrology, or cosmology and fruitful avenues for future research.

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In this excellent book Bronstein interprets Aristotle’s *Posterior Analytics* (*APo*) as unified by the Meno problem, understood as follows: (1) prior to seeking whether S exists, either one knows what S is or one does not; (2) if one knows what S is, one must already know that it exists; (3) if one does not know what S is, then one cannot inquire whether it exists; (4) therefore, one cannot inquire whether S exists. The problem is to be solved in two ways: first through rejecting the presumption, implicit in point 1, that knowledge is an all or nothing matter and, second, by showing that the term “what it is” is ambiguous and that knowledge of “what it is” in one sense may fall short of scientific knowledge, but nonetheless allow for inquiry. Bronstein shows how Aristotle employs both of these solutions.

The major achievement of Bronstein’s book is to show how the *APo* can be understood as a sequence of solutions to the Meno problem as it arises in different epistemological contexts. Each version of the Meno problem concerns the epistemological presumptions of the solution before. Thus *APo* 1.1 wonders about how a particular truth can be learned while ignorant of the particular at issue; the solution is that the universal knowledge that makes possible the new knowledge in a sense is knowledge of the particular and in a sense is not. This solution presupposes demonstration, which, Bronstein argues, is productive of new knowledge for the practicing scientist engaged in inquiry. New knowledge is acquired through demonstration insofar as the knowledge of the conclusion is in a sense present in the knowledge of the premises. Demonstration presupposes knowledge of causally basic essences.

The Meno problem concerning the inquiry into these essences arises because Aristotle is convinced that true scientific inquiry must be inquiry into real features of the world. Hence the inquiry into an essence cannot get off the ground unless one knows that the kind of which the essence is being sought is some-
thing real, but a version of the Meno problem arises: How can one know this unless one knows what the kind is? The problem is solved in 2.8–10 through distinguishing different modes of knowing the “what it is” of some kind or attribute. Preliminary nonscientific accounts allow the investigator sufficient epistemological toehold for the inquiry into what the kind is. His account presupposes that one already has a grasp of the indemonstrable principles of the sciences, which Bronstein, following Ross and me, takes to be definitions of the simple kinds that are considered as the subjects by the sciences studying the attributes. The Meno problem arises, again, concerning the inquiry into these simple essences. It is solved in 2.13, where Aristotle advocates a version of Plato’s method of division for the sake of ascertaining this essence. The use of this method in the case of inquiry into essences presupposes preexistent knowledge of basic differentiae. How is it that one can learn the relevant differentiae, prior to collating them by the method of division? Again, the answer lies in distinguishing different senses by which something is known. APo 2.19 shows how perception gives us the necessary preexisting knowledge to allow the inquiry to proceed.

Bronstein understands the Posterior Analytics to be offering an overarching account of the temporal progress of scientific research into a fact $S$ is $P$. Revising the influential interpretation of Charles, Bronstein takes the stages of scientific inquiry into a fact to be as follows: “At Stage 1, we do not know whether a subject $S$ exists and we seek whether it exists. At Stage 2, we know that $S$ exists, and we seek what it is (its essence). At Stage 3, we know what $S$ is, and we seek whether $P$ belongs to it as one of its demonstrable attributes. At Stage 4, we know that $P$ belongs to $S$ as one of its demonstrable attributes and we seek why it belongs (the cause). At Stage 5, we know why $P$ belongs to $S$” (6). Bronstein’s Aristotle is concerned with method, how scientific inquiry proceeds, and not merely with the logical and conceptual relations that hold among the elements of those explanatory schemes at which one arrives.

In the remainder of this review, I will signal and indicate problems with some of the key interpretative moves that Bronstein makes and will take issue with one. One of the classic problems concerns the relationship between Nous (intelllection), demonstration, and induction. Bronstein accepts a standard account of induction as a mode of reasoning by which a universal (characteristic or predication) is discerned through particulars and takes the point of APo 2.19 to be that the human mind is such as to be able to do this. The problem concerns how to reconcile this with the teaching that Nous is that by which a universal principle is grasped. The traditional account has it that Nous is a kind of intuition, which, given appropriate perceptions, will lead to a cognitive grasp of the explanatory principles at work. In recent decades there has been a move away from attrib-
uting to Aristotle the extravagant view that human beings have such a powerful epistemological principle; this move is in part motivated by the problem of how to integrate the “intuitionist” notion that nous grasps the principles of science with Aristotle’s view that these principles are attained only after hard work. The main alternative (the “explanationist” interpretation) is that nous secures definitions only by grasping that they are the principles that will do the explanatory work that needs to be done. Bronstein rejects this view, since he holds Aristotle to a strict temporal time line according to which stage 3 of inquiry, the inquiry into what S is, must precede stage 5, the attaining of an explanation of why S is P. Accordingly, Bronstein thinks that a grasp of a definition as a definition must precede the noetic grasp of the definition as grounding demonstrations. The method of division is that by which we have the prenoetic grasp of the definitions. But this simply reproduces the problem that the intuitionist and explanationist lines of interpretation are meant to solve. How is it that the mind grasps differentiae and demonstrated attributes of the kind in question and is able to distinguish them? The alternatives seem to be intuition, selection on the basis of explanatory power, or some combination of the two.

Bronstein follows Ross and me in taking Aristotle’s theory of explanation to rest on the metaphysical distinction between subject and attribute; the inquiry into the essence of a subject has a different form, and a different role in the time line of inquiry, than that of the inquiry into the essence of an attribute. The subject need not be a true metaphysical subject; all that matters is that, like “line” in geometry, it is regarded as a subject by the science that studies it. Bronstein distinguishes basic subjects such as line or animal from “subordinate subjects” such as human being, which are to basic subjects as species to encompassing genera. “Triangle” he takes to be a subordinate subject and distinguishes it from demonstrable attributes such as eclipse. This raises problems for Bronstein that he does not adequately address: Aristotle is explicit that the geometer proves that there are triangles, which suggests that there is a demonstration in which “triangle” or perhaps “is a side of a triangle” is the predicate term. A demonstration might be something like Euclid Elements 1.1, which could be understood as showing that a certain (equilateral) triangle exists, on the basis of first principles concerning the basic subjects of line and circle. Confirmation of this can be found in APo 1.10 76b9, where deflection and verging, which, like a triangle, arise when more than one straight line stands in a certain relation, are classified as demonstrable attributes. I therefore suggest that an item such as triangle and eclipse have the same status: they are the attribute of a basic subject’s standing in a certain relation to another subject and, as such, are properly to be understood as predicates of the basic subjects (although language can be simplified so that both
“triangle” and “eclipse” can stand as grammatical subjects). I note that Bronstein incorrectly attributes to me the view that attributes, like eclipse and (forming a) triangle (in relation to other lines), are to be identified with subordinate subjects (170). I agree that this is wrongheaded; further, I think that it is wrong to understand triangle as a subordinate subject. Aristotle does not think that triangle is a kind of line.

The interpretation of a text as thorny as the Posterior Analytics is bound to elicit some disagreements. What Bronstein gets wrong should not obscure how very much he gets right, not least of which is his discerning a coherent line of argument that runs through the whole text and his showing how Aristotle had a very great deal to say on how scientific inquiry is to be conducted.

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This is quite a fascinating book. The work is an extended argument, thoughtfully organized with careful attention to detail and sourcing. I cannot speak to whether the argument will be convincing to all. But I cannot envision the argument being presented any better.

The author’s overriding thesis is that mechanics played a much more substantial role in the development of Aristotle’s natural philosophy than has previously been appreciated and that appreciating the role mechanics played leads to a more subtle and nuanced understanding of key aspects of Aristotle’s natural philosophy. Somewhat more specifically, I see three intertwined theses as central to the author’s overall argument:

i) the (relatively uncontroversial) view that even before Aristotle’s time, basic mechanics, especially those involving the lever and related devices, were well understood, including a solid understanding of the quantitative principles underlying the workings of such devices;

ii) that this understanding of mechanics played a key role in the development of Aristotle’s philosophy of nature (including but not limited to