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Demonstrative Knowledge and Epistemic Continuity
In Aristotle’s Posterior Analytics

A DISSERTATION

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Demonstrative Knowledge and Epistemic Continuity
In Aristotle’s *Posterior Analytics*

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This dissertation challenges the axiomatic deductive interpretation of demonstrative knowledge (ἡ ἀποδειτικὴ ἐπιστήμη) in Aristotle’s *Posterior Analytics*, which was dominant in the last century. According to the interpretation, the treatise is thought to hold to an ideal structure of scientific knowledge consisting in a system of axiomatic deductive knowledge: this system has a finite set of basic and necessary propositions as axioms or principles and takes syllogism as its formal language. The net effect of this interpretation is to cast Aristotle’s philosophy of science in hypothetico-deductive terms and thus to eclipse Aristotle’s theory of demonstration in the overall interpretation of his philosophical and scientific method.

This dissertation offers a deflationary account of the axiomatic interpretation by rediscovering the role of the principles (archê) of demonstrative sciences within the epistemic process of demonstrative investigation. The dissertation provides a unified vision of demonstrative knowledge in the two books of the *Posterior Analytics* taken together. According to the alternative model offered in the dissertation, the nucleus of demonstrative knowledge consists in the epistemic processes of mediating between knowledge of facts and knowledge of causes. Unlike the deduction from axioms, demonstrative knowledge on this view is not a one-directional procedure from principles to theorems as conclusions. Rather, it consists of both understanding concrete facts from causes and understanding causes from the concrete without vicious circularity. Within Aristotle’s framework for science, the contexts of ἐπιστήμη and nous
are not sharply separated from each other, a point of contrast to the axiomatic interpretation. For Aristotle, searching for causes and explaining from them are sometimes concurrent, and not always linear, processes.

Chapters 1 and 2 treat two principles of demonstrative science, hypothesis and definition. The Chapters loosen the rigid understanding of principles of Aristotelian science as they are interpreted by the axiomatic-deductive model, and then recover the role of principles within the movement of demonstrative reasoning. Chapter 3 explores the dynamism of demonstrative knowledge, which is a continual epistemic process that brings the reasoner closer to the essences of entities in the empirical world, even though some fallibility may remain within the process. Chapter 4 seeks the epistemic ground of demonstrative knowledge itself: in the first and last chapters of the treatise, Aristotle presents that human cognitions from perception to nous are continuously conjoined in their signifying essences, a view that contrasts with Plato’s epistemic discontinuity.
This dissertation by Jeong Hwan Kim fulfills the dissertation requirement for the doctoral degree in philosophy approved by Jean De Groot, Ph.D., as Director, and by Timothy Noone, Ph.D., and Richard Hassing, Ph.D., as Readers.

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Jean De Groot, Ph.D., Director

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Richard Hassing, Ph.D., Reader
To my parents

with deepest gratitude
# TABLE OF CONTENTS

ACKNOWLEDGEMENT ........................................................................................................vi

INTRODUCTION ......................................................................................................................1

CHAPTER I. HYPOTHESIS AS A PRINCIPLE:

The Problem of Existential Interpretation and A Solution .....................13

§1.1. Hypothesis as Existence Statement and the Issue of Being ......................16

§1.2. Hypothesis as Postulate and the Problem of Philosophical Approximation ..........32

§1.3. Hypothesis as Instantiation of Universals .........................................................50

§1.4. Hypothesis as Establishing Facts .................................................................64

CHAPTER II. DEFINITION AS A PRINCIPLE:

A Criticism of the Axiomatic Deductive Reading .................................85

§2.1. Definition as Ultimate Premise in the Axiomatic Deductive reading ........88

§2.2. Knowledge Simpliciter and Conditions of Principles in an Alternative Reading ..........104

§2.3. Definition, Per Se Predication, and the ‘What it is’ Locution .......................130

CHAPTER III. DEMONSTRATIVE KNOWLEDGE:

The Dynamism of Demonstrative Inquiry .............................................172

§4.1. Starting points of Demonstrative Inquiry and the Issue of Nominal Definition ........174

§4.2. Types of Definition, Stages of Inquiry, and Essences ..............................192

§4.3. Imperfect Demonstration and Fallibility of Demonstrative Inquiry .............212
CHAPTER VI. EPISTEMIC CONTINUITY:

The Ground for Demonstrative Knowledge ...........................................223

§4.1. Pre-existing Knowledge of Demonstration ........................................227

§4.2. Simultaneous Knowledge and the Problem of Induction ......................237

§4.3. The *Meno* Paradox and Aristotle’s Response to it ...............................257

§4.4. Epistemic Continuity of Human Cognition: Perception, Experience, and *Noûs* ........269

CONCLUSION ............................................................................................294

BIBLIOGRAHY ............................................................................................297
ACKNOWLEDGEMENTS

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Introduction

*Posterior Analytics: Status Quaestionis*

The subject of the *Posterior Analytics (PoAn)* is *epistêmê*, which was rendered in the medieval period as *scientia*. The historical value of the treatise lies in the fact that it presents the first elaborated theory of scientific knowledge itself in the history of Western philosophy. Moreover, for almost two millenia until the Renaissance era, the treatise maintained the venerable status of not only presenting what *scientia* is but also guiding how scientific knowledge is to be pursued. During that long period of time, it received numerous commentaries and various interpretations with reference to the emergent sciences and philosophies at any particular times.¹

With the advent of the modern era, however, “All that has changed,” as Barnes puts it. He says:²

The modern prosecutors generously allow the *Prior Analytics* a little merit for cultivating, with some formality, one small patch of logic; but they do not spare the *Posterior Analytics*: its first book, they allege, presents in the theory of ‘demonstration’ a barren and pernicious essay in scientific methodology; its second book, on definition, offers a farrago of doctrines about ‘essences’ and ‘real’ definitions which should embarrass even the most liberally disposed reader.

Truly, no scientists in the modern era would have looked up the treatise seeking guidance for their scientific undertakings. For modern sciences based on empiricism had already departed

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from the old Aristotelian-scholastic framework that employs concepts like essence and accident among others. The disparagement of the treatise by the moderns has continued into recent times; for instance, an eminent philosopher like Anscombe finds Book I of the *Posterior Analytics* the worst of Aristotle’s corpus.

Then, in the last quarter of the twentieth century, about twenty years after the first edition of his commentary, Barnes heralds the revival of interest on the *Posterior Analytics* among scholars, this time with embellishment, “The *Posterior Analytics* plays Cinderella in the Aristotelian pantomime…. Some of the interest has been primarily philological or historical; but much of it has had a philosophical drive—and the ideas of the *Posterior Analytics* are widely taken to be as estimable and as sophisticated and as modern as anything in Aristotle’s *oeuvre.*"

As a matter of fact, during the twentieth century, there have been numerous articles, monographs and collections devoted solely to the treatise in addition to the two monumental commentaries by Ross and Barnes.

This revived interest among philosophers (though not from scientists) has grown slowly but steadily from the early years of the last century. The relationship between the two *Analytics* was at the center of the debates at that time, which were initiated by German scholars, notably Solmsen with the backdrop of Jaeger’s groundbreaking work on the development of Aristotle’s

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thought. What is more noticeable in this period is the impact of the rise of mathematical logic on the traditional view of Aristotle’s logic. After Andronicus’ composition of the Organon that comprises Aristotle’s logical works, there was a very long tradition that regarded Aristotelian logic as having a building block structure founded on the ‘terms’ or ‘names’ of the Categories and culminating in the material logic or ‘demonstration’ of the Posterior Analytics. These two parts of logic were mediated by the ‘propositions’ treated in the De Interpretatione and the formal logic or ‘syllogism’ of the Prior Analytics. This traditional rendering of Aristotelian logic is strongly sustained by the notion of logic as an instrument (organon) for the sciences. In opposition to the Stoic notion of logic as a part of philosophy, this notion of logic upheld initially by the Peripatetic School was dominant throughout the medieval period until nineteenth century. For logic as a discipline has, strictly speaking, no place in Aristotle’s tripartite division of sciences into the theoretical, practical, and productive knowledge. In terms of the Thomistic division, logic is rather a rational science that deals with epistemic activities of human thinking or ‘second intentions’ of the mind in medieval terminology.

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7 F. Solmsen, Die Entwicklung der aristotelischen Logik und Rhetorik (Berlin, 1929). W. Jaeger, Aristoteles: Grundlegung einer Geschichte seiner Entwicklung (Berlin, 1923)
9 Metaphysics VI.1; Topics VI. 6, 145a15-18, VII. 1,157a10-11; Nichomachean Ethics VI. 2, 1139a26-29. For an excellent analysis on the place of logic in Aristotle’s division of sciences, see M. Burnyeat, “The Organon as ‘logical’,” in his A Map of Metaphysics Zeta (Pittsburgh: Mathesis Publications, 2001), chap. 5.
10 See Aquinas’ Prooemium to his commentary of the Posterior Analytics: “The parts of logic must therefore correspond to the different acts of reason, of which there are three. The first two belong to reason insofar as it is a kind of intellect. The first of these is the understanding of indivisible or simple things, the act by which we conceive what a thing is. (Some call this act “intellectual representation” or “intellectual imagination.”) Aristotle’s teaching in the Categories is ordered to this act of reason. The second act of the intellect is the composition or division of things that are understood, the act in which truth or falsity is found. Aristotle considers what pertains to this act in his On Interpretation. The third act is proper to reason itself; it is the act by which we proceed from one thing to another, so as to arrive at a knowledge of the unknown from the known. The remaining logical treatises pertain to the third act of reason.” St. Thomas Aquinas, Commentary on Aristotle’s Posterior Analytics, trans. R. Berquist (Notre Dame: Dumb Ox Books, 2007), 1.
Łukasiewicz’s work, influential before and after the Second World War, began the departure from the medieval tradition of interpretation of logic. He interpreted Aristotle’s syllogistic as an axiomatic system that conforms to the view of Frege and Russell about logic as formal ontology.\(^{11}\) He takes Aristotle’s concern in the *Prior Analytics* to be ontic rather than epistemic, and goes so far as to say:\(^{12}\)

“It is not the object of logic to investigate how we are thinking actually or how we ought to think. The first task belongs to psychology, the second to a practical art of a similar kind to mnemonic. Logic has no more to do with thinking than mathematics has.”

This very great change of perspective on syllogistic logic is also reflected in the appraisal of Aristotle’s logic by Bochenski, a renowned historian of logic:\(^{13}\)

For we can distinguish several Aristotelian logics, at least two of which are very different from each other: the early systematization of the Platonic “dialectical” λόγοι in the *Topics* and the formal logic of the *Prior Analytics*.

We now recognize that it makes no sense to speak about Aristotelian logic in general: there is no *one* logic, but rather *several* different ones…. For, if logic is to consist of a set of rules for discussion, then it is an ὑγίαννον, tool of the sciences, a general methodology of inference and discussion. But if it is a set of laws, such as is presented in the *Prior Analytics*, then it is obviously much more than that. It is a μέρος of philosophy, a most general theory of objects.

The drive to deconstruct the traditional understanding of Aristotelian logic reached to other parts of the *Organon*. The *Categories* was frequently an issue, either regarded as an

\(^{11}\) “The system is axiomatized. As axioms Aristotle takes the two first moods of the first figure, Barbara and Celarent. To these two axioms we have to add two laws of conversion, as these cannot be proved syllogistically.” J. Łukasiewicz, *Aristotle’s Syllogistic; From the Standpoint of Modern formal Logic* (Oxford: Clarendon, 1951), 73. See Corcoran’s estimation of Łukasiewicz interpretation: “When modern logicians in the 1920s and 1930s first turned their attention to the problem of understanding Aristotle’s contribution to logic in modern terms, they were guided both by the Frege-Russell conception of logic as formal ontology and at the same time by a desire to protect Aristotle from possible charge of psychologism. They thought they saw Aristotle applying the informal axiomatic method to formal ontology, not as making the first steps into formal epistemology.” J. Corcoran, “The Founding of Logic: Modern Interpretation of Aristotle’s Logic,” *Ancient Philosophy* 14: Logic, Dialectic, and Science in *Aristotle*, eds. R. Bolton & R. Smith (1994): 9.

\(^{12}\) J. Łukasiewicz, ibid. 11.

ontological work of the earlier Aristotle\(^\text{14}\) or as a preface to the *Topics*, considered from the older title of the work, ‘what comes before the *Topics*’ (τὰ πρὸ τῶν τοπικῶν).\(^\text{15}\) In the same venue, the *De Interpretatione* is now understood as closer in content to the *Topics* rather than to the *Analytics*, since it defines and discusses a key concept, i.e., ‘contradictory assertions’ (ἀντιφάσις), which is a vital tool for dialectical debates.\(^\text{16}\)

Since the 1960s, the *Posterior Analytics* has been at the forefront of scholarly debates within a distinctive problem setting. Scholars began to question the real uses of logic—the philosophical and scientific method—in Aristotle’s physical and biological works: given that demonstrative syllogisms starting from principles can rarely be found in Aristotle’s major scientific works, what purpose and use would the theory of demonstration have? In light of the discrepancy between Aristotle’s theory and his practice of science,\(^\text{17}\) G. E. L. Owen in his seminal paper, “*Tithenai ta Phainomena,*” suggested that what is practiced in the scientific works is not the venerable ‘demonstration’ of the *Analytics* but the ‘dialectic’ or the method of ‘endoxa’ in the *Topics*, which was traditionally considered as a peripheral part of the *Organon*.\(^\text{18}\) In a crucial way, Owen’s thesis opened the path toward reassessing Aristotle’s philosophical method and at the same time to revamping the basic characteristics of the *Posterior Analytics*. This move was prepared earlier by H. Scholz and others who reconsidered the theory of

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\(^{16}\) See C. Whitaker, *Aristotle’s *De Interpretatione*: Contradiction and Dialectic* (Oxford: Clarendon Press, 1993), and M. Burnyeat, Ibid.105-106.


demonstration in the *Posterior Analytics* from the viewpoint of ancient axiomatic deductive sciences. The treatise was thought to hold to the ideal structure of scientific knowledge consisting in the *system* of axiomatic deductive knowledge: this system has a finite set of basic and necessary propositions as axioms or principles, equipped with syllogism as formal language. Barnes’ provocative claim—at least at that time but accepted soon as ‘orthodoxy’—that the theory of demonstration is rather a form for philosophical pedagogy can be viewed as the outcome of this interpretive drive.

In developing the theory of demonstration and in constructing his notion of a demonstrative science, Aristotle was not telling the scientist how to conduct his research; he was giving the pedagogue advice on the most efficient and economic method of bettering his charges. The theory of demonstration offers a formal account of how an achieved body of knowledge should be presented and taught. The presupposition of the theory, that such bodies of knowledge exist, may seem optimistic to the point of fatuity.

The elegance of these systems is, of course, the elegance of axiomatisation: the glory of the *Posterior Analytics* is that it represents the first, and for many centuries the only, attempt to characterize and investigate the notion of an axiomatised deductive science.

The net effect of this construal is, however, to eclipse Aristotle’s theory of demonstration in the overall interpretation of his philosophical and scientific method, and consequently to depart from the traditional understanding of Aristotelian logic, where demonstration is located at the apex. On this view, the project that Aristotle undertakes through the theory of demonstration is the one that Aristotle never accomplishes in his scientific works: the earlier Aristotle depicts—rather

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imagines—an ideal state of scientific knowledge, but the mature Aristotle never undertakes his actual practices of sciences according with the strict standard of scientific knowledge.

The flipside of this interpretation was instead to enhance the power of dialectic or the method of *endoxa*, by which one could reach the first principles of science. Irwin’s argument was once much discussed: that Aristotle in his later works, especially *Metaphysics IV*, *De Anima* and the ethical works, investigates the first principles of sciences by means of strong dialectic. Nussbaum went so far as to assert that for Aristotle scientific as well as philosophical activities consist of sorting and puzzling out *phainomena*, i.e., what ‘we say or believe’, and subsequently presenting coherent and so internal truths of human beliefs.

Reacting to the axiomatic reading, a group of scholars who have distinctive interests in Aristotle’s biology, Gotthelf and Lennox among others, tried to find in the *PoAn* II the methodology or heuristics used in Aristotle’s biological works. They presented Aristotle’s demonstration as a dynamic process that is actually employed in his investigation of living things: according to them, there is no discordance between the theory of *Posterior Analytics* and the

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21 His arguments are comprehensive in scope but very subtle in details: the project in the *Analytic*, where metaphysical realism and epistemological foundationalism is evidently presupposed, does not place a significant weight on the pure dialectic that gives only coherence of common beliefs; but the strong dialectic employed in the later works has the power to reach objective grounds of realities. See his own appraisal of the strong dialectic: “Since Aristotle is this sort of metaphysical realist himself in the *Analytics*, it would do him no good, in the light of such assumptions, to think of strong dialectic. For strong dialectic assumes that in some conditions the appropriate kind of coherence between our beliefs constitutes justification for believing them to be true; and in the *Analytics* Aristotle rejects that assumption. In order to take strong dialectic seriously, he has to reject foundationalism.” T. Irwin, *Aristotle’s First Principles* (Oxford: Clarendon, 1988), 482.

22 M. Nussbaum, “Saving Aristotle’s appearance,” in her *The Fragility of Goodness* (Cambridge: Cambridge University Press, 1986), chap. 8. For her construal of internality of Aristotelian truth, refer this statement at 256-257: “Even the contrast between the world as it is for us and the world as it is behind or apart from our thought may not be a contrast that the defender of a human internal truth should allow himself or herself to make using human language. Here we might say that Aristotle usually maintains his internality more consistently than Kant, refusing, most of the time, even to try to articulate what it is that we cannot say…. We can have truth only inside the circle of the appearances, because only there can we communicate, even refer, at all.”

practices in the biological works. This group of scholars, however, leaves untouched the theory of ‘strict demonstration’ in the first few chapters of the PoAn I, which is the main textual locus of ‘demonstration as an axiomatic-deductive science’. Nowadays, it is commonplace to say that “the beginning of wisdom in reading the Analytics consists in distinguishing descriptions of an ideal of science and scientific activity that shows what a perfect scientific theory should be like, and descriptions of what epistemic condition human researchers are in at every moments and careers.” That is to say, within the scope of contemporary Aristotelian scholarship, the Posterior Analytics is to be viewed either as a failed project or to have somewhat inconsistent doctrines within it.

This dissertation is, in one way, a critical dialogue with the recent axiomatic readers of the Posterior Analytics: it aims to deflate the axiomatic interpretation by rediscovering the role of the principles of sciences within the epistemic process of demonstrative investigation. In other way, it takes a position against the interpretation of Detel just quoted, claiming for the treatise a unified and intelligible interpretation of demonstrative knowledge in the two books of the Posterior Analytics taken together. According to this model that we will present, the nucleus of demonstrative knowledge consists in the epistemic processes of mediating between knowledge of facts and knowledge of causes. Unlike the axiomatic-deductive notion, demonstrative knowledge on this view is not a one-directional procedure from axioms and

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24 Barnes acknowledge in his second edition of the commentary the response of these scholars to his axiomatic reading, stating: “Recent scholarship has thought to discover somewhat more profound and systematic connections between APst and the scientific corpus; in some quarters it is again fashionable to speak, in a carefully qualified fashion, of a method promoted in APst and practiced in the scientific writings. . . . It is worth noticing, in any case, that they tend to refer to the theories of definition discussed in APst B rather than the theories of demonstration discussed in APst A. However that may be, it is plain that this is an area in which much work remains to be done.” J. Barnes, Aristotle: Posterior Analytics, xx.

principles to theorems as conclusions. Rather, it consists of both understanding concrete facts from causes and understanding causes from the concrete without vicious circularity. This point could be rephrased by saying that, within Aristotle’s framework for science, the contexts of epistêmê and nous are not sharply separated from each other, in contrast to the axiomatic interpretation: for Aristotle, searching for causes and explaining from them are sometimes concurrent, and not always linear, processes.

In addition, this study intends to reveal a crucial epistemic problem in the *Posterior Analytics*, which is to show how inquiry itself is possible. This is directly related to one of the Platonic inheritances of Aristotle, i.e., the paradox of inquiry in Plato’s *Meno*. Even though this issue does not seem to be significantly addressed in the treatise, this study will show the urgency of solving it for Aristotle’s demonstrative science to be viable. We will seek inside the *Posterior Analytics*, Aristotle’s answer to the problem which will turn out to be Aristotle’s philosophical presupposition of what we will call the ‘epistemic continuity’ of human cognition.

The basic stance of this study is that the text is descriptive of then-current sciences, especially mathematics. That is, Aristotle reflects upon the *epistemic movement* of the mathematical reasoning of ‘analysis’, rather than on a finished *system* of the knowledge that is later crystallized in Euclid’s *Elements*. The strategy of this study is, in the first place, to loosen up the rigid understanding of principles of Aristotelian science as they are interpreted by the axiomatic-deductive model, and then to recover the role of principles within the dynamic movement of demonstration. Accordingly, the main parts of this dissertation will be devoted to treating the principles of science, particularly, ‘hypothesis’, ‘definition’, and the connection of definition to essence.
Chapter 1 will explore the meaning of ‘hypothesis’ as one of the principles or starting points of demonstrative science, with a clear intent of initially deflating the axiomatic-deductive conception of demonstrative science. Four points will be argued. 1) Hypothesis, commonly interpreted by most commentators as a kind of existential statement of the primary terms, fails to show how such existential statements function in demonstration processes. 2) The mainstream interpretation that compares Aristotle’s hypothesis and Euclid’s postulates is a philosophical approximation that is based on the wrong understanding of Aristotle’s view on mathematical objects and reasoning. 3) Hypothesis in demonstrative proof has a role similar to ‘instantiation’ (ecthesis) in ancient geometrical proof. This has been suggested by one scholar, Gómez-Lobo, though he did not fully exploit its significance or connect it with demonstrative processes. 4) Hypothesis has a direct relationship with the establishment of initial facts in demonstrative inquiry, which figure in PoAn II. 1-2.

Chapters 2-3 will concern Aristotle’s notion of definition in his theory of demonstration. Chapter 2 will in large parts take a negative route to elucidating the notion of definition as the second principle of demonstrative science. It will be shown that the locus classicus of the axiomatic interpretation, PoAn I. 2 & 4, do not bear on definition as the ultimate premises (propositions) of a science in the way the axiomatic interpretation conceives. First, we will present the axiomatic readers’ construction of ‘knowledge simpliciter’ and the six conditions for principles in PoAn I.2, indicating at the same time some serious drawbacks of it. The most critical point among them is that they presuppose the contemporary idea that the basic unit of

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knowledge is the proposition, when they read Aristotle. Second, we will propose an alternative reading of the six conditions for principles from the perspective of concepts (or universals) instead of propositions. The result of our new reading is that these point to the way in which maximal universal causes—our rendition of ‘commensurate universals’—should be sought in a demonstrative inquiry. Third, we will examine the extremely important predications in PoAn I.4, \textit{kata pantos, kath’ auto and kath’ holou}, which are, according to the axiomatic interpretation, three requirements that the so called definitional premises of demonstrative syllogism should fulfill. It will be argued, contra the axiomatic interpretation, that they concern rather the condition which the ‘definiens’ (\textit{medium demonstrationis}) has to satisfy in its relation with substrate (subject) and attribute.

Chapter 3 will be a positive treatment of definition as a principle in specifics, and a synoptic view of Aristotelian demonstration in general. Three points will be argued. 1) Definition as a principle (starting point) is the \textit{nominal} definition that triggers demonstrative inquiry. 2) Definition has \textit{multiple} significations in the epistemic processes of demonstrative investigation, first in the stage of establishing concrete facts and then in the final—sometimes tentatively final—and reflexive product of a demonstrative investigation. 3) Demonstration is a \textit{dynamic} fallible process moving back and forth in between both \textit{quia} demonstration and plausible \textit{propter quid} demonstrations.

Chapter 4 will investigate the implication of PoAn I.1 and PoAn II.19, the opening and closing chapters of the treatise. It will be argued here that Aristotle’s discussions in both places bear on the initial (\textit{non}-incidental) grasp of \textit{particulars} in a demonstrative investigation, in contrast to the common and historically dominant understanding that they have to do with preexisting knowledge or the starting point (\textit{archê}) of demonstrative \textit{deduction}. We will find
also in both places Aristotle’s responses to Plato’s epistemic thesis, the real gap between perceptual knowledge of particulars and noetic knowledge of universal forms. Behind Aristotle’s responses, we will reveal, lies a philosophical presupposition, ‘epistemic continuity’: man’s cognitive faculties from perception to nous are continuously conjoined such that not only each of the lower levels of cognition is articulated and deepened by the upper level, but also that each of the upper levels of cognition is presupposed and confirmed by the lower ones. In this understanding of Aristotle’s ‘epistemic continuity,’ nous works or is operative on all levels of demonstrative processes and definitions. These points will be made by treating 1) the questions of pre-existing knowledge, 2) the induction in simultaneous knowing, 3) Aristotle’s reference to the Meno paradox in PoAn I.1, and 4) the three accounts of knowing the principles in PoAn II.19.
Chapter 1

Hypothesis as a Principle:
The Problem of the Existential Interpretation and a Solution

Introduction

It is well recognized that Aristotle’s demonstrative science has three ultimate principles (archai), i.e., axiom, definition, and hypothesis. These are introduced and described in the first few chapters of book I of the *Posterior Analytics*. When we read accounts of the structure of Aristotelian science, what is most conspicuous among the fundamental principles is definition. The principles axiom and hypothesis are treated peripherally by scholars. This can be easily seen by reviewing many works on Aristotle’s philosophy of science, whether they are introductory or not.

The reason why definition is treated as central part of principles of demonstrative science seems to lie in the following. First, Aristotle’s remarks on the other two principles are very limited in the *Posterior Analytics*. They are mentioned briefly only in chapters 2, 7 and 10 of Book I. Contrastingly, there are many remarks on definition in the first book of the *Posterior Analytics*, while it is intensively dealt with in the first ten chapters of the second book. Thus, we might be inclined to consider that axiom and hypothesis are relatively insignificant part of the structure of demonstrative science.

Second and more importantly, the usual and traditional understanding of Aristotle’s demonstrative science, according to which a science proceeds from ultimate premises within the domain of the science by syllogistically deducing propositions and facts, does not demand much treatment of the other two principles, especially hypothesis. For such an understanding of
demonstrative science, i.e., axiomatic-deductive interpretation can proceed without concern about hypothesis as a principle. That is, details about what hypothesis is and how it functions in the demonstrative structure of science do not have much effect on the axiomatic-deductive interpretation. However, if we examine Aristotle’s remarks on hypothesis as an ultimate principle, which is to be distinguished from the usual meaning of hypothesis,¹ they do not quite match the axiomatic-reading of Aristotle’s demonstrative science.

This chapter deals with hypothesis as a principle within the structure of Aristotle’s demonstrative science. It will endeavor to show that hypothesis as a principle is as much a central part of demonstrative science as definition and axiom. The interpretation this chapter brings forth about hypothesis, as its conclusion, will demand revision of the traditional interpretation of demonstrative knowledge in the *Posterior Analytics*. That is, contrary to the axiomatic interpretation, which regards hypothesis as at best ‘existential underpinning’ of the subject genus of a domain of science, the view of hypothesis this chapter argues for will incorporate hypothesis in a picture of demonstrative inquiry. In the process of demonstrative inquiry, hypothesis as a principle will be shown to be a starting point that sets forth scientific facts, which are to be proved in the remainder of the inquiry. If this chapter succeeds in arguing these points, ‘*hypothesis as a starting point in the demonstrative inquiry*’ will serve in this study as a first and significant step to deflate the traditional but still lingering understanding of demonstrative knowledge in the *Posterior Analytics*, i.e., the axiomatic reading.

The first section, while examining the main texts concerning axiom, definition and

¹ The normal meaning of ‘hypotheses’ for Aristotle is ‘taking something for granted,’ i.e., any true assumption within a science; for example, see *Physics*, VIII. 3, 253b5.
hypothesis as principles, will deal with how interpreters of hypothesis as an existential statement of ‘subject-genus’ manage to avoid textual difficulties with the axiomatic reading. Some interpreters are shown to drive to create a theoretical chimera for hypothesis. Here, focus will be on the key issue of translating the ‘to be’ (einai) when the ‘hypothesis’ is said ‘to be’.

After the presentation and criticism of several existential interpretations, the second section will argue that the existential interpretation of hypothesis is based on the traditional but philosophically biased comparison of Aristotelian principles with Euclidean principles. Here, the main thesis is to argue against a philosophical approximation of Aristotle’s hypothesis into Euclidean postulates, and to assert that this approximation is based on the wrong interpretation of Aristotle’s view on mathematical objects and reasoning.

In the third section, we will review an alternative reading of hypothesis that has been proposed by Gómez-Lobo. He proposes that hypothesis as a principle is analogously viewed as a sort of geometrical exposition (ekthesis) in the process of mathematical proof procedures. This section will strive to confirm and explicate the contention of Gómez-Lobo, maintaining that hypothesis as a principle is the setting forth of a particular falling under universal, i.e., instantiation. It will be argued that this alternative interpretation can actually serve to deflate the axiomatic-deductive understanding of Aristotelian demonstrative science.²

The fourth section is the further development of the third section. It will strive to connect the notion of hypothesis as instantiation to which we concluded in section three to the notion of the two scientific questions—‘if it is?’ (ei esti) and ‘that it is?’ (hoti esti)—that are presented in

²The exegetical issues concerning ‘hypothesis’ may be a small part of the full understanding of the structure and functioning of Aristotel’s demonstrative science, but it will be shown that the proper understanding of the concept provides us with a reason to deflate the rigid understanding of demonstrative knowledge as axiomatic.
the first two chapters of the second book of the *Posterior Analytics*. Here, it will be argued that the two notions coincide in the context of ‘establishing facts,’ that is, the first phase of demonstrative inquiry.

§1.1 Hypothesis as Existence statement and the Issue of Being

Aristotle’s first and full remarks on ‘hypothesis’ are as follows:³

[A] An immediate deductive principle I call a posit (θεσία) if it cannot be proved (δεικτικαί) but need not be grasped by anyone who is to learn anything. If it must be grasped by anyone who is going to learn anything whatever, I call it an axiom (there are items of this kind); for it is of this sort of item in particular that we normally use this name. A posit which assumes either of the parts of a contradictory pair—what I mean is that something is or that something is not (τὸ ἐίναι ὁ τι ἢ τὸ μὴ ἐίναι τι)—I call a supposition [hypothesis]. A posit which does not I call a definition. Definitions are posits (arithmeticians posit that a unit is what is quantitatively indivisible), but they are not suppositions (for what a unit is and that a unit is are not the same).

We need to point out first the apparent difficulties that this passage presents in light of what immediately precedes it (71b20 – 72a6). For Aristotle there identified the ‘primitives’ and ‘principles’ with immediate propositions (protasis amesos), just after he had enumerated the six logical or epistemological requirements that the premises of ‘the strict sense of demonstration’ should satisfy.⁴ Can we say for sure then that the three items Aristotle classifies as principles are the immediate and ultimate propositional premises of demonstrative knowledge? Even a swift reading shows the following absurdities:

(A1) Hypothesis, e.g. a statement that “a unit is” takes its place as a premise of a

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⁴ *PoAn.* I. 2, 71b20-34. The main idea is that we have demonstrative knowledge of P in so far as we syllogistically infer it from premises that are true, primitive, immediate, better known than, prior to, and explanatory of P.
demonstrative syllogism. Even the statement that “a unit exists” would be strange, because it is still not a categorical statement.

(A2) Definition, e.g. a statement that “a unit is a quantitatively indivisible” is not a proposition in the sense specified at 72a 8-14. Here Aristotle says that “a proposition is one part of a contradictory pair, one thing said of one,” while clearly denying at 72a21-22 that definition does not “assume either of the parts of a contradictory pair.” Then does this entail that definition cannot serve as a premise of demonstrative proof?5

(A3) what Aristotle calls an axiom, e.g. a conditional statement that “if equals are removed from equals, the remainders are equal” should serve as a premise of demonstration, even though it does not seem to conform to the syntax of categorical statements.6

Apart from these difficulties, the pedagogical criterion in the passage—‘should or should not be grasped by a learner’—that Aristotle brings in for distinguishing axioms from posits (theses) seems to be out of place, when it is considered in the context of the preceding passages.7

On the whole, the three principles of demonstrative science appear not to fit with the axiomatic and syllogism-oriented reading of demonstrative knowledge. Hypothesis and axiom do not syntactically conform to any categorical statements, and definition is according to Aristotle not endowed with the status of a proposition or a premise. If Aristotle’s remarks on the principles have no direct bearings on the ultimate premises of demonstrative knowledge, we have to ask what status and use in demonstration Aristotle has in his mind for the principles. We need

5 See also PrAn. I. 1, 24a17; “A premise (protasis) is a sentence affirming (kataphatikos) or denying (apophatikos) something about something.”
6 As a matter of syntax, axioms do not match with any of the four categorical statements; PrAn. I. 1, 24a17-20
7 A similar pedagogical criterion is used for distinguishing hypothesis from postulation; PoAn. I.10, 76b27-34.
to look further to clarify the problem.

When Aristotle sets out in PoAn I.7 to establish the impossibility of demonstration from one genus to another, i.e., proving something in a physical subject matter by a mathematical argument, he announces:  

[Ba] There are three things involved in demonstrations: one, which is being demonstrated, or the conclusion (this is what holds of some kind in itself); second, the axioms (axioms are the items from which the demonstrations proceed); third, the underlying kind [subject genus] (τὸ γένος τὸ ὑποκείμενον) whose attributes—i.e. the items incidental to it in itself (τὰ καθ' αὐτὰ συμβεβηκότα)—the demonstrations make plain.

The triad, i.e., the three elements of demonstrations that are displayed here, is offered by Aristotle in a slightly different version in PoAn I.10:  

[Bb] Every demonstrative science is concerned with three things: what it posits to exist [be] (these items constitute the kind (τὸ γένος) of which it studies the attributes which hold of it in itself); the so-called common axioms (τὸ κοινὰ λέγονα ἀξίωματα), i.e. the primitives from which its demonstrations proceed; and thirdly, the attributes (τὰ πάθη), where it assumes what each of them means. . . . None the less by nature there are these three things: that about which (περί ὧν) the science conducts its proofs, what it proves (ἀ δείκνυσι), and the items from which (ἐξ ὧν) it proves.

The point to be made in these two texts is quite clear. There are three elements—not principles—that we demonstrate: (B1) the underlying kind about which demonstrations are concerned; (B2) the attributes or ‘per se incidentals’, that is, what demonstrations proves; (B3) the axioms from which demonstrations proceed. Accordingly, the overall picture of demonstration in a science we obtain from these elements is that a science proves attributes of subjects in a kind (or the subject kind itself) from the common axioms. However, if we look closely at the different phrasing of attributes, i.e., “conclusion” (to sumperasma) in [Ba], we may

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8 PoAn. I. 7, 75a39-b2. See also Meta.99a5-9.
9 PoAn. I. 10, 76b11-16.
reduce the three *elements* into just two different kinds of *propositions*: (B1’) a conclusion of a demonstration where an attribute is predicated of an underlying subject; (B2’) axioms that make the demonstrative deduction possible. Doubtlessly, this analysis of elements of demonstration is strange to a person who understands by Aristotelian demonstration the chains of deductive argument starting from unproved or immediate premises frequently called principles, because there are not any ‘premise elements’ in this analysis.

The following passages from *PoAn* I. 10 might provide a clue to bridge the chasm between the text [A] and [B] on the one hand, and between the two texts and the axiomatic understanding of demonstrative science on the other.

[Ca] I call principles (ἀρχαὶ) in each kind those items of which it is not possible to prove that they are (ὅτι ἐστί). Now what the primitives (τὰ πρῶτα) and what the items proceeding from them mean (τί σημαίνει) is assumed; but that they are must be assumed for the principles and proved for the rest. E.g. we must assume what a unit is or what straight and triangle are, and also that units and magnitudes are; but we must prove everything else.10

[Cb] Of the items used (χρώματα) in the demonstrative sciences some are proper to each science and others common. . . . Proper too are the items which are assumed to exist [be] and concerning which the science studies what holds of them in themselves—e.g. units in arithmetic, and points and lines in geometry. They assume that there are such items (τὸ ἔχει), and that they are such-and-such (τοῦ ἔχει). As for the attributes of these items in themselves, they assume what each means—e.g. arithmetic assumes what odd or even or quadrangle or cube means and geometry what irrational or inflexion or verging means—and they prove that they are, through the common items and from what has been demonstrated. Astronomy proceeds in the same way.11

Here, Aristotle brings in the dichotomy of “that it is” (*hoti esti*) and “what it means” (*ti sēmainai*), and applies them to the triad of demonstrative elements. The results are the four assumptions and one proof of demonstration:

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10 *PoAn*. I. 10, 76a31-36.
11 *PoAn*. I, 10, 76b2-12.
(C1) Assuming that the primitives (underlying subject) are;

(C2) Assuming what the primitives (underlying subject) mean;

(C3) Assuming that axioms are;\(^{12}\)

(C4) Assuming what the derivatives (the attributes) mean;

(C5) Proving that the derivatives (attributes or per se incidentals) are.

The following chart will make us see clearly what we have dealt with in the three main texts up to now:

<table>
<thead>
<tr>
<th>Principles of science</th>
<th>Elements of science</th>
<th>Assumptions of science</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A1) Hypothesis</td>
<td>(B1) the underlying subject (about which)</td>
<td>(C1) that underlying subject is</td>
</tr>
<tr>
<td>(A2) Definition</td>
<td>(B2) the attributes or ‘per se incidentals’ (what)</td>
<td>(C2) what underlying subject means</td>
</tr>
<tr>
<td>(A3) Axiom</td>
<td>(B3) axioms (from which)</td>
<td>(C3) that axiom is</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(C4) what attributes mean</td>
</tr>
</tbody>
</table>

We can see that the content of the first principles (archai) and the assumptions (lambanounta) overlaps and diverges in ways which need somewhat careful treatment. First, [(A1) and (C1)] and [(A3) and (C3)] correspond to each other, evidenced by the examples Aristotle uses. That is, it is the starting points (archai) of each demonstrative sciences to assume the ‘being’ of their proper underlying subjects (hypothesis), and the ‘being’ of common axioms,

\(^{12}\) Theoretically, it should be possible to assume what axioms signify, but Aristotle does not raise this question in any places. It is most likely that Aristotle’s treatment of ‘Principle of Contradiction’ and ‘Excluded Middle’ in the Metaphysics confronts the “that it is (true)” side of the axioms.
since these two are the primitives and their being (hoti esti) cannot be proved. And while we can notice that the assumption (C2) is none other than what Aristotle classifies as definition (A2), it is an open question whether the assumption of signification of attributes (C4) is also included in what Aristotle calls definition. If we exclude it from the domain of definitions, we might run the risk of losing key ingredients of demonstrative knowledge, since demonstrative knowledge mostly consists in proving or explaining the fact that certain subjects receive as predicates certain per se incidentals (C5). At any rate, the definition as a principle is viewed as the assumption of the meanings of key terms, and it is thought to be unprovable likewise.

At this point, two important questions should be raised against this background. First, why does Aristotle classify the three kinds of principles as principles? In other words, why does Aristotle render these three items as indispensible starting points that any demonstration should hold to? Aristotle’s answer is already implied by his insistence that these three items cannot be proved in the same way as a demonstration proves something else. That might be the thrust of Aristotle’s identifying ‘principle’ with ‘primitive’ and ‘immediate’ (to ameson). Then, we may ask one more time why Aristotle thinks that the ‘primitives’ and the ‘immediate’ cannot be proved. We should be careful of our answer here, because when Aristotle mentions ‘immediate’ it has a double-sided implication. On the one (familiar) side, if a proposition does not allow for interposition of any other (middle) term between its subject and predicate, it is said to be immediate. On the other side, if a proposition or something cannot be obtained by any further

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13 That axioms are thought by Aristotle as one of the primitives is clear by his syntactic construction too. An axiom, such as “equals taken from equal leave equal” is taken as a one whole, worded by a that-clause (I.10, 76a41; I.11, 77a33-31) or incomplete infinitival clause (I.10, 76b20-21).

14 This point is main burden of Chapter 2 and Chapter 3 of this study.
argument, it is said to be immediate too.\textsuperscript{15} To ignore the second sense of the ‘immediate’ leads to the mistake of interpreting all principles as unprovable premises of demonstration because of the immediacy (having no middle) of their propositions. As has been pointed out in the presentation of the text [A], hypotheses and axioms at least by their syntactic forms escape this interpretation. To make things complicated, Aristotle says that what cannot be proved regarding principles is their being (\textit{hoti esti}), i.e., the being of the underlying subject and the being of axioms. What does Aristotle mean when he speaks of assuming their being?

Second, we have to ask how and in what manner the three kinds of principles rule and govern (\textit{archô}) the process of demonstration. We can easily answer that they function together as the first premises of demonstrative syllogism. It could be a direct response, granted Aristotle’s remark that principles are immediate premises of demonstration (I.2, 76a8). Leaving aside the issue of axioms for the moment, however, the major obstacle against this view is Aristotle’s strong restriction that only hypotheses are propositions, which assume one part of contradiction, i.e., one thing said of one (\textit{ti kata tinos}).\textsuperscript{16} We can discern that the requirement for propositions is quite straightforward:\textsuperscript{17}

[D] Terms [definitions] (\textit{ôrroi}) are not suppositions (they are not said to be or not be anything; \textit{ouden ga õr ei0~nai h0/ mh \le/getai}). Rather, suppositions [hypotheses] are found among propositions. Terms [definitions] need only be grasped; and grasping something is not supposing. . . . Rather, suppositions are items such that, if they are the case, then by their being the case the conclusion comes about.

\textsuperscript{15} This distinction has been made by Hintikka. According to him, ‘\textit{atomos}’ (atomic) equals to ‘\textit{ameson}’ plus ‘\textit{adiaireton}’ (indivisible). Hintikka, “On the Ingredients of an Aristotelian Science,” \textit{ Nous} 6 (1972): 61.

\textsuperscript{16} Commentators are puzzled by Aristotle’s use of this terminology. Ross says that 71b18-20 is the only passage in which hypothesis has this strict sense. W. D. Ross, Aristotle’s Prior and Posterior Analytics: A revised Text with Introduction and Commentary (Oxford; Clarendon, 1949), 510-511.

\textsuperscript{17} PoAn. I. 10, 76b35-39.

\textsuperscript{18} It is a clear example of inconsistency in Barn’s translation of ‘being’ in the case of hypothesis. Here he adopts predicative use of being.
If the hypothesis is the sole possible candidate for premises of demonstration as Aristotle clearly claims, we have to clarify how definitions and axioms serve non-propositionally in the process of demonstrations. But more importantly, we have to be able to reformulate the surface form of the hypothesis—“something is or something is not”—into the syntax of a proposition. It will require interpreters to confront the difficult task of revealing the hidden logic of being.

Hence, the two important questions raised here concerning the Aristotle’s principles—the improvability of principles and the function of them in demonstration—hinge on how to interpret the meaning of ‘being.’

The path that most commentators have taken for solving the problems, however, is quite the opposite. Boldly disregarding Aristotle’s insistence that only the hypothesis is an assertoric proposition, they construe the hypothesis as a sort of existential statement. This interpretation not only has a long tradition in Aristotelian scholarship but also gains strong supports among current scholars. At the passages cited above, especially text [A] and [Cb], we have already seen that Barnes explicitly translates the ‘being’ in the several key sentences existentially, whereas he keeps somewhat neutral translation regarding the specific examples:19 “what I mean is that something is or that something is not (τὸ ἐἶναι τὰ ἄντι τὸ ἐἶναι τῶν—Ι call a supposition” (72a20-21); “Proper too are the items which are assumed to exist” (76b3 ); “They assume that there are (τὸ ἐἶναι) such items” (76b6). Barnes notes in his commentary that “Hence we might better follow the majority of the commentators in construing “that something is” as “that there are Fs,” thus taking suppositions to be exclusively existential propositions. In favour of this is

the fact that Aristotle’s examples are existential (72a24; A10.76a35).”20

Still, the real motive for Barnes adopting the existential translation seems to be his belief that only definitions are proper vehicle of demonstration. For he says that “definitions are posits, posits are principles, and principles (72a7) are propositions.”21 As a matter of fact, Aristotle says on a number of occasions that the basic starting points of demonstrations are definitions.22 Thus, Aristotle’s remarks in our texts that definitions not only lack the assertoric force but also do not allow universal or particular predication has puzzled interpreters:23 If definitions are not universal or particular, how could they work as premises of scientific knowledge? For Aristotle asserts that every propositions used in demonstrations should be universal in quantity.24

Confronting the puzzle, the traditional interpretation tries to find a sort of exegetical escape by reinstating definitions in their proper status in demonstration while at the same time downplaying the propositional characteristic of hypotheses. The result is the following: (1) the ‘definition’ mentioned in our texts is different in kind from the real definition, which is an immediate premise of demonstration, and (2) the ‘hypothesis’ is divided into two types, one with the technical sense, i.e., the existential statements of subject-genus, and the other in the usual sense that serves as premises of demonstration.

Let us examine first how the traditional interpretation reinstates definition as the primary bearer of demonstration knowledge. The strategy is quite indirect in that the status of definition as an immediate premise is intact in the passage (72a19-25), where definition is contrasted with

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20 J. Barnes, Aristotle: Posterior Analytics, 100.
21 Ibid.
22 PoAn. II. 3, 90b24; II.17, 99a22-23.
23 PoAn. I. 10, 77a4-5; “Again, every postulate and supposition is either universal or particular, and terms are neither of these.” Barnes, Aristotle: Posterior Analytics, 101.
hypothesis. For definitions here rather means ‘definiens’: “If Aristotle is thinking in this passage of definentia, the reason for these statements [in definitions nothing is said to be or not to be] become clear. A definiens is a predicate (rhêma). As such, it is like any other name in that it is a significant sound, but taken by itself, it does not assert anything which is true or false, universal or particular. Taken by itself, its function is to arrest thought.”25 A definiens is here taken to be an aspect of a definition in the sense that it is an answer to “what is it (ti estin)?” Thus, the seeming inconsistency between the definition in our texts and the definition as immediate premises is resolved, it is claimed. In addition, according to the interpretation, the real meaning of definition is implied by Aristotle in the assumption of what the primitive and derivative terms mean.26

This interpretation has a serious drawback, however. It does not explain why Aristotle is pointing out only an aspect of the definition, i.e., definiens, when he describes such an important issue as the principles of demonstrative sciences. Moreover, as frequently pointed out, the assumption of the meaning of primitive and derivative terms which the interpretation identifies with the real definition is rather close to the ‘nominal definition,’ which is frequently cited in the second book of the Posterior Analytics.27 In fact, it is appropriate to call the meaning of primitive and derivative things (terms) nominal definitions, since the latter do not have an

26 Ibid.
27 Ian, Mueller, “On the Notion of a Mathematical Starting Point in Plato, Aristotle, and Euclid,” in Science and Philosophy in Classical Greece, ed. Alan Bowen (New York: Garland Publishing Inc., 1991), 80. The implication of ‘nominal definitions’ is also mentioned in I.1.71a11-16; “There are two ways in which we must already have knowledge: of some things we must already believe that they are, of others we must grasp what the items spoken about are.”
assertoric force as the definition at 72a19-25 does not.\textsuperscript{28} For, no matter how we construe the ‘that it is’ (*hoti esti*) of the primitive and derivative things, either as having assertoric force or existential import, it is evident that the meanings of primitive and derivative terms do not have this feature, because they are single terms. This is the same reason Barnes is obliged in the last resort to translate *horoi* at 76 b35 simply as ‘terms’ rather than definitions.

The fact that the definitions in our texts [A] and [C] could not be deemed to be the real definition sets the stage for most other commentators to easily interpret the hypothesis as an existential claim of a subject genus of a science. When “*to einai ti*” is said of hypothesis, ‘*ti*’ is normally taken as having the syntactic place of subject, and the verb ‘*einai*’ as having a sense of existence. By the parallelism of the syntax, “*to einai monada,*” is translated as “a unit exits.” But there are two other possible analyses of its syntactic form; ‘*ti*’ can be either a subject or a predicate of a statement where the verb ‘*einai*’ is taken as a predicative sense. In those cases, the example sentence can be: “a unit is x (something),” or “x (something) is a unit.”

Still, these two alternative translations are easily overlooked by most commentators, despite the fact that they conform to Aristotle’s criterion of propositions (*ti kata tinos*). The rationale for the disregarding is to some extent based on the texts. For Aristotle does not put forward any single statement of hypothesis by the syntactic form of subject-predicate statement; the examples, all of which are from mathematics, bear witness to this fact. Furthermore, even if we could always formulate a subject-predicate form for a hypothesis, we would immediately confront the problem of telling the semantic difference between hypotheses and definitions. For,\footnote{\textsuperscript{28}Thus, Hintikka includes among the basic assumptions of demonstrative sciences nominal definitions along with common axioms, generic premises, and atomic premises. Hintikka, “On the Ingredients of an Aristotelian Science”: 66-67.}
while the semantic status of the predicate of a definitional statement is to be the *definiens* of a subject, e.g. “what is quantitatively indivisible” for a subject “unit,” it would not be easy to figure out the semantic status of the predicate of a hypothesis statement. Switching this point to the setting of the assumption of an underlying subject (C1), what could be the semantic content of the predication of an underlying subject?

In contrast to the alternative interpretations that have such difficulties to be solved, the existential interpretation is seen to match well the above account of the definition in our texts. According to the existential interpretation, the hypothesis as a principle of demonstrative science is the same as the assumption of existence of the underlying subject (subject-genus) in a particular science; in arithmetic, “units exist,” and in geometry “points and lines exist.” By the same token, the *being* of attributes (*per se* incidentals of subject-genus) is viewed as the existence of the entities: ‘odd’, ‘even’ or ‘quadrangle’ in arithmetic, and ‘irrational’, ‘inflexion’ or ‘verging’ in geometry are proved to *exist* in demonstration. As a result, in Aristotle’s basic assumptions of demonstrative sciences, there are two distinct metaphysical entities: “Aristotle distinguishes between two kinds of beings on the basis of the sort of *explanation* proper to them. On this reading Aristotle distinguishes between those beings whose existence is to be rendered intelligible only on the basis of their essences (for, metaphysically, they have no cause other than their own essences), and those whose existence is to be explained on the basis of other entities.”

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29 Notice Hintikka’s firm assertion that “*to eînai* here means *existence* pure and simple, not being this or that. Hintikka, “On the Ingredients of an Aristotelian Science,” 64.

Within the framework of two distinct entities whose modes of being are existentially interpreted, the existence of \((\text{per se})\) attributes is to be proved with the help of two things, on the one hand by the premises of (nominal) definitions, and on the other hand by the claim of existence of subject-genus. Strictly speaking, the existential claim of subject-genus \textit{does} take a second place to definitions in the main business of demonstration; what it does is just to provide ‘existential import’ down to the nominal definitions in order that assertions about derivative terms cannot be vacuous. McKirahan nicely recapitulates the point as follows:\textsuperscript{31}

Existence claims prove to be the existential underpinning that gives definitions a grip on reality. Even if they did not appear in any proofs as premises, they would be presupposed in proofs. The links are straightforward: science deals in the \textit{per se}, the \textit{per se} depends on “what it is,” and the “what it is” presupposes existence. Therefore, some existence claims are needed.

As we can see in the above comment, it is agreed among commentators that the existence claim of the subject-genus is not an actual premise of demonstration, but a presupposition of a particular science, just as axioms are prerequisite rules of inference in demonstration. In this respect, it is noted, the existence claim is similar to the modern logical notion of a theory presupposing a subject domain.\textsuperscript{32} If it is true, then we may reorganize Aristotle’s principles into the formal and the material:

(I) Formal principles

(i) Existential presupposition of subject-genus (S): Ex (Sx)

(ii) Rules of inference: Axioms

\textsuperscript{32} Mueller, “On the Notion of a Mathematical Starting Point in Plato, Aristotle, and Euclid,” 77-78.
(II) Material principles: Nominal definitions of primary and derivative terms (Sn):

\[ \text{Def (S)} \& \text{Def (S1, S2, S3,... Sn)} \]

In this scheme, it should be emphasized one more time, the existence claim does not directly engage in the actual processes of demonstration; \( \text{Ex (Sx)} \rightarrow \text{Def (S)} \rightarrow \text{Def (Sn)} \).\(^{33}\) To explain the point in concrete terms, all properties of geometry, e.g. triangle, quadruple, and convergence should be ultimately explained by the definition of line and unit, while their existences are already guaranteed by the initial claim of existence of line and point as far as the proof is successful.

It is interesting that the existential claim, which is a one-time presupposition of demonstrative sciences, is deemed to be true to a scholar like Ferejohn, who vehemently argues that Aristotle’s treatment of principles and assumptions of demonstrative science should be viewed not as the actual sphere of demonstration, but as the pre-syllogistic sphere, i.e., \textit{diairesis}. For he alleges that “any applications of the method [of division] . . . involve the presupposition that the genus under division actually \textit{does} exist (i.e., that it is a genus of real things).”\(^{34}\)

It is quite doubtful whether Aristotle thinks about demonstrative knowledge in general, and hypothesis in particular, in this way. Does Aristotle radically separate the existential import from the assortoric content of definitions in his theory of demonstration, as the existential interpreters explain? Doesn’t this construal of existence saddle Aristotle with the contemporary logical idea that existence should be expressed only by the existential quantifier? Hintikka, who

\(^{33}\) The interpretation of ‘being’ like this saddles Aristotle with the modern first-order predicate logic, which is grounded on the formal distinction between being of existence and being of predicate; the former conforms to Aristotle’s existential claim, while the latter to nominal definitions.

extensively addresses the issue of being in Aristotle, thinks so:

Aristotle is not thinking model-theoretically of a fixed domain over which quantifiers range. He is thinking of the information conveyed by an actual utterance of a proposition. . . . In any case, such a model theory is not necessary for the purpose of understanding what Aristotle has in mind, anyway. What it shows is that there is no simple way of expressing Aristotelian existential assumptions in a modern logical notation.

In contrast to the presuppositional construal of existence, Hintikka maintains that the existence claim of a subject-genus should be formulated as an actual premise of demonstration. For him, the so-called ‘generic premise’ of a particular science, which he proposes for the assumption of being for a subject-genus (C1), is said to be mere “definitory reformulations of tautologies of the form—every G is a G’,” where G’ serves to define G, even though it appears “surprising and even paradoxical.” This topmost premise in any maximally fine sequence of scientific syllogism is claimed to have the peculiarity that it does not contribute to the analysis of the narrower terms, but in any scientific syllogism the existential import is in fact carried downwards from this generic premises.

Since the thesis of the ‘generic premise’ and the ‘trickle-down theory of existence’ have been criticized by other existential interpreters because of the ambiguity regarding the actual syllogistic connection between the generic premise and the rest, Hintikka adjusts his claims in a recent study. He says that the existence of a genus characteristic of some particular science is in fact introduced by the actual definition of that genus. In other words, in the case of a genetic

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premise we are allowed to make a valid inference from (1) every B is A to (2) every B is (that is, exists). 38 This inference is possible, he maintains, because of the inextricable connection between predication and existence in the case of essential and *per se* predication. 39 Here we can simply notice that he is distorting the texts, since Aristotle evidently distinguishes the ‘that it is’ of the underlying subject (C1) from the ‘what it signifies’ of it (C2) at his classification of assumptions of demonstrative sciences. That is, Hintikka muddles the crucial distinction in his effort to incorporate the existential claim into an actual premise of demonstration.

Another feature that Hintikka adds to his original thesis is the ‘asymmetry of Aristotle’s syllogism’, by which he means that only major terms in syllogism have the function of transmitting a hidden force, whether it is epistemic/modal force or existential one. 40 So he claims that the existential import in a series of nested syllogisms is handed down step by step through the major terms initially from the generic premise.

The overall thrust of Hintikka’s arguments is quite understandable in that the ‘being’ in Aristotle’s thinking escapes the clear-cut distinction of Frege-Russell thesis. However, his construal of the generic premise seems, with all measures considered, to be an *ad hoc* creation, still in service of the axiomatic and syllogism-oriented understanding of Aristotle’s demonstrative science whereby demonstration is syllogism that proceeds linearly from unmediated premises.

39 He supports his argument here by *De Interpretatione*, 11.21a29-32.
40 For example, the following syllogism is a valid argument with a (hidden) operator where ‘K’ means “it is known that”:

\[
\begin{align*}
(x) \ [B(x) \to KA(x)] \quad \Rightarrow \quad (x) \ [C(x) \to KA(x)]. \\
(x) \ [C(x) \to B(x)]
\end{align*}
\]
Before moving to the next topic, we need to indicate a few other weakness of the existential interpretation of Aristotle’s hypothesis. First, what applies to the being (hoti esti) of subject genus and attributes, we should be able to say also of the axioms, but it is highly unlikely that Aristotle intends the ‘existence’ of an axiom. What matters in a science assuming the being of an axiom, e.g., “if equals are removed from equals, the remainders are equal,” is most likely the veracity rather than the existence of it. Second, we should remember that Aristotle mentions not only the positive side but also the negative side of hypothesis, i.e., “something is not.” How can a claim of nonexistence be a principle or an assumption of a science, if we accept the existential interpretation? To this question, Aristotle’s treatment of ‘void’ in Physics is frequently and briefly brought up as a defense for the existential reading. Nonetheless, it is clear that the nonexistence of void is not a starting point (principle) of a demonstration or an inquiry, but an end point of entirely dialectical arguments. Without further explanation, the idea of Aristotelian science that presupposes the nonexistence of a subject is implausible.

§1.2 Hypothesis as Postulate and the Problem of Philosophical Approximation

It is not difficult to discern that when Aristotle mentions the kinds of principles of his demonstrative sciences and their characteristics in the passages we examined, he has a certain paradigm case in hand, i.e., the mathematics in his time. At least prima facie, his reports on mathematical science seem to take a quite a descriptive stance, rather than the prescriptive and critical one that we sometimes observe in Plato’s writings. On account of the predominance of mathematics for the scientific examples especially in the first book of the Posterior Analytics and

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41 R. McKirahan, Principles and Proofs, 43; Owen Goldin, Explaining an Eclipse, 67.
Aristotle’s approving and descriptive attitude to mathematics,42 scholars in the last century expended much effort to reveal the historical and philosophical impact that the mathematics in Aristotle’s time had made on the formation of his theory of demonstrative sciences, and perhaps vice versa.43 It could be no coincidence that there was a great success in the axiomatization of mathematical knowledge at the almost same time that there was a philosophical investigation of the systematization of scientific knowledge in Aristotle’s Posterior Analytics.

What especially draws our attention in studies of Aristotle’s use of mathematics is the relationship between Aristotle’s principles and Euclidean principles. Because of the striking presence of the triple division of the principles in both Euclid and Aristotle, much work has been devoted to the one-to-one comparison of them, even though it is nearly impossible to decide how Aristotle undertook and applied the ‘Pre-Euclidian Elements’ in his deliberation on theory of science. It would be both redundant and beyond the scope of this study to go into all the details of the extensive studies of the relationship between them. Instead, this section will focus on highlighting the gray-area that the comparison studies do not make clear. In what follows, it will be argued that despite the clear conception of axioms/common notions and definitions in both Aristotle and Euclid, the ill-fit between Aristotle’s hypotheses as existentially interpreted and Euclid’s postulates should give us pause about treating Aristotle’s principles as Euclidian ones. Following the discussion, a new approach to understanding Aristotle’s notion of principles will

42 According to the report by Wians, there are a total of 118 cases of mathematical examples in the Posterior Analytics; W. Wian, “Scientific Examples in the Posterior Analytics,” in Aristotle’s Philosophical Development, ed. W. Wians (Lanham: Rowan & Littlefield, 1996), 134.

be explored from a different aspect of the mathematics in Aristotle’s time, i.e., ‘analysis’ in proofs.

Let us now examine how Aristotelian principles are related to Euclidean principles. A similarity of principles is most conspicuously seen between the axioms of Aristotle and common notions of Euclid. Actually, the third of common notions that “if equals are subtracted from equals, the remainders are equal” is exactly the same example Aristotle gives of the axiom in the texts. Judging by the words of Aristotle—“we normally use this name” (I.2. 72a18) and “the common that are called axioms” (I. 10. 76b14), it appears that Aristotle accepts the meaning and use of the term in mathematics with no reluctance. Though it may be injudicious, because of Aristotle’s logical axioms like the principle of non-contradiction, to assert Aristotelian axioms come exclusively from the mathematics in his time, it is very likely that the idea of axiom as the principle in a system of knowledge originates in pre-Euclidean mathematics.

Less conspicuous but still clear are the similarities between the definitions in Aristotle and Euclid. In both cases, definitions are explications of the significance of primitive terms, and are the fundamental notion of material starting points of proofs in the case of Euclid and demonstrations in the case of Aristotle. However, if we consider the semantic level of definitions in both cases, the similarities become quite blurred. Some definitions in the Elements explain the prior by the posterior, for example, the unit as “extremity of line” and line as “extremity of surface,” something which Aristotle finds objectionable. In addition, some definitions of Euclid have been overstated, e.g., the diameter of circle as “any straight line drawn

45 Topics, VI. 4. 141b19-22.
through the center and terminated in both directions by the circumference of the circle, and such a straight line also bisects the circle.” All in all, it is not quite clear that the author of *Elements* has a well-defined idea about criterion of definitions. On the other hand, definitions in Aristotle are more complicated, since the varieties of the term in the second book of *Posterior Analytics* go beyond the simple formulation of ‘genus with differentia’ of the *Topics*. Also, as we will appreciate in the later chapters, definition in a sense is not a starting point of but a final point of demonstration, the philosophical tradition of which refers back to Socratic search for essences.

If we set out to compare the hypotheses of Aristotle and the postulates of Euclid, it will become clear that axioms and definitions are relatively the clearer-side of the comparison between Aristotle’s principles and Euclid’s ones. First of all, the five postulates of Euclid have quite different forms from the hypotheses of Aristotle.  

P1. Let it be postulated to draw a straight line from any point to any point, and

P2. to produce a limited straight line in a straight line,

P3. to describe a circle with any center and distance,

P4. that all right angles are equal to each other,

P5. that, if one straight line falling on two straight lines makes the interior angles in the same direction less than two right angles, the two straight lines, if produced *ad infinitum*, meet one another in that direction in which the angles less than two right angles are.

Within the postulates themselves, P1-P3 are different from the P4-P5 in that the former are construction rules, while the latter are assertions. Given the agreed observation by scholars that P4 and P5 are Euclid’s own inventions that Aristotle could not have been familiar with, what is

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at stake for comparison are the three construction rules. On the traditional interpretation, which is still strongly espoused by current scholars, the existential claim of hypotheses corresponds to the construction rules of the postulates: the existences of point and line are the same as the constructability of point and line.\textsuperscript{48}

However, if we probe the meaning and use of postulates in the \textit{Elements}, we can see that the traditional interpretation instigated earlier by Heath and Lee includes obscurities that impede any matching to Aristotle’s hypotheses. First, there is no implication that postulates are meant to posit the existence of subject-genus. The three postulates only “allow one to move from a given objects of a certain kind (two points, a straight line, and a point and a distance) to others (a straight line, a longer straight line, and a circle).”\textsuperscript{49} It is quite doubtful that Euclid understands by ‘point, line and circle’ the subject genus of geometry. Second, the semantic features of objects are quite different: The objects of the postulates are arbitrary (instantiated) instances, i.e., a \textit{certain} line and a \textit{certain} circle, while the object of the hypothesis is the universal, i.e., \textit{the} unit and \textit{the} line. Third, even though constructability guarantees the existence of what is constructed, existence does not entail constructability.\textsuperscript{50} For example, “it is implausible that controversies over squaring the circle, duplicating the cube, and trisecting the angle were focused on the question whether there exist the squares, cubes, and angles of the required sizes... The problem


\textsuperscript{49} Mueller, “On the Notion of Mathematical Starting Point in Plato, Aristotle, and Euclid,” 78.

\textsuperscript{50} For a recent defender of this position, see W. Knorr, “Construction as Existence Proof in Ancient Geometry,” \textit{Ancient Philosophy} 3 (1983): 125-48.
At this point, we should ask why the current followers of the traditional interpretation still cling to their position, despite the apparent differences between hypotheses and postulations. Their defense strategy can be called the ‘philosophical approximation thesis.’ It is claimed that Aristotle intentionally or mistakenly incorporated the geometrical feature of constructability into the general claim of existence in his theory of science, since constructability is presumably not an appropriate term or a tool to apply to real things in other physical or biological sciences; physical entities and biological beings do not admit of being constructed, because they are things that exist. Further, the function of both constructability and existence claims is said to be mutatis mutandis the same in their job of “introducing things into the realm of discourse of a science, as subjects for per se predications, in a way suitable for the methods and purposes of the sciences.”

Considering philosophers’ generalizing tendency, the philosophical approximation thesis might appear attractive. But there seems to be a critical exegetical fault here. That is, when Aristotle is asserted to approximate the constructability of Euclid’s postulations, Aristotle’s hypotheses are already presumed by the commentators to be the existence claim of subject genus. If we had approached the Euclidean principles without any such a presumption but only with a view to shedding light on Aristotle’s principles, could not the constructability of Euclid’s

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52 There was a debate in the Plato’s early Academy whether scientific knowledge can be generated and come into existence in relation to geometric construction. On the details of this controversy, see: Alan Bowen, “Menaechmus versus the Platonists: Two Theories of Science in the Early Academy,” *Ancient Philosophy* 3 (1983): 12-29.
postulates give a different exegetical route for understanding the hypotheses as principle?  

In this respect, let us for a moment reflect on the delicate point of the thesis that the approximation by Aristotle is intentional or mistaken.  If it is intentional, it means that Aristotle fully acknowledges the implication of geometric construction but disregards it for the sake of general application to other sciences.  In contrast, if it is mistakenly appropriated, it indicates that Aristotle is not sensitive enough to grasp the feature of geometric construction.  In either case, it is implied that the feature of geometric construction as an aspect of postulates is absent in the formation of Aristotle’s concept of hypothesis.  Let us consider Mueller’s insistence in this regard:

The postulates include both assertions and rules.  There corresponds to this division not only the distinction between theorems and problems, the latter being what we would call construction, but also the distinction between the reasoning part of a proof (ἐποδείξει in Proclus’ terminology) and the construction (κατασκευή) which precedes it.  Euclid’s geometric reasoning is highly constructional in this way… However, even when this aspect of geometric reasoning is recognized, there is a tendency to focus on assertions and proofs rather than rules and constructions and, in particular, to speak of geometry as a matter of proving assertions from assumed assertions.  This tendency may represent a philosophical bias [italics are mine], but, at least since Aristotle, accounts of reasoning have standardly focused on procedures by which assertions are transformed into other

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54 This question will be answered in the next section that deals with the geometrical interpretation of Aristotle’s hypotheses.
55 McKirahan insists that it is intentional: “I call this account an approximation because it moves too quickly over some difficult matters and assumes too easily that the geometry known to Aristotle had principles more or less identical with those of Elements I (excluding P4 and P5);” McKirahan, Principles and Proofs, 135. On the other hand, Goldin thinks it is a mistake: “We can safely assume that the author of Posterior Analytics I would have been sensitive to the deficiency of geometrical proofs that argue from a single case… But, instead of attending to the logical form that these proofs actually have, Aristotle mistakenly takes for granted that in respect to logical form they conform to his account of demonstration.  Aristotle interprets the assumption that a certain line can be constructed as the positing of the existence of all such lines.  He likewise takes the construction of a certain figure as a demonstration that all such figures do exist, not realizing that at the very least one needs here a principle of existential generalization”; Owen Goldin, Explaining an Eclipse, 60.
56 This question will be answered in the next section that deals with the geometrical interpretation of Aristotle’s hypotheses.
assertions and not on procedures by which constructions are built out of other constructions.

From Mueller’s assertion above, we could conjecture that Aristotle’s approximation of constructability into his existence claim relates to his philosophical bias of disregarding one important (essential) aspect of geometric reasoning, which is identified as rules, problems (solving) or constructions. Mueller raises two important issues here (i) that the essential aspect is recognized at least by some philosophers, but (ii) that it is ignored by them due to their philosophical bias. Is it true, then, that Aristotle does not pay to the constructional aspect of geometry the attention it deserves because of a distinct philosophical purpose, so that only the reasoning of assertions features in his reading of geometry? Mueller’s assertion regarding Aristotle’s philosophical bias is very pertinent to our study of Aristotle’s demonstrative knowledge, because it could serve as the starting point from which a different picture of demonstrative knowledge in general might be developed. Surely, how Aristotle understands the structure of mathematical reasoning is an important aspect of demonstrative knowledge in any case. Thus, before moving back to the issue of hypothesis, we need to examine Mueller’s contention, by specifying the features of ancient mathematical proof and Aristotle’s response to these features.

(1) Enunciation (protasis) consists of both what is given and what is sought; “what is given is a finite straight line, and what is sought is how to construct an equilateral triangle on it.”

(2) Exposition (ekthesis) is a setting out the given by referring to a particular instance; “let this be the given finite line.”

(3) Specification (diorismos) is restatement of what is sought to fix our attention to the proof; “it is required to construct an equilateral triangle on the designated finite straight line.”

(4) Construction (kataskeuē) is adding some other figures to the given in order to find what is sought, normally using postulates; “let a circle described with center at one extremity of the line and the remainder of the line as distance…, and then from the point of intersection of the circles let straight lines be joined to the two extremities of the given straight line.”

(5) Proof (apodeixis) is showing that what is sought is accomplished with the aid of definitions and axioms; “Since one of the two points on the given straight line is the center of the circle enclosing it, the line drawn to the point of intersection is equal to the given straight line.”

(6) General conclusion (sumperasma) is restatement of the conclusion in terms of the particular instance; “An equilateral triangle has therefore been constructed upon the given straight line.”

The above procedures give the structure of a typical case of solving problems in Euclid’s geometry. It is not an overstatement to say that ancient geometry is all about solving problems, since theorems, which are outnumbered by problems in the ancient mathematical literature, can be reformulated into problems.59 Usually, the problems are stated in infinitive clauses like “to construct an equilateral triangle.”

Noteworthy in the proof procedure is that problems are introduced within the context of a particular case, for example, “to construct an equilateral triangle on a finite straight line.” What

the exposition (ektthesis) does is to actualize the particular case into a visible diagram, by drawing a line and saying “let this be a finite line.” The rest of proof procedures are performed on these particular diagrams. For this reason, Proclus says that “mathematicians are accustomed to draw what is in a way a double conclusion. For when they have shown something to be true of the given figure, they infer that it is true in general, going from the particular to the universal conclusion.” What Proclus calls ‘double conclusion’ reveals unique characteristics of the objects that geometric proofs deal with. The geometric figures that are visibly displayed are not ‘particulars’ in a strict sense, which have their contrary notion of ‘universals.’ Rather they are representative particulars, because whatever is proved for them applies to others instances too;\textsuperscript{60} “for even if you make the line double that is set forth in the exposition, or triple, or of any other length greater or less than it, the same construction and proof would fit it.”\textsuperscript{61} Actually, this is the same characteristic that we have discussed in terms of constructability of Euclid’s postulates; what postulates allow to be constructed are representative particulars. Does Aristotle understand this operational feature of geometric entities?\textsuperscript{62}

Then, what about the essential feature of geometric reasoning that Mueller mentions in terms of constructions? It is clear that he refers by “reasoning from constructions to construction” primarily the third step of Euclidean proof procedure. In fact, the procedure of construction (kataskeuē) is the key element of the whole proof that determines a successful accomplishment

\textsuperscript{60} It is frequently noted that the ‘representative particular’ is a very close idea to modern logical notion of ‘existential generalization.’ See I. Mueller, Philosophy of Mathematics and Deductive Structure in Euclid’s Elements (Cambridge: MIT Press, 1981), 11-15. It seems that the ‘qua locution’ can be used to designate this feature of mathematical entities; this triangle (that is drawn in a paper or sand) is treated as ‘this triangle qua triangle.’

\textsuperscript{61} Proclus, A Commentary of the First Book of Euclid’s Elements, 210 (164).

\textsuperscript{62} We will get back to this issue in the next section while explicating Aristotle’s hypotheses as a principle in a geometrical context.
of what is sought, as we can see from the simple example by Proclus. For constructions are necessary conditions of what is being sought or what is to be proved. They should not be regarded only as preparatory procedures for the next procedure of proof. Once the constructions are made successfully, the procedure of proof (apodeixis) is rather just a matter of presentation.

But constructions in proofs are as complicated as they are important. Sometimes, to come up with an appropriate construction is very difficult, e.g., in the problem cases of squaring a circle, duplicating a cube or trisecting an angle. Sometimes, not a single but several construction options lead to solving problems or to proving theorems. E.g., to prove that the interior angles of a triangle make two right angles, we may construct a line that is parallel to the base line, or construct a line that is parallel to a side line. And sometimes, even though a construction is successful, the construction itself is viewed as an incidental property of what is sought. As a matter of fact, to find a successful and appropriate construction is not an easy task for a geometer. Proclus explains implicitly the difficulty of construction as follows, while bringing in a different term, ‘lemma’ to designate the logical aspect of construction.

The term “lemma” is often used to designate any proposition invoked for the purpose of establishing another, as when we assert that a proof can be made from such-and-such a lemma. … The best aid in the discovery of lemmas is a mental aptitude [italic mine] for it. For, we can see many persons who are keen at finding solutions but do so without method. … Nevertheless there are certain methods that have been handed down, the best being the method of analysis, which traces the desired result back to an acknowledged principle. Plato, it is said, taught this method to Leodamas….

At the outset, Proclus’s statement that “the best aid in the discovery of lemmas is a

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63 Proclus says that it is a demonstration by signs, which is contrasted with the perfect form of demonstration; Proclus, A Commentary of the First Book of Euclid’s Elements, 206 (161).
64 Proclus, A Commentary of the First Book of Euclid’s Elements, 211 (165). The reason Proclus uses proposition instead of construction is that here he considers proving of a theorem. So, it does not make any difference for our argument.
mental aptitude for it” is very interesting, when we think about the statement not just from the outlook of the general problem of scientific discovery, but also in its implicit relation with Aristotle’s similar word, ‘acuteness’ of mind (αγχοσ) which “is a talent for hitting upon the middle term in an imperceptible time.” Does the ‘mental aptitude’ imply that the process of discovery is not just difficult but also fundamentally anomalous—“without method”—so that it is impossible to sort it out in systematic terms and logics? Nonetheless, Proclus says there are certain methods for this discovery, the ‘method of analysis’ alongside with the ‘method of diairesis’ and the method of ‘reductio ad absurdum.’

When the method of analysis is said by Proclus to “trace the desired result [conclusion of proof; what is sought to be constructed in problems] to acknowledged principles,” it is clear from the example of Euclidean proof procedures that analysis involves not just the finding of appropriate principles (postulates), but also previously proved theorems, and constructional figures by means of which the problem can be solved. Among these tasks, finding the constructional figures might be the most important feature of analysis. For the (auxiliary)

65 PoAn. I. 34, 89b10-11. There is also another reference of this term in relation with ‘deliberation’ at Nichomachean Ethics, VI. 1142b1-6.
66 Focusing on this fundamental anomalousness of discovery, Netz maintains that even “Greek mathematical analysis should be understood as a tool for the presentation of results, rather than as a tool for their discovery.” Reviel Netz, “Why Did Greek Mathematicians Publish their Analyses?” in Ancient & Medieval Traditions in the Exact Sciences, ed. Patrick Suppes, Julius Moravcsik and Henry Mendell (Stanford: CSLI Publications, 2000), 156.
68 Hintikka and Remes distinguish between directional and configurational analysis and argue that the latter is of far greater importance than the former.
constructional figures (kataskeuē) are the most unrevealed element from the viewpoint of what is given (ekthesis); the acknowledged principles and previously proven theorems are rather close to what is the given in the sense that what analysis concerns is not the principles and theorems themselves—they are already known, but how they are related to the given in solving problems. Thus, it appears that the method of analysis needs imagination or creative ideas to bring out constructions and examining various elements among them.

Evidently, then, analysis as method of discovery is a kind of backward reasoning from conclusions (what is the given) to premises (what should be fulfilled) in order for problems (what is sought) to be solved. And, following the process of analyses, there always accompanies any proof “their reverse procedures [forward reasoning], ‘syntheses’ (for it is possible from those principles to proceed in orderly fashion to the thing sought, and this is called ‘synthesis.’” As Mueller mentioned, the essential feature of ancient mathematical proof lies in constructions, i.e., the backward reasoning of analyses. To make it explicit, ancient geometric proofs are not the matter of starting from principles, but the matter of how to lead backward to appropriate principles by way of creative constructions.

Contrary to Mueller’s insistence that Aristotle takes no notice of geometric constructions, it is the case that the importance of analyses was fully recognized by Aristotle in his various works, as we will examine. Further, we find that Aristotle frequently uses the analytic reasoning of geometry as an analogous model for explaining some of his metaphysical and

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69 In the case of theorems, ‘what is the given’ is identical with ‘what is sought.’
70 Proclus, A Commentary of the First Book of Euclid’s Elements, 255 (198).
71 For the argument that the method of analysis is the underlying main tool of the Posterior Analytic, see P. Byrne, Analysis and Science in Aristotle, 7.
ethical problems. Can we, then, go so far as to suppose that the analytic reasoning of mathematics provides Aristotle with the idea of what the demonstrative science should be like? To begin answering this question, let us note Aristotle’s recognition of the importance of analytic reasoning.

One issue in examining Aristotle’s references to analysis concerns its status as a method. Is the method of analysis elaborated above really a method of discovery? While synthesis is evidently deductive reasoning, what procedures or logic of inference can we expect to find, when analysis is said to be a method to find appropriate principles, theorems and also auxiliary figures? Despite the overall importance of the method in ancient Greek mathematics, we do not have full extant description of it until the text of Pappus. 72 So for our question, we rely on Pappus’s reports. 73

Now analysis is the way from what is sought—as if it were admitted—through its concomitants [διὰ τῶν ἔξης ἀκολύθουσι] in order to something admitted in synthesis. For in analysis we suppose that which is sought to be already done, and we inquire from what it results, and again what is the antecedent of the latter, until we on our backward way light upon something already known and being first in order. And we call such a method analysis, as being a solution backwards [ἀνάπαλιν λύσιν]. In synthesis, on the other hand, we suppose that which was reached last in analysis to be already done, and arranging in their natural order as consequents [τὰ ἐπόμενα] the former antecedents and linking them one with another, we in the end arrive at the construction of the thing sought. And this we call synthesis.

Pappus’s description of synthesis is the same as Proclus depicts for the method; it is the reverse procedure of the analysis that starts from the last point of the analysis. But as far as the analyses

72 Plato’s method of hypothesis and the dialectic in his middle dialogues like *Meno, Phaedo* and *Republic* are considered to have a relationship with the method of analysis. Proclus’s testimony on the origin of the method with Plato, however dubious it is, bears on the relation between the two methods. For the relationship, refer P. Byrne, *Analysis and Science in Aristotle*, 3-8; I. Mueller, “Mathematical method and philosophical truth,” in *The Cambridge Companion to Plato*, ed. R. Kraut (Cambridge: Cambridge University Press, 1992), 170-199.

are concerned, he makes a crucially important indication in terms of inference. Analysis is the way from a conclusion (what is sought) to a premise (the first in order of syntheses) by way of concomitants of the conclusion. If we accept the usual translation of ‘akolouthón’ as ‘consequents,’ our question regarding the inference logic of analyses is easily answered: analysis is deductive reasoning too. It treats the conclusion to be proved as a hypothesis (as if it were admitted), and then draw consequences from it, and further consequences from these, until a proposition is reached which was already proved as true. But according to this interpretation, a proof by the analysis and synthesis immediately becomes circular: Q\(\rightarrow\)P, and P\(\rightarrow\)Q. Even if in frequent cases of arithmetic, the propositions that are dealt with are in relation of equality, however, deriving the consequences of a conclusion (what is sought) will not necessarily yield its premises that in return are used to prove it. As we have seen, there is no easy deductive road from consequents (what is to be constructed) to antecedents (principles, theorem, and auxiliary figures). Contrary to the deductive reading of analyses, some interpreters translate the akolouthón rather as ‘concomitants’ in the weaker sense of ‘things that go together with one another’ or ‘the succession of sequent steps,’ insisting that the concomitants are different from the logical consequents (epomena). Still, they acknowledge the fact that the concomitants, even though helpful to find, do not necessarily yield the premises that are used to prove the conclusion. Thus, Cornford says that the analyses consist in the “divination of a premise that must be true if

the required premise is to follow,” or intellectual “perception without discursive argument that a prior condition must be satisfied.” Plainly, the path to the principles is anomalous according to this interpretation.

Aristotle seems recognizably very sensitive to the two seemingly incompatible logical sides of the analyses:

If it were impossible to prove truth from falsehood, it would be easy to make analyses [τὸ ἀναλύειν]; for then the propositions would convert from necessity. Let A be something that is the case; and if A is the case, then these things are the case (things which I know to be the case—call them B). From the latter, then, I shall prove that the former is the case. (In mathematics conversion is more common because mathematicians assume nothing incidental—and in this too they differ from those who argue dialectically—but only definitions.)

This passage is clear evidence that Aristotle recognizes the reversibility of propositions in mathematical analyses. In other words, to make analyses from the conclusion (“the case that A is something”) to the premise (“the things which I know to be the case”) is easy because of their reversibility. However, this passage is, at the same time, evidence that there are other difficult cases of analyses. For, if analyses deal always with reversible propositions, it would be impossible to deduce truth from falsehood. But for Aristotle, the possibility of deducing true propositions from false propositions is the clear indication that the backward reasoning of analyses is not always easy but intricate and imaginative in some cases.

Aristotle’s recognition regarding the analytic reasoning of geometry is implied in following famous statements too:

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77 PoAn, I. 12. 78a6-13
78 Metaphysics, IX. 9, 1051a22-24. See also Nichomachean Ethics, III. 3, 1112b12-24.
It is by actualization also that geometric relations are discovered; for it is by dividing the given figures that people discover them. If they had been already divided, the relations would have been obvious; but as it is the divisions are present only potentially.

Since geometric constructions are unrevealed in the sense specified before, Aristotle maintains, discovering them is like actualizing the potential. In the case of proving the theorem that the angles of the triangle equal to two right angles, “if the line parallel to the side [an auxiliary construction] had been already drawn [actualized by a geometer], the theorem would have been evident to any one as soon as he saw the figure.”\textsuperscript{79} But it is not easy to actualize the construction, because it is only potentially given, it is implied.

According to Aristotle’s understanding, the necessity that is present in mathematical reasoning portrays the fundamental difficulty of the backward reasoning of geometric analyses. In Physics II. 9, Aristotle makes an interesting analogy between mathematical necessity and hypothetical necessity that can be found in physical entities:

Necessity in mathematics is in a way similar to necessity in things which come to be through the operation of nature. Since a straight line is what it is, it is necessary that the angles of a triangle should equal to two right angles. But not conversely; though if angles are not equal to two right angles, then the straight line is not what it is either. But in things which come to be for an end, the reverse is true. If the end is to exist or does exist, that also which precedes it will exit or does exist; otherwise just as there, if the conclusion is not true, the principle will not be true, so here the end or that for the sake of which will not exist. For this too is itself a principle, but of the reasoning, not of the action. (In mathematics the principle is principle of the reasoning only, as there is no action.) If then there is to be a house, such-and-such things must be made or be there already or exist, or generally the matter relative to the end, bricks and stones if it is a house.\textsuperscript{80}

This is Aristotle’s account of the hypothetical necessity that is present in physical processes. For Aristotle, it is from the hypothesis that the end (there is a house) is realized that one infers that

\textsuperscript{79} Metaphysics, IX. 9, 1051a25-27.
\textsuperscript{80} Physics, II. 9, 200a15-24.
certain material conditions (there should be bricks and stones) are necessarily satisfied; (ends) \( \rightarrow \) (conditions). But even though it is necessarily the case that if bricks and stones (conditions) are not given, there should not be a house (end) \( \sim \) (condition) \( \rightarrow \sim \) (ends)], the existence of bricks and stones does not necessitate the existence of houses. Contrarily, in the case of mathematical proof, it is from the hypothesis that conditions (a straight line is what it is) are true that one infers that the conclusions (triangle’s being equal to two right angles) are true; (conditions) \( \rightarrow \) (conclusions). But even though it is necessarily the case that if a triangle’s interior angles are not two right angles, then the straight is not such-and-such \( \sim \) (conclusion) \( \rightarrow \sim \) (conditions)], a triangle’s interior angles being two right angles does not necessitate the straight being such-and-such. Interesting is the fact that in both fields of mathematics and physics, one must reason backwards what conditions must be satisfied for something to be the case. But in the case of physical processes, the backward reasoning for conditions coincides with the necessity of inferences, because the starting point of the reasoning for conditions and the principle of the necessary inferences are the same, i.e., the end or ‘that for the sake of which.’ On the contrary, in the case of mathematical proof, it is evident that the backward reasoning for conditions does not coincide with necessity of inferences. \( ^{81} \)

Now this seems enough to confirm that Aristotle is fully aware of the importance of geometric constructions as well as the difficulty of the backward reasoning of geometric analyses. The more Aristotle is shown to be sensitive to the essential aspect of geometric reasoning, the

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less persuasive is the insistence that Aristotle disregards it in his philosophical appreciation of the mathematics in his time. Mueller’s insistence that Aristotle has a philosophical bias towards mathematical reasoning is itself biased. Furthermore, it becomes obvious that the most commentators’ hasty approximation of Euclid’s postulates to Aristotle’s hypotheses existentially interpreted is attributable to their misapprehension about Aristotle’s awareness of the mathematical details of his time. The rest of this study will argue that the geometric reasoning here specified provides Aristotle with the idea of what demonstrative science should be like. But we need to clarify and reinstate the original meaning of hypotheses as Aristotle presents his theory demonstrative knowledge.

§1.3 Hypothesis as Instantiation of Universals

In the previous sections, we have shown that the majority of commentators are driven to the existential interpretation of Aristotle’s notion of hypotheses as a principle, by their explicit or implicit reading of demonstrative sciences as an axiomatic deductive system. It has also been indicated that the interpretational tendency is buttressed by a hasty comparison between Aristotle’s principles and Euclidean principles. Implicit in the comparison is a serious misunderstanding, which we tried to correct, that Aristotle has a kind of philosophical bias as to the mathematical reasoning and the operational status of mathematical entities. During our critical review of the existential interpretation, a hint of an alternative reading on Aristotle’s

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82 His view is reinforced by the fact that ancient geometric proof resists to be translated in Aristotle’s syllogistic logic; he claims that a geometric proof presented in terms of syllogistic loses its original force of proof. I. Mueller, “Greek Mathematics and Greek Logic;” in *Ancient Logic and Its Modern Interpretation*, ed. J. Cocoran (Dordrecht:Kluwer, 1974), 35-70.
notion of hypotheses has been already suggested, on the base of which this study will develop the deflationary theory of Aristotle’s demonstrative knowledge. Let us set out the alternative reading initially by reviewing Gómez-Lobo’s arguments.

Gómez-Lobo in his much discussed article claims that the clarification of Aristotle’s hypotheses has to be sought in Euclidean proof procedures rather than in postulates. He argues conclusively that “none of the items in Aristotle’s classification of principles corresponds to the Euclidean postulates,” because the postulates are doubtless an original creation of Euclid, which is probably unknown to Aristotle in the pre-Euclidean era.

According to Gómez-Lobo, Aristotle’s notion of hypotheses refers to the exposition (ἐκθέσεις) in the Euclidean proof procedures that we specified before. He says that “In the terminology of Proclus, an Aristotelian hypothesis corresponds to the part of the πρώταις, which states what is given and is then adapted and repeated, by itself, in the ἐκθέσεις of a geometrical proposition.” As we have seen, the exposition is the procedure of setting out the given for a problem by referring to a particular instance. Returning to our example before, when a geometer confronts a problem ‘to construct a triangle with a given finite line,’ he actually draws a particular line AB, and says that “let this AB be a finite line.”

The greater part of Gómez-Lobo’s arguments are focused on the exegetical issue of rephrasing the syntactic form of Aristotle’s hypotheses into this particular statement. When “to einai ti” is said of a hypothesis, we have shown that the ‘ti’ is normally taken as having the syntactic place of subject, and the verb ‘einaí’ as having a sense of existence. But the possibility

84 Ibid. 438.
of placing the ‘ti’ in the predicate of a statement has been suggested. Following the thesis by Kahn that the verb eiani in Greek literatures has prominently the predicative use even where an existential use is taken for granted, Gómez-Lobo claims that the hypothesis statement by Aristotle has to be supplemented by a subject so that it becomes a predicative statement; to einai (todi) ti. What is important in his understanding is that the supplied subject is a demonstrative pronoun. Hence, the example sentence of hypotheses in the text is rephrased as: “this is a unit.”

By the same move, he takes the hoti esti locution in the scientific assumptions as the elliptical form of predicative statement of hoti esti todi ti. Therefore, the logical formulation of the locution is claimed to be: it is the case that this is (a) F. Here, he appends a veridical use of einai to his predicative interpretation, because according to him, “these two meanings are blended in 71a 12-16, where ‘hoti esti’ is first said to be assumed for the law of contradiction (it is accepted without proof that it is true) and then assumed for the unit (it is accepted without proof that a given line in the diagram is the unit that measures other lines in it).”

The interpretation suggested by Gómez-Lobo seems on the right track considering the reasons that follow. First, unlike the existential interpretation that forces Aristotle’s hypotheses and Euclid’s postulates into a Procrustean bed, he points out the proper location (exposition) in mathematical proof procedures, where the notion of hypotheses fits in. For this contention, we need only remind ourselves that Aristotle’s statements of hypotheses are referring to something (some process) of mathematical proofs in a plainly descriptive tone. Second, the interpretation succeeds in reinstating the propositional form of hypotheses. For Aristotle is emphatically clear that unlike definitions, hypotheses are propositions, which assume one part of contradiction, i.e.,

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85 Ibid. 437.
one thing said of one. It goes without saying that this point has been vaguely left aside by the most existential interpretations. Third, we can get a consistent sense of being that applies to the hypotheses and axioms as well. We indicated before the oddness of the construal, ‘the existence of axioms.’

Despite these interpretive merits, Gómez-Lobo’s arguments have not gained support from interpreters. For one thing, his construal of hypotheses as a particular proposition seems straightforwardly disapproved by the fact that in none of Aristotle’s examples of demonstrations does an ostensive proposition of the form “this is an F” occur.86 Regardless of the seriousness of this critique, it is a considerable weakness of Gómez-Lobo’s interpretation that he does not dig further into the implications of hypothesis identified as exposition (ekthesis) within the scope of mathematical proofs on the one hand, and within the demonstrative knowledge in general on the other. If he had done so, the triviality of the critique would have been evidently revealed.

Let us, then, explore how hypothesis can be seen as an exposition in mathematical proofs. When we were dealing with the Euclidean proof procedure, it was underlined that proofs have in every case ‘double conclusions’; “when they [geometers] have shown something to be true of the given figure, they infer that it is true in general, going from the particular to the universal conclusion.” The transition from the particular to the universal is possible in the Euclidean proofs, because geometric entities have to be in advance instantiated for themselves to be served as elements in the proofs. We called the instantiation the operational feature of geometric entities, the actualization of which in particular statements is made possible by ekthesis.

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86 B. Landor, “Definitions and Hypotheses in Posterior Analytics 72a19-25 and 76b35-77a4,” 318, n.26; Goldin, Owen, Explaining an Eclipse, 52-58; Orna Harari, Knowledge and Demonstration, 42-43.
Aristotle is definitely cognizant of the feature:\(^{87}\)

Geometers do not suppose falsehoods, as some people have asserted. They say that you should not use falsehoods but that geometers speak falsely when they say that a line which is not a foot long is a foot long or that a drawn line which is not straight is straight. But geometers do not conclude anything from the fact that the line which they have themselves described is thus and so; rather, they rely on what these lines show.

As trivial as the point of this passage appears, it makes several significant points about how Aristotle understands the feature and status of geometric entities in proofs. When Aristotle clears geometers of the charge of laying down false hypotheses, he clearly distinguishes this particular line’s *being thus and so* from what this line shows or makes manifest. What geometers prove is not about accidental aspects of this particular line (a little bit longer than a foot, a somewhat curved straight line), but the particular line inasmuch as (*qua*) it is a straight line.\(^{88}\) By the phase “what these line shows [*δηλούμενα*],” though, we should not be beguiled into thinking that Aristotle is making a distinction between this particular line and the line itself, as Plato does in his criticism of geometers; “although they use visible figures and make claim about them,…. They make their claims for the sake of *square itself* and the *diagonal itself*, not the diagonal they draw, and similarly with others.”\(^{89}\) In Aristotle’s passage, there is no Platonic tension between particulars and universals (forms). Surely, there are transitions of conclusions from the particular to the universal. But what Aristotle intends to convey by the phrase is the operational feature of geometric entities. That is, whatever is proved about this particular line—what this line shows—also applies to other particular lines, because this particular line is a

\(^{87}\) *PoAn*. I. 10, 76b40-77a3. See also the almost parallel passage in *PrAn*. I. 41, 49b33-50a4.


\(^{89}\) Plato, *Republic*, 510d2-e1.
representative particular; each line is as good as any other precisely because all manifest inalterably the definite straightness which proofs address.⁹⁰

Also worth highlighting in this passage is the confirmation of the syntactic form of hypotheses suggested by Gómez-Lobo. When geometers make hypotheses, what they are concerned with is not existential statements such as ‘a straight line exists’ or ‘a foot long line exists’, but a particular diagram (a drawn line), propositionally expressible such as “let this (x) be a straight line, or a foot long line.” Contrary to the criticism against Gómez-Lobo, the ostensive particular statement is certainly conceived by Aristotle as a hypothesis.

Lastly, though not explicitly brought forward by Aristotle in the above passage, the use of diagrams in geometric proofs needs our special attention. Why does geometry depend on diagrams in its proofs? A further and perhaps deeper question is this: is the use of diagrams indispensible and necessary in geometric proofs? Considering the dependence of Euclidean proof on the procedures of ekthesis and kataskeuē, it is very likely so. However, McKirahan suggests a different interpretation, while commenting on the above passage: “diagrams have heuristic value [italic mine] in discovering geometrical properties and ways to prove them, but that fact is irrelevant [italic mine] in presenting the results reached by their aid.”⁹¹ Also he alleges that even though “diagrams assist in visualizing how proofs work,”⁹² that is, the spatial relations between objects, they can be replaced by the verbal descriptions of the geometric entities and their relations, because “what counts…is not the diagram itself, but what it

⁹⁰ See also PoAn. I. 1, 71a31-71b6.
⁹¹ McKirahan, Principles and Proofs, 146.
⁹² MCKirahan, Principles and Proofs, 147.
represents.”93 Remarkable is his contention that those are Aristotle’s view on the use of diagrams in geometry.94 Clearly then, McKirahan is here Platonizing Aristotle, by platonizing the geometric objects and their relations. It is obvious that his claim is not grounded in the text of Aristotle: There is no suggestion in Aristotle’s thought that diagrams can be replaced and got away with by descriptions of the geometric entities. Rather, McKirahan’s ideas on geometric entities seem to come from his reading of Plato. For this fact, the same quotation should be allowed: “although they [geometers] use visible figures and make claims about them, their thought isn’t directed to them but to those other things that they are like.”95 Needless to say, in the view of Plato the diagrams are only visible signs and likeness of the forms of geometric entities. Thus, he seems to think that his own dialectic in contrast to mathematics can basically do away with figures and diagrams: “Having grasped this principle, it [dialectic] reverses itself and, keeping hold of what follows from it, comes down to a conclusion without making use of anything visible [diagrams as hypotheses] at all, but only forms themselves, moving on from forms to forms, and ending in forms.”96

Though we can discount the Platonic thesis of dispensability of diagrams for interpretation of Aristotle, at the same time, we cannot get any conclusive evidence from the

93 Ibid. See also his statement: “Thus, we may reasonably think of a diagram as a representation of a description of geometrical entities and their relations…but it follows from this that the descriptions can be substituted for the diagrams without loss of information.”
94 See the same but incorrect judgment in Hussey’s following statement: “Aristotle might have believed that the results of mathematics could ultimately be presented in a form which involves no introduction of mathematical objects. On this view geometry could be presented as the science of the possible spatial structures of physical bodies, and arithmetic as the science of numerical properties of sets of physical objects. It would be immensely cumbersome, but modern logical techniques could perhaps do it.” Edward Hussey, “Aristotle on Mathematical Objects,” 128.
95 Plato, Republic, 510d2-e1.
96 Plato, Republic, 511b2-c1
passage cited above that Aristotle firmly believes the indispensability of diagrams for geometric proofs. We may seek the evidences for this point outside the context of the Posterior Analytics. For one thing, Aristotle says in the De Anima that a phantasma is necessarily involved in thinking about abstract objects like mathematical entities: “the objects of thought are in the sensible forms, viz. both the abstract objects and all the states and affections of sensible things. Hence no one can learn or understand anything in the absence of sense, and when the mind is actively aware of anything it is necessarily aware of it along with an image [phantasma]; for images are like sensuous contents except that they contain no matter.” From these statements, then, we may infer that diagrams as images are thought to be necessary for mathematical entities to be understood.

For highlighting the importance of expositions in Aristotle’s view of the mathematical proofs, we need not resolve the question of the indispensability of diagrams in relation to Aristotle’s philosophical psychology. The following passage shows the remarkable use of expositions in a demonstration:

Something holds universally (τὸ καθόλου) when it is proved of an arbitrary and primitive case (ἐπὶ τοῦ τυχόντος καὶ πρώτου). E.g. having two right angles does not hold universally of figures…. An arbitrary isosceles does have angles equal to two right angles—but it is not primitive: triangle is prior. Thus if an arbitrary primitive case is proved to have two right angles (or whatever else), then it holds universally of this primitive item, and the demonstration applies to it universally in itself.

97 Other passages on mathematical objects that would need consideration, refer Edward Hussey, “Aristotle on Mathematical Objects,” 130, n52.
98 DeAn. III.8, 432a3-10.
99 It is also interesting to see in this point that in view of Proclus, the geometric objects are dependent on man’s cognitive power of discursive reasoning (dianoia) and imagination (phantasia). Proclus. A Commentary of the First Book of Euclid’s Elements, 48-55 (39-44). For the detailed study on Proclus’s view on mathematical objects, see Orna Harari, “Methexis and Geometrical Reasoning in Proclus’ Commentary on Euclid’s Elements,” in Oxford Studies in Ancient Philosophy 30 (2006), 361-389.
100 PoAn. I. 4, 73b32-74a3.
This passage is usually looked upon in the context of Aristotle’s introduction of the concept of ‘universal,’ normally known as ‘commensurable universal’. But what draws our attention in this passage is the unique way in which Aristotle establishes a universal truth. In order to prove the universal truth that the two right angles (2R) universally hold of triangle, Aristotle demands first setting forth a particular figure, whatever figure it can be. This is definitely a process of exposition (ekthesis). Let’s say the arbitrarily chosen and drawn figure is a quadrangle; “let this be 2R.” But an easy inspection of the properties of this figure shows that 2R does not hold of this quadrangle. Then, the original ekthesis is discarded. A fresh new ‘setting forth’ (ekthesis) is demanded, this time from an isosceles; “let this be 2R.” A few steps of geometric construction and the analysis of the properties of the angles show that 2R holds of this isosceles, but this isosceles has redundant information that has no bearing on 2R, that is, ‘two sides being equal to each other.’ Hence, it cannot be a primary subject of the 2R. Because we have already found a particular figure of which 2R holds, the next ekthesis should be relatively easy. If it is proved that 2R holds of this particular triangle, then “it holds universally of this primitive item, and the demonstration applies to it universally in itself.” From these processes, the universal truth that 2R holds of triangle is established.

This way of establishing a universal statement suggests that Aristotle has a strong faith in the force of ekthesis. It means not just that in Aristotle’s mind, diagrams and the process of ekthesis are indispensible parts of geometric proofs, contrary to the judgment of McKirahan. It also implies that for Aristotle universal truths are inherently confirmed by particular cases in so far as these particulars have a bearing on the universals. Probably the most important thing this passage shows is that the proofs, whether they are mathematical or demonstrative, are not a
matter of deducing from some universal principles but a matter of painstaking processes of finding them from ‘trial and error’ of ekthesis. One might object that the ‘setting forth’ part of proofs stands strictly speaking outside of scientific proofs. For it resides outside the formal structure of Aristotelian syllogistic. Such an objection, based on the axiomatic cum syllogistic-oriented reading of Aristotelian demonstrative knowledge hinders us from attaining the true picture of it Aristotle presents in the Posterior Analytics. The rest of this study will argue against such a reading based on the connection among ekthesis, particulars, and universals that has just been presented. For the time being, however, we should go back to clarifying the remaining implications of Aristotle’s notion of hypotheses interpreted as ekthesis.

At the beginning of the presentation of Aristotle’s remarks on hypotheses (72a15-24), we indicated a somewhat bizarre situation that the distinction between axioms and posits (hypotheses and definitions) is made pedagogically; axioms have to be grasped by a learner, but posits need not. Interestingly, we confront the same pedagogical remarks by Aristotle in distinguishing hypotheses from postulates (76b23-34) right after his treatment of assumptions of every demonstrative science:102

What must be the case (ὁ ἀναγκή ἐνυαί διὰ τύτο) and must be thought to be the case because of itself is not a supposition [hypothesis] or a postulate. (Deductions, and

101 Against this objection, see the statement of De Rijk who insists that particulars are the ultimate objects of demonstrative proofs: “ to Aristotle, every epistemonic enquiry starts from particulars of the outside world, to the effect indeed that the ‘some kind of thing or type of event’ is always an inhabitant [x] or [y] of the outside world, and definitely not some universal nature taken in abstracto, apart from its being instantiated in our world;” “Hence the pivot of Aristotelian epistemonic procedure is to focus on these common natures in the particulars under examination and to categorize these particulars accordingly, in order to have the appropriate ‘middle’ or ‘medium demonstrationis’.” L. M. De Rijk, Aristotle: Semantics and Ontology, vol.1 (Leiden: Brill, 2002), 169. Contra this point, see Barnes’s syllogistic reading, at some points of which he says that when “singular terms creep into Aristotle, he tacitly treats them as general terms.” Barnes, Aristotle: Posterior Analytics, 146. The focus of Aristotle’s treatment of perception (I.31, 87b29-88a16) is on the danger of perceptual knowledge without universal demonstration. Thus these passages do not harm to our analysis of the current passage.

102 PoAn. I.10, 76b23-34.
therefore demonstrations, are not addressed to external argument but rather to argument in the soul, since you can always object to external argument, but not always to internal argument.) If you assume something which is provable without proving it yourself, then if it is something which the learner thinks to be the case, you are supposing it (and it is a supposition not simpliciter but only in relation to the learner); and if you make the same assumption when the learner has no opinion or actually a contrary opinion on the matter, then you are postulating it. It is in this that suppositions and postulates differ: a postulate is something not in accordance with the opinion of the learner which though demonstrable, you assume and use without proving it.

It is true that commentators are perplexed by the pedagogical context, in opposition to which they might expect a somehow dry and (mathematics-like) formal presentation about the principal elements of demonstrative sciences. So Barnes says that “the distinction between postulates and the type of supposition defined here is new. These things fit ill into the structure of demonstrative science…. Presumably Aristotle is thinking of the teacher who wants to start, as it were, from Book II of the Elements; he may use theorems proved in Book I, but since he has not proved them himself or to this pupil he will be ‘postulating’ or supposing’ them.”103 Similarly, Ross in his commentary of this passage claims that ‘postulates’ and ‘hypotheses’ here have not yet hardened into technical terms, unlike the technical ‘hypothesis’ at 72a15-24 that is interpreted as an existential statement of subject genus.104

But the perplexity is alleviated, if we view the passage from the perspective of hypotheses interpreted as ekthesis. There are two distinctions in the passage: the distinction between the hypotheses and the postulates on the one hand, and the distinction between the hypotheses ad hominem and the hypothesis simpliciter on the other. A demonstrator sets forth a particular statement to a student that it is the case that ‘x is (a) F’; e.g., “this is an isosceles

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103 Barnes, Aristotle: Posterior Analytics, 140.
triangle.” If he takes it as a case and true (*hoti esti*), even though it is provable, it is a hypothesis, but if not, then a postulate. However, if the particular statement is true not *ad hominem*, but because of itself (δι' αὑτό), then it is a hypothesis *simpliciter* (ἀπλῶς). How could the student deny that the drawn figure is a straight line, in so far as he grasps the (nominal) definition (τί σημαίνει) of the line? In other words, the proposition that ‘this is a straight line’ is indisputable, and “must be thought to be the case” in the rest of proof procedures, and accepted as a starting point of a proof, given that the student is aware of the definition. Still, is it possible to object to this obvious statement (*logos*)? Aristotle thinks so, but this objection would “be addressed to external statement, not to the internal statement in the soul.” All in all, in such a construal of the notion of hypotheses and postulates, there is no clear cut distinction of the technical vs. the non-technical use of the notion of hypotheses, contrary to Ross: Aristotle’s ‘hypotheses’ has an unitary and primary notion of *ekthesis*.

The moral to be drawn from the pedagogical context is also obvious, when we look over the passage from the reading of hypotheses as *ekthesis*. The focus of the pedagogical perspective is not on the side of a teacher (a demonstrator) who may have already known the whole process of a proof, but on the side of a student who wants to learn and inquire the truths in mathematics. It should be carefully observed that the distinction between hypotheses and postulates are made not from the outlook of a teacher, but from the one of a student. What is set forth in front of a

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105 It is plausible to guess that postulates are somewhat complicated cases for a student, because of which he has no opinion on them, like the theorem of incommensurability of sides with the diagonal.

106 Barnes takes the phase “what must be the case because of itself” as referring principles of a science, but the context of the passage naturally lead to identifying it with the hypothesis *simpliciter*. Barnes, Aristotle: Posterior Analytics, 140-141.

107 Gómez–Lobo does not provide enough explanations about the hypothesis *simpliciter* except saying: “An absolute hypothesis (ἀπλῶς) is, we may infer, the one that appears in the *ekthesis* of the very first proof initiating the deductive chain of a given science.” Gómez–Lobo, “Aristotle’s hypothesis and the Euclidean Postulates,” 438.
student is accepted by him as a case and true. Accordingly, the pedagogical context that Aristotle brings in here for these distinctions and the one between axioms and posits (theses) as well, is to show that not only hypotheses but also principles of demonstrative sciences are to be taken as starting points for a learner or an inquirer to set out the learning and inquiry. In fact, it is the similar pedagogical situation where a slave boy is confronted with a mathematical problem in Plato’s *Meno*. As far as an inquiry matters, we would not say that the outlook is the standpoint of Socrates, the teacher, rather than the slave boy. In view of all these things, Barnes’s judgment that “these things fit ill into the structure of demonstrative science” is clearly attributable to the absence of the perspective of inquiry in his reading of *the Posterior Analytics*. In contrast, the following statement of De Rijk locates the role of the principles in their bearing on an inquiry: “But the starting-points as such are nothing to do with the proper syllogistic or deductive procedure, as they are merely the steady stepping-stones which enable the investigator to start off the epistemonic [demonstrative] proof. In addition, it is a mistake to view the starting-points exclusively in terms of statemental elements.”

Up to this point, we have concentrated on illuminating the syntactic and logical dimensions of the hypotheses as *ekthesis*, especially in the domain of geometric proofs, as it is

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108 It seems obvious that the *Posterior Analytics* of Aristotle and the *Meno* of Plato are on the same plane of the problem of inquiry. Aristotle’s response to the Meno’s paradox, and the problem of ‘preexistent knowledge’ will be discussed in the section 1 of the Chapter 4.


110 De Rijk, *Aristotle: Semantic and Ontology*, vol. 1, 607. Probably, De Rijk is one of a few commentators who support the *ekthesis* interpretation of Aristotle’s notion of hypotheses, even though he does not directly employ the term of ‘*ekthesis*’ in his exegeses. See his book, chapter 6, especially section 6.3 and 6.5.
understood by Aristotle. Before concluding this section, we have one remaining crucial point to make regarding a semantic dimension of Aristotle’s notion of hypotheses.

Even though Goldin takes the wrong road to the existential interpretation of hypotheses, he correctly acknowledges the semantic significance of hypotheses interpreted as *ekthesis*. While commenting on Gómez-Lobo’s argument, Goldin notes that if his interpretation is correct, then “he [Aristotle] makes a *methodological* point concerning our *identification* of particulars as falling under certain kinds. On this reading Aristotle distinguishes between those predicates for which the *particular* exemplifications can be identified as such without a justificatory account and those predicates whose inherence in given particulars must be proved through a demonstration.”

Reminding ourselves of Aristotle’s remarks on the three basic elements and the assumptions of a demonstrative science at 76b3-22; the assumption of being (‘that it is’) and meaning (‘what it signifies’) of the underlying subject (a primary term), the assumption of axioms, and the assumption of being and meaning of the attributes (derivative terms), we can see what Goldin takes of the interpretation of hypotheses as *ekthesis*. Here, Goldin catches sight of ‘being’ (*ὅτι ἐστι*) not just of predication but crucially of identification. That is, when hypotheses are interpreted as a predicative form of a proposition, ‘*x is (a) F,*’ the verb ‘being’ has a semantic force more than just of predication: It is to identify particulars as falling under a certain kind. For example, in a geometric exposition, the statement, ‘let this be a triangle’ serves as a way of identification, by semantically referring to this (a drawn figure) as an instantiation (*‘exemplification’ in Goldin’s terminology*) of a triangle. Thus, the difference between the being of the underlying subject and the being of attributes among the assumptions of a science lies in

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the difference between the identification of a particular that needs no justificatory account and the identification of a given particular that needs to be proved by a demonstration.\textsuperscript{112}

At this point, we are closer to the full account of hypotheses in Aristotle’s theory of demonstrative knowledge: A hypothesis is all about identifying (identification) a particular object as actually (veridically) being (predicated as) an instance of a certain kind: it is the case that x is identical with being F(a).\textsuperscript{113} Interestingly, ‘tode ti’, Aristotle’s compound expression constructed to refer usually to individuals sheds more lights on the ontological and semantic dimension of the notion of hypotheses.\textsuperscript{114} The ti which literally means ‘such-and-such’ contains a sortal and identifying element, while tode (this) includes a referential element. Combined together, tode it denotes an instantiation of a universal nature in the perceptually identifiable level.\textsuperscript{115} Thus, we can reach the following conclusion: for Aristotle, a hypothesis is the (semantic) identification of tode ti in the (syntactic) form of ‘x being F’ on the (proof-theoretic) condition that it serves as a starting point for a demonstrative inquiry.

§1.4 Hypothesis as Establishing Facts

It is obvious that the task of hypotheses, i.e. the identification of particulars by means of ‘setting forth,’ is not a difficulty in mathematical proofs. For in mathematics, the ekthesis is the

\textsuperscript{112} The distinction, thus, corresponds to the distinction between the hypothesis simpliciter and the hypothesis ad hominem, as we have examined. In addition, in the difference of two modes of being lie the different modes of scientific question, which we will deal with in the next section.

\textsuperscript{113} Another formulation would be: it is identifiably the case that x is (a) F. But it seems that the above formulation catches better the sense of instantiation.

\textsuperscript{114} See PoAn. I. 31, 87b28-30: “Even if perception is of what is such-and-such, not of what is a this so-and-so, nevertheless what you perceive must be a this so-and-so at a place and at a time.”

actualization of ‘what has already been given,’ i.e. a certain simple figure from which a geometer constructs a complex one, or a certain theorem to be proved, but admitted in advance as true. That is, the hypotheses in mathematical proofs are the setting forth of the given, problems and theorem.

But in the natural sciences, the hypotheses as the setting forth of the given is not a simple procedure. In fact, there arises a conceptual shift of ‘the given,’ especially the ‘problems’ in the case of the natural sciences. For in the natural sciences, there is no such problem as to construct or make a new figure from a given simple one.\(^{116}\) The problems in the natural sciences are not ‘how to.’ Rather they are, though not exclusively limited to, in the form of ‘whether is it the case or not?’ Apparently, the problems in the natural sciences are intimately related with ‘establishing facts.’ For Aristotle, as we will see, establishing facts is not just a stepping stone for a science to set off its inquiry, but an indispensable part of a science. And establishing facts is just as intricate as explaining the reason why the facts hold.\(^ {117}\) Now, it seems that Aristotle’s notion of hypothesis, which we have identified with the ‘setting forth of a given,’ has to be illuminated afresh in the context of establishing facts in a demonstrative science.

In this section, we will examine what it means for Aristotle to establish facts in the inquiry of demonstrative sciences, following Aristotle’s discussion of scientific questions in the second book of the Posterior Analytics. The aim of this section is to argue that Aristotle’s

\(^{116}\) For a provocative and laborious argument that there arises a conceptual shift of the view on the geometric construction between the ancients and the moderns, see David, Lachterman, The Ethics of Geometry (New York: Routledge, 1989).

\(^{117}\) For scientific facts to be established, Aristotle suggests different methods or ways: empeiria (accumulated experience), epagógē (induction), endoxa (accredited opinions of experts), and in some cases a kind of demonstration, i.e., demonstration quia. The first three topics will be touched on the Chapter 4, and the last will be treated with in the Chapter 3 of this study.
treatment of principles, especially the hypothesis in the first book of the *Posterior Analytics* is in continuity with investigation of what we seek in the second book. This point will be argued by showing that the upshot of our analysis of the notion of hypotheses equally applies to Aristotle’s thought on the two scientific questions:  

The things we seek (Τὰ ζητούμενα) are equal in number to those we understand. We seek four things: the fact (τὸ ὅτι), the reason why (τὸ διότι), if something is (εἰ ἔστι), what something is (τί ἔστιν). When we seek whether this or that is the case, setting down a plurality of terms (e.g. whether the sun is eclipsed or not), we are seeking the fact. Evidence for this: on finding that it is eclipsed we stop; and if from the beginning we know that it is eclipsed, we do not seek whether it is. When we know the fact we seek the reason why (e.g. knowing that it is eclipsed or that earth moves, we seek the reason why it is eclipsed or why it move). These things we seek in this way; but certain items we seek in another way—e.g. if a centaur or a god is or is not. (I mean if one is or is not *simpliciter* and not if one is white or not.) And having come to know that it is, we seek what it is (e.g.: Then what is a god? or What is a man?).

The first word that the second book of the *Posterior Analytics* starts with is ‘the things we inquire into’ (Τὰ ζητούμενα).  These are said to be the four possible objects of inquiry, and at the same time to correspond with the four possible types of our knowledge: (1) the “that” (*hōtī*), (2) the “why” (*diōtī*), (3) “if it is” (*eἰ ἔστι*), (4) “what it is” (*tί ἔστι*). Even though most commentators regard them as the four types of questions that a demonstrative science can ask, there can be found, strictly speaking, only three possible candidates of questions; (2), (3) and (4). For (1) the “*hōtī*” that something is the case cannot be a question, no matter how we construe it. Hence, it is puzzling that Aristotle himself in the following expositions treats the *hōtī* also as a question, by transforming it into ‘whether or not’ (*poterōn hē ou*). As we will see, the puzzle is

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118 PoAn. II. 1, 89b24-35.
119 If we compare it with the first sentence of the first book, “All teaching and all learning of an intellectual kind proceed from pre-existent knowledge,” then we might be naturally inclined to think that the direction of the two books are quite opposite: The first book concerns ‘the way from the principles, while the second deals with ‘the way into the principles.’ As it has been outlined in the Introduction, it represents a significant chasm between the two books in the viewpoint of the current Aristotelian scholarship. See the notes of McKirahan in the preface of his treatment of the above passage that “Unlike *APo* I, which mainly describes the structure of finished sciences, this passage discusses *the research phase of a discipline* [italics mine], when we are determining what the facts are and whether certain facts can be shown to follow from the principles.” McKirahan, *Principles and Proofs*, 189. Also see the similar remarks, Goldin, *Explaining an Eclipse*, 15.
not owing to a lack of clarity in Aristotle’s thought, but to his argumentative strategy of presenting as many possible alternatives and condensing them into the one that he aims to show up. Anyhow, the four types of questions and their examples are usually listed as follows:

(1a) is it the case that S is P?  
(1b) is the Sun eclipsed?

(2a) why does P belong to S?  
(2b) why is the Sun eclipsed?

(3a) if S is?  
(3b) if is a centaur or a god?

(4a) what S is?  
(4b) what is a god or a man?

The construction of (3a) is here somehow awkward, in contrast with such an existential construal as “if there is such a thing as (an) S,” which Barnes and other commentators take for granted. For the moment, we will leave it literally as it is, until we turn to the problem related to it. What is noticeable is that there are two pairs and two levels in the four questions:

<Pair A>  
<Pair B>

<Level 1> 
(1a) is it the case that S is P?  
(3a) if S is?

<Level 2> 
(2a) why does P belong to S?  
(4a) what S is?

Let us examine the <Pair A> which is less problematic to most commentators than the <Pair B>. It seems clear that (1a) is a question that asks whether some subject is qualified by some predicate; the subject ‘sun’ is qualified by the predicate ‘eclipse’, and the subject ‘earth’ is qualified by the predicate ‘moving.’ It is a question about a fact or a state of affairs, which can

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120 Barnes, Aristotle: Posterior Analytics, 203.
be identifiable at the perceptual level. *Prima facie*, it seems quite a simple entry-level question of scientific inquiries.

Then, is (1a) the correct construction of the form of this basic question of the demonstrative inquiry? Based on the examples, it looks evident that there should be two terms that hold the places of a subject and a predicate, so that the question is whether a subject is predicated of a predicate, or something is qualified by one of its property. But if we step back from this construction, while focusing on the cryptic phase “setting down a plurality of terms,” we realize that what Aristotle has in mind for the formula of the *hoti* question is different from the statement form of ‘Sis P.’ By “setting down together the subject term and predicate term,” it is rather in the form of “whether this ‘sun-being-eclipsed’ is or not?”, where the ‘this,’ the demonstrative pronoun refers to a state of affairs that is somehow put before us. More formally, the *hoti* construction is: “it is the case, (a) Px(Sx).” Truly, there are two particular predications in this construction; “x is (a) S,” and “x is (a) P.” Therefore, (1a) asks whether what we refer to by the predicate S is truly predicated also by the predicate P; is the thing out there that we call (are predicating) ‘the sun’ qualified by the property (predicate) ‘eclipse?’ This is without doubt the ‘setting forth’ (*ekthesis*) of a hypothesis that we have articulated in the previous section. The only difference is that the one is a question, while the other is an assertion. And what has been added is the double predication on the particular thing referred to by ‘this’ or ‘that.’ Then, following the results that we have arrived at regarding the hypotheses as *ekthesis*, we can say that the *hoti* question is all about identifying particular things as falling under (instantiating) some

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121 De Rijk’s translates the phrase as “putting it in a more-than-one-word expression.” See his illuminating interpretation of the word ‘number’ on this phrase; De Rijk, *Aristotle: Semantics and Ontology*, 653, n.273.
universals (properties): to establish facts is to identify particulars as an instantiation. At the outset of the second book of the *Posterior Analytics*, we may insist, Aristotle is explicating the meaning of hypotheses as a starting point of demonstrative knowledge in a more explicit context of scientific inquiries.

Once the question that asks to identify the particular things put before us is answered, i.e., the facts (*hoti*) are settled, we can move to the next level of question (2a) of the why (*dioti*), e.g. why is it the case that the sun is eclipsed or the earth moves. Now, likewise (1a), this <level 2> question can be translated as “why is it the case that x is P(x(Sx))?” Then, the question means to seek the reason, i.e., through what (*dia ti*) the state of affairs as constructed as ‘P(x(Sx)),’ e.g. ‘sun-being- eclipsed’ obtains; it is the search for the reason or explanation not just of this-being-sun, or this-being-eclipsed, but of this-being-sun-and- eclipsed. Only by stepping up to this level does the demonstrative reasoning of the search for reasons start off. It implies that the *dioti* question (2a) makes the fact (*hoti*) a conclusion of demonstrative proof, since it is conceivable that we can “stop our inquiry” at the level of *hoti*, without going up the next level.

Then, when the <level 1> question is a prerequisite for the <level 2> question, because the former always precede the latter, is it certain that (1a) is logically a necessary condition of the (2a)? It seems so, since without knowing that something is the case, there could not be an inquiry why something is the case. However, it becomes puzzling when we see the development of the questions Aristotle leads to:122

These and thus many are the things which we seek and which we find and know. When we seek the fact or if something is *simpliciter* [unqualifiedly] (απλῶς), we are seeking whether or not there is a middle term (μέσον) for it; and when, having come to know

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122 *PoAn.* II. 2, 89b37-90a6
either the fact or if it is—either partially (ἐπὶ μέρους) or simpliciter —, we seek the reason why (τὸ διὰ τί) or what it is (τὸ τί ἐστι), we are then seeking what the middle term is. (By the fact that it is partially and simpliciter I mean this: partially—Is the moon eclipsed? or Is it waxing? In such cases we seek if it is something or is not something. Simpliciter: if the moon or night is or is not.

Here, Aristotle puts forward two new questions that are closely related with each other.

(5a) is there a middle term?

(6a) what is the middle?

And then, he reduces (1a), the ‘hoti’ question and (3a), the ‘ei estin’ question to (5a) [Reduction 1], at the same time condensing (2a) ‘dioti’ question and (4a) ‘ti esti’ question into (6a) [Reduction 2]. The initial outcome of reducing the four types of question into the two does not stop at the following points: When we inquire into facts or ‘if it is,’ we are searching for the existence of a middle term for a demonstrative proof; and when we inquire into the reason and ‘what it is,’ we are searching for a specification of a middle term. For, by condensing the four questions into the two new questions, Aristotle at the same time assimilates (1a) and (3a), the questions of facts and ‘if it is,’ and (2a) and (4a), the questions of the reason and ‘what it is.’ This assimilation is indicated in the [Reduction 1] by the odd phrase “if it is partially.” Here, the hoti question is identified with the ‘if it is’ question with a qualification of “partially,” the contrast of which is the question of “if it is simpliciter [unqualifiedly].” Thus, the two questions do not differ in kind, but only in quality. 123

(1a) → (1a∗) if is it qualifiedly (ei estin epi merous)?

(3a) → (3a∗) if is it unqualifiedly (ei estin haplōs)?

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123 Barnes’ translation of the “epi merous” as “partially” gives an impression of the difference of the two questions in quantity. He holds that “‘X is Y’ says that X is ‘partially’ because ‘X is’ is a part of ‘X is Y.’” Barnes, Aristotle: Posterior Analytics, 203.
It has been pointed out before that among the four original questions, the *hoti* construction cannot be a question. The intention of Aristotle for such an enunciation of the questions is now clear: He proceeds initially as if the two questions of (1a) and (3a) were different in kind, because the obscure setting of the (3a) question is relatively hard to apprehend, comparing with the (1a) question; and after clarifying the (1a) question, and also by assimilating the two questions into the same one in kind, he illuminated the sense of (3a) question. It follows then that the answers to the ‘if it is’ questions are indifferently the *hoti*, i.e., assertions of concrete facts that can be identifiable at the perceptual level. At this point, we can confirm that the (3a) question bears on the same thing as (1a), differing only in quality. We will get back to this issue soon.

In addition, Aristotle explicitly asserts the assimilation of (2a) and (4a), the ‘reason why’ and the ‘what it is’ in his claim that the ‘what it is’ (*to ti estin*) and the ‘why it is’ (*to dia ti estin*) are the same (90a14-5). This assimilation entails an interconnection between definition and demonstration, the puzzling discussion of which occupies the immediately following chapters of the second book of the *Posterior Analytics*.¹²⁴

Returning to the problem that we raised in the <Pair A>, can we still maintain that the <Level 1> question is not only a temporal but also a logical prerequisite of the <Level 2> question? Given the transformation of the questions, we have to ask now whether question (5a) that ‘is there a middle term?’ is logically necessary for (6a) ‘what is the middle?’ Since the question of *hoti* (1a) and *dioti* (2a) are respectively identified with the questions of (5a) whether

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¹²⁴ This problem will be treated in the Chapter 3 of this study.
there is a middle, and (6a) what the middle is, it seems evident that (5a) should precede (6a).

However, an acute reflection on the logical implication from (5a) to (6a) reveals some puzzles:

{P1} how can we seek for the middle, before we know what it is?

{P2} how can we know that there is a middle, even without knowing what it is?

{P3} how can we recognize the middle at the level of question (1a), even if we come across it in the midst of hoti inquiry?

These puzzles are the critical problem that Aristotle confronts explicitly in other places of the Posterior Analytics. And it is not an exaggeration to assert that the key portions of Aristotle’s theory of demonstration address the solution of the puzzles, though not directly. At any rate, it is clear that {P1} concerns the temporal priority, {P2} is about logical priority, and {P3} has to do with the criterion of identification.

Although {P1} - {P3} articulate the different aspects of the problem that arise in the transition from (5a) to (6a), the puzzles boil down to the one fundamental problem: How can we establish scientific facts in a demonstrative inquiry in order for them to serve as conclusions of demonstrative proof? Truly, not all statements of facts, i.e., the answers of the (1a) and (3a) questions, can serve as the conclusions of demonstrative proof. There should be a distinction

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125 This puzzle appears as the Meno’s paradox at the chapter 1 of the first book, and as the puzzle between ‘that it is’ and ‘what it is’ at the chapter 7 of the second book. It will be intensively examined in Chapter 4 of this study.

126 As we will examine, both Aristotle’s theory of scientific predications in the chapter 4 of the first book, and his ideas on the ‘nominal definition’ in the chapters 8-10 of the second book, are closely related to the solution of this puzzle.

127 See the different configurations of the puzzle by McKirahan, Principles and Proofs, 190-191. He does not conceive the puzzle as a serious problem of Aristotle’s theory of demonstrative science. According to him, the confusion resolves by “softening the description” of the question of facts such as “whether there is a likely candidate of middle.”
between ordinary facts and scientific facts. To insist that a statement of a fact be a conclusion of demonstration means that the fact has a middle to be revealed by a demonstrative proof. Thus, Aristotle says that “If we have not perceived the middle term, we seek it…. But if we were on the moon we would seek neither if there is an eclipse nor why there is: rather these things would be plain at the same time. By perceiving we would come to know the universal.” This passage implies that the causal connection that demonstration tries to reveal by way of the middle is not evidently displayed in our perceptual judgment of the facts. Then, the puzzle arises: how could the demonstrative inquiry start off from the statements of facts, without knowing previously that there is some causal connection in them to prove? As we have mentioned at the beginning of this section, establishing facts in demonstrative inquiry is not a simple and easy process.

In this section, we do not offer the solution of the puzzle. Instead, we go back to our analysis of the hoti, and examine again if our formulation of it can differentiate the scientific facts from the ordinary facts. When we analyze the hoti question within the framework of the hypotheses as ekthesis, the formulation of it results in the form of ‘it is the case that x is (a) Px(Sx).’ Is this a right formulation of a scientific fact? Let us look at the statements by Aristotle in the middle of his argument that there cannot be predication chains of infinite

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128 Upton’s distinction between the ordinary and scientific level of ‘if it is’ questions applies to the point that we make here. Thomas, Upton, “The If-It-Is Question in Aristotle,” Ancient Philosophy 11 (1991): 315-329. However, he cannot escape the dominant view of the existential interpretation of ‘if it is’ question, by virtue of which he asserts that particular sciences hypothesize the existence of the fundamental genera. By the same reason, he does not successfully show the formula of the scientific ‘if it is’ question— “does SP exist?” or “does S exit as P?” See esp. 327.

129 PoAn. II. 2, 90a25-28. The example in this passage is somewhat awkward; how could a dweller on the moon observe the eclipse of the moon? However, the message of it is clear that some perceptual facts do not lead to a scientific inquiry.
You can say truly that the white thing is walking, and that the large thing is a log, and again that the log is large and the man is walking. When you speak in these two ways, you make different sorts of statement. When I assert that the white is a log, I say that something which is incidentally white is a log, and not that the white thing is the underlying subject (τὸ ὑποκείμενον) for the log.... But when I say that the log is white, I do not say that something different is white and that is incidentally a log.... Rather, the log is the underlying subject which came to be white not in virtue of being something different from just what is a log or a particular log.

Two different kinds of predication are compared in the above passage:

<Kind 1> “the white thing is a log.”

<Kind 2> “the log is white”

Within our formulation of the ‘facts’ (hoti), <Kind 1> and <Kind 2> do not differentiate themselves from each other. <Kind 1> will be: it is the case that [x is (a) White] and [x is a Log], or it is the case that x is Lx(Wx). And <Kind 2> will be: it is the case that [x is a Log] and [x is (a) White], or it is the case x is Wx(Lx). In other words, [x-being-white-log] and [x-being-log-white] are the same state of affairs, within our analysis of the hoti.131

However, according to Aristotle, <Kind 1> predication is not a real predication: “If we must legislate, let speaking in the latter way be predicating, and speaking in the former way

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130 PoAn. I. 22, 83a1-14.
131 According to Upton, the lack of difference might be a necessary entailment of Owen’s instantiation interpretation of the ‘if-it-is’ question; “Conspicuously, if we were to translate the accidental and essential if-it-is responses—man exists as a pale thing or man exists as a certain kind of animal—into instantiation form, they would be indistinguishable from one another... However, by itself, instantiation would be unable to differentiate between the two responses, only the second of which, according to Aristotle, would be able to guide genuine scientific inquiry into the causal what-it-is of man;” Upton, “The If-It-Is Question in Aristotle,” 325. Owen, who insists that for Aristotle ‘to be is always to be something,’ thinks PoAn, II. 1-2 are the only chapters where Aristotle is solely concerned with existence. G. E. L. Owen, “Aristotle on the Snare of Ontology,” in Logic, Science and Dialectic, ed. M. Nussbaum (Ithaca: Cornell, 1986), 270-271.
either not predication at all or else predicating not *simpliciter* but incidentally." Now, <Kind 1> and <Kind 2> predications are respectively identified with ‘incidental’ and ‘*simpliciter*’ predication. For, <Kind 1> brings up something incidental (the white), when it initially refers to the underlying subject (this particular log), while <Kind 2> rightly calls the underlying subject (this particular log) simply that by virtue of which it is (the log). We come to realize, then, that Aristotle is talking not about predication, but *categorization*. Barnes’ translation of ‘*kategorein*’ as ‘predicating’ systematically misleads us to think the predication relation of subject terms and predicated terms is being treated in this passage. Thus, it is no wonder that Barnes produces such comments on the text: the ‘unnatural predication’ which takes the formulation of ‘YaX → (∃Z) (YaZ & it happens that XaZ),’ *does* occur in demonstration, contrary to Aristotle’s remarks; for any *true* unnatural predication, Aristotle might think that “there will always be an associated sentence which expresses the natural truth which underlies the unnatural predication.” Further, Barnes asserts that any mathematical sentence which has a subject term like ‘triangle’ should be conceived as unnatural predication, because the term, ‘triangle’ is not an underlying subject.

It is manifest that Barnes’s translation and his comments are off the mark, when we read the next few sentences that follows the above passage.¹³⁴

Let us suppose that what is predicated [categorized] is always predicated *simpliciter*, and not incidentally, of what it is predicated [categorized] of; for _this is the way in which demonstrations demonstrate_ [italic mine]. Hence when one thing is predicated [categorized] of one, either it is in what the item is or it indicates that it has some quality or quantity or relation or is doing something or undergoing something or is at some place or time.

¹³² *PoAn*. I. 22, 83a14-17.
First, to avoid the confusion caused by Barnes’ misleading translations, it should be underlined that the predication here, rather than the categorization, is not a logical relation between a subject term and predicate term. It bears on the semantic relation between the underlying subject (‘substratum’ in medieval terminology) and the names that we bring in for identifying it. For example, while referring to Socrates, we may call him “the white thing,” “the thing in the agora,” “the man,” or “the animal.” By the first two names, we categorize and identify him respectively in quality and in place, which is incidental for Socrates, but by the last two names, we categorize him in the ‘what it is,’ i.e., *simpliciter*.

Thus, the categorization is the initial step of identifying some entity (substratum) put before us as a particular thing. In Barnes’ translation, there is no distinction between the categorization and the predication, which follows along after the step of categorization; after we name and identify a substratum in the categories (x-being-F), we can predicate the categorized thing by ascribing an attribute. Then, it seems that the statement, “the waking is white” has a categorization of some entity in the ‘doing something’ (*poioun*), and a predication in an accident. Clearly, in Aristotle’s view, such a statement cannot serve as a conclusion of demonstration, contrary to Barnes’ comment. It is not a well-formed statement of a fact (*hoti*), which deserves to be proved, even if this *true* unnatural predication can be reformulated.

Second, we should be careful not to enter into the realm of metaphysics in dealing with the notion of ‘underlying subject’.

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135 As we will examine, Ross and Goldin commit the same exegetical mistake of taking the underlying subject as a strong metaphysical notion in their treatment of ‘if it is *simpliciter*’ question.
substratum that is not inherent in any other fundamental entity. Barnes misconstrues in such a way that since the triangle is composed of the more basic lines, any sentences that attributes a predicate to the triangle is, according to the criterion of Aristotle, an unnatural predication.\footnote{Contrary to Barnes’ misunderstanding, Aristotle thinks that all mathematical sentences are the ‘natural predication,’ or rather the essential predication, because there is nothing incidental in them. See the passage that we quoted in the section 3, PoAn. I. 12, 78a11-12.} Without doubt, the notion of the ‘underlying subject’ in the Posterior Analytics has nothing to do with the notion of matter or substantial substance. Rather it is close to the bare perceptible entity that waits to be identified by as a demonstrator. We do need to reiterate the point that the identification of the underlying subject that “is put forward before us (to prokeimenon)\footnote{Topics, II. 4, 111b17.} is always accompanied by a universal character, i.e., ‘x-being-F.’

Third, the phrase “the way in which demonstrations demonstrate” informs us of what Aristotle conceives demonstration deals with. Barnes takes it, in congruence with his interpretation of the natural predication, to mean that “the subject term of any scientific proposition will denote a substance…The constraint which this thesis imposes on the sciences—and not just on the mathematical sciences—severe.”\footnote{Barnes, Aristotle: Posterior Analytics, 176.} As a matter of fact, what is severe is not the restriction on the subject of scientific proposition, as Barnes interprets. Rather it consists in the fact that if all predications in demonstration, as Aristotle supposes, are \textit{simpliciter} predications, the scope of demonstrative knowledge becomes too narrow. Since we view the \textit{simpliciter} predication as ‘bringing up (categorizing) a substratum only in the ‘what it is’ (ti esti), if all predications in demonstration as well as the ascribed attributes are of this kind, it entails
that demonstration excludes dealing with properties (to idion), which are among the key ingredients within a demonstrative proof.\textsuperscript{139}

For our purpose, we do not need pursue this issue further. Still, what we can glean from the above discussion of predications is that, even at the level of establishing facts (hoti), in order for them to become conclusions of demonstrative proof, they should be carefully formulated to conform to the rule of the correct predication. That is, a substratum has to be correctly identified in the category of ‘what it is,’ and the attribute ascribed to it should be in the same line of the category.\textsuperscript{140}

Now, can we ascertain that our formulation of the hoti spelled out via the notion of hypotheses as ekthesis, rightly reveals the aspect of predications? It seems not, because we should at least admit that the formulation fails to reflect in itself the aspect of categorical predication; it cannot explain why such a formulation as ‘it is the case that x-being-waking-white’ cannot be a scientific fact. The difficulty is deeply grounded in the fact that Aristotle’s ideas on categorical predication cannot find any specific (syntactic) expression in the verb ‘being.’ That is to say, the syntactic form of ‘being’ does not differentiate the various predications in the categories.\textsuperscript{141} Then, we may add a semantic condition to our formulation of ‘fact’ (hoti), so as to limit the identification sense of ‘being’ within the category of ‘what it is.’ No matter how

\textsuperscript{139} We will discuss the status of the ‘property’ in demonstrative proof at the Chapter 2, along with per se predications.

\textsuperscript{140} For a persuasive interpretation that the categorical predication of the substratum does not have to be limited in the category of ‘what it is,’ see De Rijk, Aristotle: Semantics and Ontology, vol. I, 638-645.

\textsuperscript{141} For this reason, Aristotle’s theory of demonstration cannot be formalized in any modern predicate logic, which lacks the theory of categories. Thus, the medieval notion that the theory of demonstrations is the material logic seems right in this respect.
imperfect it is as a formal presentation, we append the condition: To establish scientific facts, the identification of substratum should be in the ‘what it is,’ when it is said to be ‘x being F.’

Notwithstanding the above burden, our construal of hoti and dioti questions at the first two chapters of the Posterior Analytics has the great merit of not committing the same type of error as the existential interpretation of the notion of hypotheses has made. This advantage will be evident when we deal with the third and fourth questions of the demonstrative inquiry. We seem to have already done some groundwork for comprehending the second pair of questions:

<Pair 2>

<Level 1> (3a) if S is? (3b) if is a centaur or a god?
<Level 2> (4a) what S is? (4b) what is a god or a man?

For it has been indicated that Aristotle reduces the questions (1a) and (3a) into a same type but different in quality so as to make the answers of the two questions concern the same thing, i.e., the hoti.

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
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<tbody>
<tr>
<td>(1a) → (1a*) if is it qualifiedly (ei estin epi merous)?</td>
<td>It is the case that x-being-F-G.</td>
</tr>
<tr>
<td>(3a) → (3a*) if is it unqualifiedly (ei estin haplōs)?</td>
<td>?</td>
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What kind of fact (hoti) will the (3a) question intend as its answer? Most commentators, who view (3a) as the question of existence regarding the ‘subject kind,’ naturally think that the answer to it is also the confirmation of the existence, i.e., the fact that some subject exists; it is the case that a centaur or a god exists. The examples that Aristotle induces for the (3a) question appear to support the existential reading. On their understanding, then, the verb ‘estin’ in (3a) should have a different sense from that of (1a), which is evidently predicative. But it is
suspicious that Aristotle has condensed the two initially different questions (1a) and (3a) into the same ‘if-it-is’ question only to reiterate two heterogeneous facts, ‘fact of a state of affair’ and ‘fact of existence.’ In this respect, it is fairly understandable that the possibility of reading even the ‘estin’ in (1a) or (1a*) as existential is groped for by some existential interpreters. For example, Goldin suggests that when Aristotle equates the question, “why is the moon eclipsed?” with the question, “why is there the eclipse?” (dia ti estin ekleipsis),  he actually reduces the ‘subject-predicate connection’ into the ‘existence of the predicate,’ and thinks that the essence of the predicate (eclipse) explains why the predicate exists and ultimately why it belongs the subject (the moon).

However, the existential interpretation of the question (3a) confronts a serious problem. As Ross makes explicit in the following comments, the problem is regarded as the possibility of demonstrating the existence of a substance kind, which will have a conclusion of the form “S exists.”

But how can ei esti or ti esti applied to a substance be supposed to be concerned with a middle term? A substance does not inhere in anything; there are no two terms between which a middle term is to be found. Aristotle gives no example of what he means by a meson in such a case, and in this chapter the application of the questions ei esti and ti esti to substances is overshadowed by its application to attributes and events, which is amply illustrated (90a15-23). He does not seem to have thought out the implications of his view where it is the ei esti or the ti esti of a substance that is in question, and the only clue we have to his meaning is his statement that by meson he means aition.

142 PoAn. II. 2, 90a16.
143 Goldin, Explaining the Eclipse, 22-23; “Similarly, to ask whether there is such a thing as harmony is to ask whether it is possible for high and low notes to harmonize; to understand why the high and low harmonize one must need to know the essence of the predicate “harmonize”: namely, to have a certain numerical ration (2.2.90a18-23).” Interestingly, he appeals to the text we examined (I. 22, 83a1-24) for this insight, where unnatural predications are reformulated into natural ones.
144 Ross, Aristotle’s Prior and Posterior Analytics, 612.
The puzzle raised by Ross goes roughly this way. Given that a well-formed conclusion of a demonstration must be in the form of “S is P,” how could the inquiry into the cause (the middle) of the existence of substance kind be possible, since in that case, the conclusion would be in the form of “S exists”? By virtue of the very idea of ‘the middle,’ which intrinsically presumes two terms to connect, it seems puzzling even to say of the middle of the existence of a substance kind. Though Ross suggests a clue to the solution of the puzzle by introducing the notion of the final and efficient cause of substance kind at the *Metaphysics* 1041a26, he immediately admits that the way of solution could not be successful.\(^\text{145}\)

Does Aristotle really conceive of a type of a demonstration that proves the existences of substance kinds? Simply put, the problem is a pseudo-problem. It is indeed caused by the two exegetical mistakes, first and foremost by taking the question (3a) existentially, and second, by viewing the ‘underlying subject’ as a metaphysical notion of ‘substance’. It has been already pointed out that the notion of ‘underlying subject’ in our text has no metaphysical connotation. Let us check once more how Aristotle employs the concept in his contradiction of the ‘being qualifiedly’ and the ‘being unqualifiedly (*simpliciter*).’

For the explanation of its being not this or that but *simpliciter*, or its being not *simpliciter* but one of the items which hold of it in itself or incidentally—this is the middle term. By “is *simpliciter*” I mean the underlying subject (e.g. the moon or the earth or the sun or a triangle), and by “one of the items’ eclipse, equality, inequality, if it is in the middle or not.”\(^\text{146}\)

Aristotle articulates the ‘being qualifiedly’ in the different phrase of ‘being this or that’—implying a descriptive (predicative) mode between a subject and a predicate—and then specifies

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\(^{145}\) Ibid. By contrast, Goldin takes up Ross’ clue up to the extent of his claim of ‘epistemic substance’ which he believes has a bearing on the existence claims of the hypothesis. Goldin, *Explaining an Eclipse*, 25-40.

\(^{146}\) *PoAn*. II. 2, 90a10-14.
it more into an essential and incidental predication—“the items which hold of in itself or incidentally.” Cleary the term ‘epi merous’ that Barnes translates quantitatively as “partially” indicates that what we bring up with a universal term in a category, while referring to a subject (substratum), is once more qualified by an essential or incidental attribute that we assign. In terms by means of which we define the notion of hypotheses, there happens in the ‘being qualifiedly’ double instantiations towards a substratum. Consequentially then, the ‘being unqualifiedly’ is unqualified, because there happens in ‘the being of unqualifiedly’ only a single instantiation-act by a demonstrator; “it is a god,” “it is a centaur,” or “it is a “man.” It is just an identification act towards a subject that is put forward before us (to prokeimenon). A decisive evidence for this interpretation is one of the examples that Aristotle mentions for instances of the underlying subject, i.e., ‘triangle.’ When we make such a ‘simpliciter predication’ as “it is a triangle,” we do not denote by ‘triangle’ any metaphysical substance, although according to the existential interpretation we should do.147

Then, can we imagine a demonstrative inquiry of a middle or a cause, starting from a single instantiation act by a demonstrator? And can this inquiry be expressible in a well-formed syllogism? Let us say, in a setting of demonstrative inquiry, one person (A) states that “it is a centaur,” or “it is a triangle,” while referring to an animal or a figure that the other person (B) is not acquainted with before. Then, (B) will ask “what is a centaur?” or “what is a triangle?” demanding to (A) a justification that “on what ground are you saying that it is such a thing as you call it?”148 The person (A) will, then, start his explanation from a definition that “a centaur

147 See how Goldin tries to escape the patent example; Goldin, Explaining an Eclipse, 19, n.6.
148 At this stage, B can surely refute that it is a centaur, because it is actually a different sort of animal.
is such-and-such an animal,” or “a triangle is such-and-such a figure.” Surely, the definitions in this context are regarded by Aristotle as a starting point or a principle of demonstrations, regardless of whether (B) accepts them or not. And also utmost important is that the definition as a starting point of demonstration is different from the definition as the end point of a demonstration. \(^\text{149}\) The next stage will be the extensive analysis of the properties of the particular things that are called by such a name as a “centaur” or a “triangle,” with a clear view to find the mediating property that connects itself with the predicate of the definition. If we successfully find it, say \(\Phi\), now the process of constructing a demonstrative syllogism ensues with the conclusion that this particular thing is a centaur or a triangle. \(^\text{150}\) We need not at this point explore further the related issues that will be exposed in the detailed study of demonstrative inquires, including the connection of definition and demonstration.

Instead, let us recapitulate the arguments that we have made so far in this chapter. Hitherto, we have aimed to show that the hypotheses, one of the principles of Aristotle’s demonstrative science, are the starting points of demonstrations, not in the sense of ultimate premises or presuppositions at the top of the chains of deductive proofs, but in the sense of stepping stones or the givens of the demonstrative inquiries. This point has been supported by the crucial argument that the hypotheses in demonstrative proof has an analogous role as the geometrical ‘setting forth’ (\textit{ekthesis}) process in the respect of the semantic identification of particulars as instantiations. Also we have tried to uphold a unified theme of the \textit{Posterior}

\(^\text{149}\) The definition as a starting point of a demonstration is the ‘nominal definition.’ We will discuss the full scope of the connection between the nominal definition and real definition at the Chapter 3 of this study.

\(^\text{150}\) See McKirahan’s correct presentation of the demonstration of existence by a geometrical example, except the objectionable point that he construes the conclusion of the demonstration \textit{existentially}, since he understands the constructability of a figure as a claim of existence of the figure; McKirahan, \textit{Principles and Proofs}, 192-197.
Analytics, namely, demonstrative inquiry, by connecting the hypotheses as a principle in Book I with the ‘hoti’ and ‘ei estin’ questions in Book II. For the purpose of deflating the reading of demonstration as an axiomatic system of sciences, those arguments were preceded by the criticism of the still dominant view of the hypotheses, i.e., the existential interpretation. We conclude this chapter: While the notion of hypothesis, as long as viewed as the existential claim, leads into the axiomatic deductive view of demonstrative knowledge. But, if hypothesis is involved in the identification of the instantiated particulars, it provides a route to a unitary perspective on the Posterior Analytics, i.e., demonstrative inquiry.

It seems now that we are at the outset of exploring the second principle of Aristotle’s demonstrative science, the definition. The focus of the next study will be in the same argument line as we explicate the hypotheses; to reveal the definition as a principle not in the sense of ultimate premises of the axiomatic deductive science, but as an indispensable stepping stone for the demonstrative inquiry.
Chapter 2

Definition as a Principle:

A Criticism of the Axiomatic Deductive Reading

Introduction

The significance of definition in Aristotle’s philosophy is so immense that the topic extends from his early thoughts on definition in the *Topics*, through the *Analytics*, to his mature views in the *Metaphysics*.\(^1\) It is well recognized that Aristotle was engaged in lively debates about definition during his early Academy years. The problem of definition was a constant concern throughout Aristotle’s philosophical career.

As Aristotle himself reports, the origin of the philosophical issue is Socrates and his seeking for the ‘what-it-is’:\(^2\)

Socrates occupied himself with the excellences of character, and in connection with them became the first to raise the problem of universal definitions…. But it was natural that Socrates should seek the what-it-is, because he was seeking to deduce and the what-it-is is the starting-point of deductions…. For two things may be fairly ascribed by Socrates—inductive arguments and universal definition, both of which are concerned with the principle of sciences. But Socrates did not make the universals or the definitions exist apart; his successors, however, gave them separate existence, and this was the kind of thing they called Ideas.

However correct Aristotle’s appraisal of Socrates and his successors may be, the passage also reveals the concerns of Aristotle himself regarding the issue of definition; the what-it-is, its ontological status, the starting-point of deductions, and most importantly, definition as a principle of the sciences.

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\(^1\) Aristotle discusses theoretically the issue of definition in Book 6 of the *Topics*, Book 2 of the *Posterior Analytics*, and Books 7 and 8 of the *Metaphysics*. But the issue extends beyond these places. If we can say that the *De Anima* concerns the definition of soul, the *Physics* deals with the definition of motion, and the *Politics* is about the definition of the polis and citizenship, etc.

Definition as a principle within the structure of demonstrative science is undoubtedly a key theme of the Posterior Analytics. However, a straightforward account of it is hard to give, partly because the text itself barely allows it. While dealing with hypothesis as a principle in the previous chapter, we touched on the issue of definition as a principle in some important passages but reached only a provisional and very cautious conclusion about it: definition as a principle and as a basic assumption of demonstrative science is very closely related to the issue of nominal definition. The following exegetical questions now confront us:

(A) In what sense can nominal definition be given the honorific title of ‘principle’?

(B) In what way does nominal definition bear upon real definition understood as an indemonstrable first premise of demonstration?

(C) What is the relationship of demonstration with definition, whether it is nominal or real? 3

As a commentator candidly confesses, 4 we are still “in the dark” about definition and its relationship with demonstrative knowledge.

This chapter takes up the issue of definition as a principle in Aristotle’s description of demonstrative science. However, rather than trying to solve the above problems and related issues, which will be discussed in the next chapter, we will take a negative route toward clarifying the notion: In line with Chapter 1, this chapter aims to deflate the contemporary axiomatic-deductive understanding of Aristotle’s demonstrative knowledge, by showing that the important passages in chapters 2 and 4 of Book I—the locus classicus of the axiomatic

3 Another difficult question would be: Why is the Topics’ thesis that definition obtains by its genus cum differentia not prominent in Aristotle’s discussion in the Posterior Analytics?

4 D. Frede, “Comment on Hintikka’s Paper ‘On the Ingredients of an Aristotelian Science’,” Synthese 28 (1974): 79-89. She says: “I do not want to pretend to have a clear-cut solution which dispenses of all the difficulties which Aristotle's notion of a deductive science based on immediate premises presents to us. A large part of the difficulties seems to stem from the fact that we are still in the dark about any precise model of procedure which Aristotle had in mind when he suggested his arkhai,” 88.
interpretation—do not bear on definition as the ultimate premises (propositions) of a science in the way the axiomatic interpretation conceives.  

The first section presents Aristotle’s description of ‘knowledge simpliciter’ and the six conditions for principles, and then follows the axiomatic interpretation of them. We will indicate some serious drawbacks in the axiomatic-deductive interpretation. In the end, it will be shown that the axiomatic interpretation falls into the mistake of concluding that definition as a principle is the indemonstrable premise of a deductive science. We will claim that behind this interpretation lies a critically misguided presupposition that, for Aristotle, the basic unit of knowledge is the proposition.

The second section challenges the axiomatic interpretation by proposing an alternative reading of the six conditions of principles. We will approach the same text from the perspective of concepts (or universals) instead of propositions. Emphasis will be placed on the three important conditions, i.e., truth, primacy and immediacy. The result of our new reading is that the six conditions for principles point to the way in which maximal universal causes—our rendition of ‘commensurate universals’—should be sought in a demonstrative inquiry. And a critical comment will be directed against the understanding that demonstration proceeds only via universal terms.

The third section examines the three predications, *kata pantos, kath’ hauto and kath’ holou*. It will be shown that they do not bear directly on definition as an ultimate indemonstrable

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5 R. Hankinson’s presentation of the axiomatic-deductive system of Aristotle’s demonstrative science is typical: “Sciences, for Aristotle, are organized bodies of knowledge; and, at least if they are properly developed, their organization will reflect that of the portion of reality they describe. Certain truths about the world are simply basic, requiring no further explanation… Each science proceeds by treating them as axioms [italics on mine] from which to derive the dependent theorems that form the remainder of the science. The deductive structure of science will thus mirror the hierarchical structure of the world. Axioms must be true, primary, immediate, more intelligible than, prior to and explanatory of the conclusion.” R. Hankinson, *Cause and Explanation in Ancient Greek Thought* (Oxford: Clarendon Press, 1998), 160.
prophecy. In the course of arguing this contention, it will become clear that the ‘what-is-it’
locution is a vital engine of demonstrative inquiry.

§2.1 Definition as Ultimate Premise in the Axiomatic Deductive Reading

Chapters 2 and 4 of Book I of the Posterior Analytics are considered by most
commentators to be the backbone of Aristotle’s doctrine of demonstrative knowledge. These
chapters delineate what demonstrative knowledge is, and from what it proceeds, describing kinds
and requirements of principles. Chapter 3 of Book I gives arguments against two opponents of
the possibility of demonstrative knowledge—those who argue demonstration leads to infinite
regress and the proponents of circular proof. Aristotle concludes that there should be
indemonstrable starting points. All in all, these chapters are usually regarded as providing a
picture of a systematic body of propositions, at the top of which lie definitions as indemonstrable
first propositions (premises). From this basic line of interpretation follows a doctrine, what was
once called ‘a new orthodoxy’:

“Aristotle here constructs demonstrative science as an
axiomatized deductive system in order to give the most efficient and economical method of
teaching and imparting understanding.”

The axiomatic understanding of demonstrative knowledge begins with construal of the
‘strict sense of demonstrative knowledge’ that is introduced in the second chapter of our text.
Let us focus, then, on the first half of the chapter, since we have already closely examined the

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6 M. Burnyeat, “Aristotle on Understanding Knowledge,” in Aristotle on Science: The Posterior Analytics:
second half in our previous study of hypothesis as a principle: 8

[A-1] We think we understand (ἐπίστασθαι) something *simpliciter* (and not in the sophistical way, incidentally) when we think we know of the explanation (αἰτία) because of which the object holds that it is its explanation, and also that it is not possible for it to be otherwise. It is plain, then, that to understand is something of this sort.

The above passage is conceived by most commentators to distinguish two fundamental requirements that the ‘strict sense of knowledge’ has to meet. For someone to understand or to have knowledge *simpliciter*, of something,

[Fundamental Requirements of Knowledge *Simpliciter*]

(FR₁: Explanation) He has to be able to give an explanation (*aitia*) or the reason-why (*dioti*) of something’s being the case, 9 and

(FR₂: Necessity) He has to know the necessity of something’s being the case. 10

Barnes formalizes these two requirements as follows: 11

* A understands X = _df_ a knows that Y is the explanation of X and a knows that X cannot be otherwise.

As they stand, these requirements— explanation and necessity— do not seem too strict:

In view of the fact that Aristotle uses here “we think” arguments, 12 it appears that he refers to the description of ‘understanding’ (knowledge *simpliciter*) already agreed upon at least among the members of his philosophical group, rather than to his own new technical criteria. As a matter of fact, it would not be a difficult task to become familiar with the term ‘explanation’ (*aitia*) or ‘that

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8 *PoAn*, I, 2, 71b10-14.
9 Notice that this first requirement is identical with the second scientific question and answer (*dioti*) of demonstrative inquiry that we examined at §1.4.
10 Whether the necessity is *de re* or *de dicto* is debated among scholars. For a reference that introduces the debate, see R. Sorabji, *Necessity, Cause and Blame: Perspectives on Aristotle’s Theory*, (Ithaca: Cornell University Press, 1980), chap. 12.
12 See Barnes’ comment on this argument; J. Barnes, Ibid. 91-92.
which cannot be otherwise’ for anyone who reads one of Plato’s dialogues, especially *Phaedo* and *Meno*. Furthermore, we do not find yet any of Aristotle’s own logical terminology which he will use to articulate the strict sense of unqualified knowledge, even though Aristotle says, a few lines after the above passage, that “by a demonstration I mean a scientific *syllogism*; and by scientific I mean a syllogism by possessing which we understand something.”

However, the passage contains a key notion revelatory of what Aristotle tries to convey by the ‘strict sense of demonstrative knowledge’, even before his mentioning of the six conditions of principles. Just before Aristotle introduces the two fundamental requirements, he brings to the fore knowledge *simpliciter* by a negative parenthetical phrase, ‘not in the *sophistic* way, *incidentally*’. To see why Aristotle contrasts knowledge *simpliciter* with knowledge *in the sophistic manner*, let us note the following:

[A-2] For this reason, even if you prove of each triangle, either by one or by different demonstrations, that each has two right angles—separately of the equilateral and the scalene and the isosceles—you do not yet know of triangles that they have two right angles, except *in the sophistic way*; nor do you know it of triangles *universally*, not even if there are no other triangles apart from these. For you do not know it of triangles as (♯) triangles, nor even of every triangle (except in number—not of every triangle as a form, even if there is none of which you do not know it).

Here, Aristotle mentions crucial notions like ‘universally’ (*katholou*) and ‘as itself’ (*qua locution*) that we will deal with in the next sections of this Chapter. But even without articulating these notions, the point Aristotle makes in the passage is clear: Even if someone proves *separately* that every kind of triangle—equilateral and scalene and isosceles—has the property of having two right angles (2R), she does not yet *know* triangle *qua* triangle; even if someone proves *exhaustively*, because there are no other types of triangles but these, she does

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13 *PoAn.* I. 2, 71b 18-19.
14 *PoAn.* I. 5, 74a25-32
not have *universal knowledge* of triangle. It is clear that in contrast to the sophistic knowing,\textsuperscript{15} Aristotle requires for *universal* or *qua* knowledge that it satisfies the condition of reaching a maximally universal term, which will explain something’s (triangle) having a property (2R).

We can see, then, that Aristotle gives us in the passage more than just the two formal requirements of the ‘strict sense of demonstrative knowledge’. That is, he imposes implicitly on the requirements—specifically on the explanation requirement—an elaborate structure of *knowing universally*. If you want to explain the reason-why (*dioti*) something is the case, you should find the ‘maximally responsible’ (and appropriate) cause (*aitia*) for its being the case. This point will provide us with a broad viewpoint on the scope of Aristotle’s later limitation on the conditions ‘*from which*’ (*ek*) demonstrative knowledge proceeds.

Before moving to the next part of our text, one more exegetical or terminological problem should be addressed, even though it might introduce an interpretive problem. When Aristotle modifies *epistēmē*, a word traditionally philosophical and carefully sharpened by Plato in his *Theaetetus*, with the adverb, “unqualifiedly” (*haplōs*), he may have a specific reason for doing so. Certainly, he employs the term to contrast with “in the sophistic way,” but the contrast, ‘unqualifiedly vs. in the sophistic manner’ seems a little clumsy or vague, in view of the fact that Aristotle uses ‘unqualifiedly’, in a technical sense to mean ‘as a whole’ (*kath’ holou*) in sharp contrast with ‘in respect to parts (or particulars)’ (*kata meros, epi merei*).\textsuperscript{16} Moreover, the composite word, ‘knowing unqualifiedly’ appears in the *Posterior Analytics* several times,\textsuperscript{17} implying roughly the same as the strict sense of demonstrative knowledge Aristotle delineates.

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\textsuperscript{15} Why Aristotle calls this type of knowing ‘sophistic’ is a long story, but it is not so hard to guess, when we recall Socrates’ complaints against sophists that they always give many answers instead of one to Socrates’ ‘what-it-is’ question. On this point, see; *Meno* 71e-72a, 73d-74a.

\textsuperscript{16} For an instance, see: *PoAn*. II. 2. 90a1. Cf. *Meta*. V. 25, 1023b12-17, V. 26, 1023b26-34.

\textsuperscript{17} *PoAn*. I. 2, 71b12-16, I. 4, 73a21-23, I. 4, 73b16-18, I. 8, 75b21-26.
mainly in the first book.

One noticeable exception stands out in chapter 1, when Aristotle notes an example of “preexisting knowledge”. The general sense of the passage is as follows: (1) you have a preexisting knowledge that (a*) triangles have two right angles, but (2) you do not know yet the fact that (b*) this particular triangle (drawn) in this semi-circle is a triangle, and then, (3) as soon as you recognize (b*), you are led to the conclusion that (c*) this particular triangle drawn in this semi-circle has two right angles. Then, Aristotle says somewhat strikingly that at the very stage (2), you know universally that this particular triangle has the property (2R), but you do not know it unqualifiedly.

At first glance, it seems that the knowledge is unqualified because it belongs to an object, the particular fact, whereas it is universal because what explains is the universal fact. On such an understanding, the unqualified knowledge (in chapter 2 of Book I) in the sense of the strict demonstrative knowledge, and the unqualified knowledge (in chapter 1), which contrasts with universal knowledge, do not seem comparable. It is either that Aristotle uses the crucial term, haplós, carelessly to mean different things in the very two adjacent chapters, or there is some not-yet clarified aspects of the notion. We raise this problem early, since a genuine solution for it demands revision of our view of Aristotelian demonstrative knowledge. Furthermore, this problem is connected to the significance of Meno’s paradox for the Posterior Analytics, which is the topic of the last chapter of this study.

After asking at 71b16-17 whether there is also another kind of understanding—thereafter

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18 M. Gifford asserts that the two incoherent uses of the term is an evidence of lexical anomalies in the Posterior Analytics; M. Gifford, “Lexical Anomalies in the Posterior Analytics, Part I,” Oxford Studies in Ancient Philosophy vol. XIX (Oxford: Oxford University Press, 2000), 163-223. We will try to solve the issue of the possible incoherence of the notion in our chapter 4.
leaving to the students of Aristotle for centuries a daunting task to puzzle out what kind of understanding it might be, Aristotle sets out to enumerate the six conditions, which together make principles of demonstrative knowledge appropriate to what is being proved: 19

[B-1] If to understand something is what we have posited it to be, then demonstrative understanding in particular must proceed from items which are true (ἀληθῶν) and primitive (πρῶτων) and immediate (ἄμεσων) and more familiar than (γνωριμωτέρων) and prior (προτέρων) to and explanatory (ἀιτίων) of the conclusions. (In this way the principles will also be appropriate (οἰκείται) to what is being proved.) There can be a deduction even if these conditions are not met, but there cannot be a demonstration—for it will not bring about understanding.

To begin, let us itemize the six conditions according to their linguistic constructions:

A-series [Absolute construction] R-series [Relative Construction]
(a) True (d) more familiar than -
(b) Primitive (e) prior to - [conclusions]
(c) Immediate (f) explanatory of -

We need, first of all, to clarify what these six items are all about. The only thing Aristotle says of them in the passage is that demonstrative knowledge proceeds or comes from (ἐξ) the things that satisfy the above six conditions. However, Aristotle leaves a hint as to what kind of objects the items are, by saying in the R-series that they are —more familiar than, prior to, explanatory of—at the higher order both epistemically and logically in comparison with conclusions. And since demonstrative knowledge for Aristotle was identified just before this passage with syllogism (deduction) by possessing which we understand (know scientifically) something, it seems natural to most commentators that the items are premises of demonstrative proofs. Moreover, since premises of syllogisms are expressed only by the four categorical propositions, the items here are conceived as propositions occupying a special place in the systematic body of scientific propositions.

That Aristotle is dealing with propositions or at least with what is reducible to propositions in his description of the strict sense of scientific knowledge—what we call here the ‘propositional approach’—is taken for granted by numerous commentators. For example, commenting on our earlier passage, McKirahan says:

Aristotle, as a realist, believes that true propositions correspond to facts, and from this perspective he does not always distinguish carefully between knowing facts and knowing propositions…. In general, knowledge of a thing will amount to knowledge of facts about the thing, and these facts will be expressed in propositions.

Undoubtedly, the proposition (apophasis) is a serious philosophical topic for Aristotle who analyzed meticulously both quality and quantity of propositions in his theory of the categorical syllogism. Nevertheless, we need to distance ourselves to some extent from the contemporary philosophical presupposition that holds propositions to be the basic units of knowledge, when it comes to reading the theory of demonstrative knowledge and its principles. As we will argue in this and later sections, Aristotle’s teaching on demonstrative knowledge is over-interpreted as an axiomatic-deductive system by this propositional approach. In the next section, another source of misunderstanding closely related with the propositional approach will be traced back to interpreters’ fixation on Aristotle’s statement in PoAn I.14 that demonstrative proof should be organized around the first-figure syllogism known as ‘Barbara’ and ‘Celarent’.

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20 Interestingly, J. Barnes in his formulation of knowledge simpliciter tries to escape controversy by neutralizing the object. Barnes, Aristotle: Posterior Analytics, 90; “This [his translation] was criticized, usually on the ground that an explanation, unlike an aitia, is a linguistic or a propositional item…. But …explanations are not necessarily linguistic or propositional items…”

21 R. McKirahan, Principles and Proofs (Princeton: Princeton University Press, 1986), 23. See also Irwin’s construal: “It is intelligible that when Aristotle speaks of first principles, he speaks indifferently of propositions and of the things they refer to… We grasp propositional first principles, and they become ‘known to us’, when our beliefs match the appropriate propositional principles that match the appropriate non-propositional principles… Let us say that in so far as we do this, we grasp ‘objective’ (propositional) first principles describing the (non-propositional) first principles of an objective reality.” T. Irwin, Aristotle’s First Principles (Oxford: Clarendon Press, 1988), 4.

22 This problem is closely related to the debate on the developmental priority-posteriority of the two Analytics in general, and the question of how much, if any, of the syllogistic Aristotle knew when he first put forth his official theory of demonstrative science in the Book I of the Posterior Analytics, in particular. The classic debate between
Returning to our passage, the difference between A-series and R-series conditions for demonstration is usually regarded as the difference between what demonstrative premises have to have in themselves and what they have to satisfy in relation to conclusions of the proofs.\(^{23}\) This initial distinction by commentators between in themselves and in relation to a conclusion, tempting as it may be, does not stay within the territory Aristotle circumscribes for the conditions, as we will see shortly. If only the R-series had been offered by Aristotle as the condition of premises of demonstrative knowledge, they could be viewed as nothing more than an articulation of the ‘explanation’ requirement (FR\(_1\)) of ‘knowledge simpliciter’: the premises are explanatory of conclusions, i.e., they are logically prior to conclusions, with the result that they are more familiar (better known ‘by nature’) than conclusions.\(^{24}\) But Aristotle does not stop at this: by including the A-series conditions, he is giving not only a simple scheme of explanation but also proposing how the whole body of demonstrative science, having a certain subject-genus as its domain and being equipped with a formal language of syllogism, should be organized around the conditions of truth, primacy, and immediacy.

This interpretive inflation—interpreters’ belief that Aristotle extends his perspective on explanation to the whole and complete structure of demonstrative science—must be the initial step in the axiomatic-deductive reading: terms like ‘ultimate premises of demonstrative proof’, ‘fundamental ground of scientific knowledge,’ and ‘definitional first principles’ are found at the center of many commentaries on the passages. A fortiori, Ferejohn, who claims in several places

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\(^{24}\) This construal is the way in which Ross and Barnes interpret the R-series conditions.
that Aristotle’s references to principles should be understood within what he calls the “pre-
demonstrative stage” of demonstration alleges with respect to the R-series: 25

…even though these—(d) ‘better known than’, (e) ‘prior to’, and (f) ‘causative of’ the
conclusion—are all “given as relative conditions (that is, as conditions that premises of a
single demonstrative syllogism must have relative to the conclusion that syllogism),
Aristotle’s syllogistic foundationalism entails that a complete syllogistic demonstration
must rest ultimately on premises that are “most knowable,” (epistemologically) primary,
and causally basic.

These absolute conditions, he spells out, are taken together to constitute the all-important
connecting points between Aristotle’s metaphysics and epistemology in such a way that

the causative condition emphasizes the metaphysical aspect—that an ultimate
justificatory premise expresses a fundamental truth rooted in the very nature of things, the
(objective) knowability condition emphasizes the connection between this metaphysical
status of an ultimate premise and its foundational position in the order of justification,
and the primacy condition is simply a gloss on either or both of the others. 26

However allowable such a reduction of R-series conditions into the absolute conditions may be, 27
for most other interpreters the two central conditions in the A-series, (b) primacy and (c)
immediacy are sufficient to confirm the extended perspective of Aristotelian demonstrative
knowledge: since in the brief accounts of the six conditions, Aristotle identifies the ‘primacy’
with the ‘indemonstrable’ (anapodeikton), and shortly clarifies the ‘primacy’ with ‘immediate
proposition’ as the principle of demonstration, Aristotle intends rather the first indemonstrable
propositional principle from the viewpoint of a whole body of systematic knowledge of a science:

[B-2] To proceed from primitives (ἐκ πρωτῶν) is to proceed from appropriate principles
(I call the same things primitives and principles). A principle of demonstration is an

27 It should be noted here that Ferejohn’s treatment of Aristotle’s conditions of scientific knowledge is deeply
oriented to the foundationalism and metaphysical essentialism conceived in his own terms.
28 PoAn., I. 2, 72a6-9.
immediate proposition (\(\acute{\vartheta}\mu\varepsilon\sigma\varsigma \ \pi\rho\omicron\tau\alpha\sigma\varsigma\iota\varsigma\)), and a proposition is immediate if there is no other proposition prior (\(\pi\rho\omicron\tau\epsilon\rho\alpha\)) to it.

The overall picture this passage builds up for Aristotelian science is that at the top of the sequences of demonstrative syllogism lie (a few) immediate propositions which cannot further be proved by any other propositions in the science. Now by these passages, the axiomatic-deductive reading of demonstrative science seems to be confirmed, the formulation of which Barnes has neatly given:  

A has demonstrative understanding that \(P\) only if \(a\) has produced a sequence of deductions \(D_1, D_2, \ldots, D_n\) such that (i) the conclusion of \(D_1\) is \(P\); (ii) the conclusion of each \(D_i\) for \(i > 1\) is identical with a premiss of some \(D_j\) where \(j < i\); and (iii) each premiss of \(D_i\) is true, is prior to, more familiar than, and explanatory of the conclusion of \(D_i\), and either is primitive and immediate or else is the conclusion of some \(D_k\), where \(k > i\).

It is plausible at this point that this kind of scientific knowledge is strict enough, when ‘knowledge simpliciter’ is normally understood as the strict sense of scientific knowledge.

However, such an axiomatic-deductive construal of knowledge simpliciter does not present a thoroughly coherent explanation of Aristotelian demonstrative knowledge. We have to note a few of interpretive issues that are raised by the axiomatic interpretation. Even to the eyes of the most prominent contemporary axiomatic interpreter like Barnes, there is an obvious flaw. Invoking the classic problem of the relation between the two Analytics, Barnes asks how much of the syllogistic structure of Prior Analytics should be applied to the reading of the immediacy condition. Barnes claims that the immediacy condition is simply the ‘syllogistic specification’ of the deductive primacy condition. This specification does not generate any problem for the overall deductive structure of demonstrative knowledge. Thus, he concludes that ‘the theory of demonstration’ is separable from the syllogistic theory of the Prior Analytics. The rationale for

29 J. Barnes, Aristotle: Posterior Analytics, 93-94.
Barnes’ argument comes from Aristotle’s references to ‘demonstration of the fact’ (*quia demonstratio*), where three terms are immediately counterpredicated or convertible: 30

[B-3] Knowing the fact (τὸ ὅτι) and the reason why (τὸ διότι) differ, first in the same science—and in two ways. In one fashion, if the deduction does not proceed *through immediates* (δὶ ἀμέσως), in this case the primitive explanation is not assumed, but understanding the reason why occurs in virtue of the primitive explanation (κατὰ τὸ πρῶτον αἴτιον). In the second way, if, although the deduction does proceed through immediates, it proceeds not through the explanation, but through the more familiar of the converting terms. For there is no reason why the non-explanatory counterpredicated (ἀντικατηγορομένων) term should not sometimes be more familiar, so that the demonstration will proceed through this term.

The case of *hoti* demonstrations—“although the deduction does proceed through immediates, it proceeds not through the explanation, but through the more familiar of the *converting* terms”—is in the following form:

What does not twinkle is near  
The planets do not twinkle.  
Therefore, the planets are near.

By noting the fact that even though the three terms are immediately connected, this demonstration fails to be the *dioti* demonstration, Barnes asserts that the immediacy condition as a syllogistic rephrasing of the primacy condition is rather redundant in terms of demonstrative knowledge; so that the theory of demonstration in the *Posterior Analytics* is chronologically (and paradoxically) prior to the theory of syllogism in the *Prior Analytics*.

The important point that Barnes’ arguments bring out, though, is that there will be immediate propositions in demonstrative proof which do not stand at the top of deductive chains. That is, in a *quia* or *hoti* demonstrations, immediate propositions can be *conclusions* of a higher syllogism. This is simply a violation of the latter part of the rule (iii) in Barnes’s formulation of demonstrative knowledge *simpliciter*; “each premiss of D is true, is prior to, more familiar than,

and explanatory of the conclusion of $D_i$, and either is primitive and immediate or else is the conclusion of some $D_k$, where $k > i$.”

Another problem regarding the ‘immediacy’ condition goes deeper to the issue that Barnes raised about ‘immediate but counter-predicable’ propositions. Taking up the issue, R. Smith examines how such propositions can function not only as the ultimate premise of demonstrative proof, but also in overall proof procedures. He sees the ‘primacy’ and ‘immediacy’ as purely logical or proof-theoretic notions that stand in contrast with other epistemic conditions. Though the main aim of Smith’s arguments is to show that the immediacy condition as a proof-theoretic notion serves to block ‘infinite premise regresses’ and ‘circular proof’ within the formal structure of syllogism, he notes a crucial interpretive difficulty about the ‘immediate but counter-predicable’ propositions:

He rejects circular demonstration on two ground; it is empty and it is impossible….What Aristotle has shown is that circular demonstrations must always involve convertible terms, and he now claims that such terms are rare (διστήματα) in demonstrations. Deceived perhaps by the reference to ‘properties (ἰδίαι)’ at 73a7, interpreters have failed to see that what Aristotle says here would apply to all pairs of coextensive terms, including a definiens and its definiendum: and such propositions, far from being rare in proofs, are regarded by Aristotle as the foundations of sciences [italic mine].

Smith’s point is that Aristotle has two different or somewhat confused views on the ‘immediate but convertible’ propositions. As we will see in the next chapter, what Smith touches on lies at the core of Aristotle’s demonstrative knowledge. Since the ideal case of demonstrative proof shows how a property or per se incidentals of an underlying subject are necessarily predicated of the subject, Aristotle’s mention that these convertible terms are rare is definitely perplexing to interpreters. Smith leaves the interpretive puzzle, saying “we have no idea how he finally

resolved the problem of fitting convertible terms into sciences,“32

We have indicated above that there are some crucial difficulties even within the axiomatic-deductive reading of Aristotle’s principles and demonstrative knowledge, difficulties which are caused by the propositional approach to them, as we will argue in the next section. Now we need to set out a significant concern that bears on the axiomatic reading: What sort of proposition is the first indemonstrable premise of demonstrative proof? Is it a definition taken as a principle? If it is, then, how do we know it? Here arises a key issue concerning Aristotelian demonstrative knowledge, i.e., the problem of preexisting knowledge. Thus, in order to identify what the first indemonstrable premise of demonstration is, we will firstly consider Aristotle’s references to how we know it. Let us delve into one of the six conditions for a principle to which most commentators do not pay close attention. In his mixed accounts of the R-series conditions of principle, Aristotle illustrates the priority condition as follows: 33

[B-4] They must be explanatory and more familiar and prior –explanatory because we only understand something when we know its explanation; prior, if they are explanatory and we already know (προγινωσκόμενο) them not only in the sense of grasping (ξυπιέναι) them but also of knowing that they are the case (ὅτι ἐστι). Here, the priority condition is normally understood in two different ways, objectively or epistemically: either they are prior because they are the objective ground (cause, aitia) of conclusion, or they are “prior in knowledge because $P$ is prior in knowledge to $Q$ if knowledge that $Q$ requires knowledge that $P$, but not vice versa.”34 But these accounts belonging respectively to Ross and Barnes do not make clear why Aristotle uses the temporal notion of ‘we already know’ (προγινωσκόμενο). Barnes’ translations above do not show whether the latter

32 Ibid., 63.
33 PoAn., I. 2, 71b29-31
34 Barnes, Aristotle; Posterior Analytics, 95.
clause, “and we already know… that they are the case,” provides a further reason for the priority condition, or whether it is an independent assertion that follows from (or is related to) the prior condition. It is also strange that most commentators do not consider more carefully the two locutions, “grasping (ἐνενθαυσάμενοι)” and “knowing that they are the case (ὅτι ἐστί)” that have a clear reference in the previous chapter of the same book:35

[B-5] Similarly with arguments, both deductive and inductive… the former assuming items which we are presumed to grasp (ἐνενθαυσάμενοι), the latter proving something universal by way of the fact that particular cases are plain… There are two way in which we must already have knowledge (προγινώσκειν): of some things we must already believe that they are (ὅτι ἐστί), of others we must grasp (ἐνενθαυσάμενοι) what the items spoken about are (and of some things both).

From this passage, it is very clear that Aristotle refers back to the kind of preexisting knowledge that was the opening theme of the Posterior Analytics. And what is a critical drawback in Barnes’ translation of the passage is that he left out a phrase, “in the other manner (τὸν ἄλλον τρόπον)” which obviously modifies the locution “grasping them.” It seems more complicated to understand why Aristotle inserts the clause in his account of the priority condition,36 which clearly points to the two modes of preexisting knowledge. It should be noted, though, that the two modes of knowledge are distinguished from each other — grasping ‘x’, and knowing that x is the case—by Aristotle in chapter 1, and that both kinds of knowing are the starting points which are temporally prior to any inquiry or proof procedures.37

Regardless of whether the axiomatic interpreters of demonstrative knowledge notice this complexity of the priority of principles—not only the causal and epistemic priority, but also the temporal priority—specifically in the above passage, the issue of preexisting knowledge is a

35 PoAn. I. 1, 71a5-16.
36 Apostle’s translation inserts a colon between “explanatory” and “and we already know”
37 Remember the implication of the ‘ὅτι ἐστί’ in our examination of the four scientific questions of the chapters 1 and 2 of the Book II of the Posterior Analytics.
critical point in construing Aristotle’s demonstrative knowledge in the format of an axiomatic-deductive system.

There are two tasks for axiomatic-deductive readers; one is the notorious problem of how the first premise of a demonstrative syllogism has been previously known in propositional forms; the other is exactly what the first premise is all about, that is, its content. Since the six conditions for principles give logical (primacy and immediacy) or epistemic (true, familiar, prior, explanatory) characteristics, the second task is to show the material content of the first unmediated proposition (premise) of the sequences of demonstrative syllogisms. The various predication types discussed in chapter 4 of Book I are usually looked to for finding the material content, but as we will see, these predications apply not just to (first) premises of a demonstrative syllogism but to conclusions as well. In fact, it is difficult to find in the first book of the *Posterior Analytics* direct mentions of the content of the first premises of demonstrative syllogisms. Among the passages that refer to *nous*, we are able to find only one mention of premises, though even that passage does not give the contents of first premises:

[B-6] We assert that not all understanding (ἐπιστήμη) is demonstrative; rather in the case of immediate items understanding is indemonstrable. And it is clear that this must be so; for if you must understand the items which are prior and from which the demonstration proceeds, and if things come to a stop at some point, then these immediate must be indemonstrable. We argue in this way; and we also assert that there is not only understanding but also some principle of understanding (ἀρχή ἐπιστήμης) by which we get to know the definitions (ὅρους).

This passage, especially the last three cryptic lines, troubled commentators for many centuries, along with the notorious *nous* issue in *PoAn* II.19. However difficult it is to decipher fully the

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38 McKirahan in his book deals with the *per se* predications under the title of “Definition I”. McKirahan, *Principles and Proofs*, chap.7.
39 See a passing statement in *PoAn*. I. 22, 83a39-b1
40 *PoAn*. I. 2, 72a25-b3; 3, 72b18-24; 9, 76a16-22; 23, 84b28-85a1; 33, 88b35-89a4.
phrase “also some principle of understanding by which we get to know the definition,” the
general line of Aristotle’s thought in the passage is clear enough to traditional and contemporary
readers: by some principle of understanding, we can come to know the immediate and
indemonstrable premises of demonstration, which are definitions. And it seems inevitable that,
among the three principles, only definitions can serve as the first premise of demonstrative proof,
since the other two principles, hypothesis (as existential statement) and axiom (common to
various sciences), do not contain any information in terms of essences of things to be proved.42

Surely, we are still left with the problem of connecting definition with its prior condition
as preexisting knowledge. Yet, a rather straightforward or unexamined understanding of
definition as an ultimate premise is entrenched in the axiomatic reading, whether or not the
interpreter has reflected on the different types of definition in Book II. The following comments
by Barnes on the Aristotelian principles show how tenacious the belief in definition as the
ultimate proposition is in the axiomatic reading: 43

Aristotle is clear that principles function as premises of demonstrations (72a7); but it is
not easy to see how they can do so. A typical axiom is . . . not expressible in syllogistic
form. If suppositions are existential propositions, then they too are not syllogistic.
Definitions might well seem wholly unamenable to syllogistic expressions; Aristotle,
however, explicitly says that they have subject-predication form…the notion of definition
which this presupposes is not elucidated until Book B.

Up to now, we have traced how axiomatic-deductive interpretation of demonstrative knowledge
is built up on the basis of a reading of ‘knowledge simpliciter’ and the six conditions of
principles. To summarize, we can note the following significant characteristics of the axiomatic-
deductive interpretation:

42 McKirahn claims, “definition of a thing must contain all the essential facts about it, from which (together with the
other principles of the science) the derivative facts about it are proved.” R. McKirahan, Principles and Proofs, 111.
Propositional Presupposition: demonstrative knowledge deals with propositions or what can be reduced to propositions.

Interpretive Inflation: demonstrative knowledge in the strict sense extends to the whole and complete structure of a demonstrative science.

Identity of Definition and Premise: at the top of the sequences of explanatory demonstration lies definition as indemonstrable premise (proposition).

In the next section, we will challenge the axiomatic-deductive interpretation by refuting the above three characteristics.

§2.2. Knowledge Simpliciter and Conditions of Principles in an Alternative Reading

That propositions are the basic unit of knowledge is undoubtedly a presupposition of contemporary philosophy. As we indicated in the previous section, when it comes to investigating Aristotle’s theory of knowledge, specifically his theory of demonstration and its principles, it is hard for modern readers to escape from modern epistemological presuppositions. Moreover, we have to note the historically long tradition of understanding Aristotle’s Organon as having a building block structure from terms to statements (propositions), and statements to inferences. This structure unites Categories, De Interpretation, and Analytics; therefore, the Analytics deals with relationships between propositions, i.e., inference.

However, if we look closely into some passages in the Posterior Analytics and other works of Aristotle, we realize that what Aristotle describes is not in the sphere of propositions as most contemporary axiomatic readers think. This section consists of two parts. Firstly, we will show that what Aristotelian demonstration deals with is concepts, more precisely, universals and their relationships. Secondly, from the perspective of concepts and universals, we will
reconsider Aristotle’s references to ‘knowledge simpliciter’ and the six conditions for first principles. During this reconsideration, the characteristics of the axiomatic-deductive interpretation that we elaborated will be refuted.

With an anti-Platonic spirit rarely found in the *Posterior Analytics*, Aristotle says openly:

[C-1] There need not be any forms, or some one item apart from (παρά) the many, in order for there to be demonstrations. It must, however, be true to say (eiπέιν) that one thing holds of (κατά) many. For there will be no universals (τὸ καθόλου) if this is not the case; and if there are no universals there will be no middle terms, and hence no demonstrations. There must, therefore, be something—one identical item—which holds of several cases non-homonymously.

Many interesting questions can be addressed to this passage. Questions concern Aristotle’s criticism of Plato’s theory of separated forms in terms of prepositions para vs. kata; Aristotle’s standpoint on the ontological status of universals, viewed from his wording, “true to say;” and (non-) homonymous predication. But the most interesting thing for us is his (quasi) syllogistic presentation of the object of demonstration:

If there is no universal, there will be no middle term.

If there is no middle term, there will be no demonstration.

If there is no universal, there will be no demonstration.

Unarguably, the middle term is a key to syllogism and demonstration. It is, so to speak, the engine of demonstrative inference. And Aristotle says explicitly that without a universal, there will be no middle. Thus, using Aristotle’s own logic, we can assert definitively, the main and direct subject of demonstration is not propositions but universals.

44 PoAn. I. 11, 77a5-9
‘Universal’ is uncontrovertially a philosophical term of Aristotle’s own.\textsuperscript{45} The term is a Latin translation of the Greek \textit{katholou}, and \textit{katholou} is a contraction of \textit{kata holou (as a whole)}. As the original meaning indicates, the term ‘universal’ is originally an extensional notion, the contrasting words with which are \textit{kata meros (as/according to part)} and \textit{kath’ hekaston (as/in respect to each thing)}, used frequently by Aristotle throughout his treatises. To fully illuminate the notion of universal in Aristotle would require a lengthy study, but some principal aspects of it should be marked. In chapter 7 of the \textit{De Interpretatione}, Aristotle defines the universal this way: \textsuperscript{46}

\begin{quote}
[C-2] (I call universal that which is by its nature predicated of a number of things and particular that which is not; man, for example, is a universal, Callias a particular). So it must sometimes be of a universal that one states that something holds or does not, sometimes of a particular. Now if one states \textit{universally of a universal} that something holds or does not, there will be contrary statements.
\end{quote}

The main job of the universal, as the passage says, is to be \textit{predicated of many things} in a non-homonymous way. We do not need to probe into the ontological problem of universals and the epistemological problem of how our mind grasps them in order to clarify this simple job of universals. In the Aristotelian view, we \textit{know} (in a quite broad sense) things in the world \textit{by way of universals}. That is, for Aristotle, we humans know by predicating a universal of many things—or speaking closer to the original meaning, we see many things \textit{as a whole}. In addition, we \textit{know universals by way of universals}, recognizing higher universals. For Aristotle, this possibility for universals to be predicated of other subordinate universals makes universals serve as terms (subject and also predicate) in statements, and therefore in deductions as well: “without universals, there will be no demonstration.”

\textsuperscript{46} \textit{De Interpretatione}. 7, 17a38-17b5
Universals for Aristotle are the cornerstone of his theory of statement-making and formal theory of syllogism. But not all universals have equal values in Aristotle’s scientific (epistēmonikon) view. From the two statements that “surface is white” and “white is a color,” we cannot conclude that “surface is a color.” The reason lies in the second statement not being well-formed; it should be that “whiteness is a color.” Some terms (universals) necessarily undergo declension when they switch position from subject to predicate or vice versa.\(^{47}\) The great discovery of Aristotle concerning universals is that not all universals permit of the special sort of predication, i.e., the ‘said of’ relation in the Categories, normally understood as the transitivity relation.\(^{48}\) Only the “terms which mean substances (τὰ οὐσιάν σημαίνουσα) . . . namely, just what that thing exactly is, or what sort of thing a particular thing is (Őπερ ἐκεῖνό ἦ ὃπερ ἐκεῖνό τι σημαίναι)\(^{49}\)” are what demonstration has scientific interest in. On the contrary, Plato’s forms that can be translated into substantiated terms, like whiteness, humanity, beauty, etc., are indifferently predicated or participated by mundane particulars. Thus Aristotle proclaims: “We can say goodbye to the forms. They are nonnynoes (teretismata): and if there are any, they are irrelevant—for demonstrations are concerned with items of the kind I have described.”\(^{50}\) What Plato wishes to make by positing forms (eidê) in the separated realm—explaining things in the world, why they are such-and-such, and what it is that are responsible

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\(^{47}\) This is generally called the fallacy of accident. On the fallacy and the antepredicamental rule, refer the chapter 8 of Allan Bäck’s comprehensive study of the problem of predication in Aristotle; A. Bäck, Aristotle’s Theory of Predication (Leiden: Brill, 2000), 228-238.


\(^{49}\) PoAn. I. 22, 83a24-25

\(^{50}\) PoAn. I. 22, 83a32-35
(aition) for them to be, Aristotle’s universals can do in an articulated and specified way without positing certain things in a Platonic fashion.\footnote{51 See Rist’s account of Aristotle’s attitude in the Posterior Analytics against Platonic forms: In the Posterior Analytics it is Aristotle’s repeated contention that there are no Platonic Forms ‘over and above’ (para) particulars; they are not needed for demonstration—for that universals do (1.77A5–9); these universals are not ‘something’ over and above the particulars. Rather we have a belief, that is, in our minds, that they have a ‘nature’ (phusin) which ‘subsists’ (huparchein) ‘in’ things (1.85A33ff, cf. 1.73B27).’ John Rist, The Mind of Aristotle: A Study in Philosophical Growth (Toronto: University of Toronto Press, 1989), 262.}

However, to modern readers, this great insight of Aristotle appears to be a significant confusion, still caused by remnants of Platonic influences. The idea that not only particulars but also universals are predicated of universals seems to have the serious drawback of mingling two quite logically different ways of predication—(1) a set-theoretical membership relation and (2) an inclusion relation—by the same notion of universal: (1’) “Socrates is white,” and (2’) “man is mortal” are differently symbolized in post-Fregean logic each as \( F(a) \) and \( (x) (F(x) \rightarrow G(x)) \).

Moreover, in Aristotle’s theory of statement-making and syllogism, some terms—by the nature of the second characteristic of universals—should switch their position from subject to predicate and vice versa. Notoriously criticized by Geach as a pivotal moment of the “history of corruptions of logic,”\footnote{52 P. Geach, Logic Matters (Oxford: Blackwell, 1972), 48. See also Anscombe’s comment: “Aristotle himself, however, misconceived the importance of the categorical syllogism, supposing that the theory of it gave him the key to the nature of ‘scientific’ knowledge. He expresses this view in what I find his worst book: Book I of the Posterior Analytics.” G. Anscombe & P. Geach, Three Philosophers (Oxford: Blackwell, 1973), 6–7.} the conflation from the standpoint of modern logic of the two different types of predications by Aristotle makes scholars reconsider Aristotle’s anti-Platonic or pro-Fregean idea of the strict distinction of the Categories between individual and universal, and thus between singular term and general term: Is the idea just a passing thought of the early Aristotle, not enough to be encoded in his overall idea of predication?\footnote{53 Within the assumption of development of Aristotle’s thought, two ontological schemes of the Categories and Metaphysics are compared by many recent scholars. Notably, D. Graham, Aristotle’s Two Systems (Oxford: Clarendon Press, 1987); M. Wedin, Aristotle’s Theory of Substance: The Categories and Metaphysics Zeta (Oxford: Oxford Uni. Press, 2000).}
In contrast to the criticism of Aristotle’s theory of predication from the viewpoint of modern logic, there are a few scholarly efforts not only to understand but also rescue Aristotle’s view on predication from such an accusation of confusion. Among these, Mignucci tries to show that there can be a logically consistent construal of particulars and universals, when they are each predicated by universals. At the base of his claim lies his mereological reading of Aristotle’s definition of universal statement, “we can say that one term is predicated of all of another when nothing [of the subject] can be taken of which the other is not said.” Unlike the normal interpretation of the definition that when a term \( G \) is predicated of every \( F \), there is no individual of which \( F \) is true and \( G \) is not true, Mignucci suggest to read the “nothing” (μηδέν) not as ‘no individual’ but as ‘no part’. This reading is supported by the point that in Aristotle’s unique way of thinking, “not only are species parts of their genera, but in general what is an instance of something is part of it.” Thus, he says that “from this point of view a universal can be conceived of as a whole whose parts are its instances.” Mignucci’s argument presents in a sense a new way of approaching Aristotelian notion of individuals: individuals are a “borderline case of the less general,” and they are ‘τὸ καθ’ ἔκκαστον’ and ‘τὸ ἐκτομοῦ’ in the sense that they have no more parts. Individuals, next level universals and higher level universals are so

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56 PrAn. I. 1, 24b28-30.


58 Ibid.
continuously connected by the relation of parts and wholes, according to Mignucci, that the famous syllogism which is often understood as incorrect;

\[
\begin{align*}
\text{Every man is mortal} \\
\text{Socrates is a man} \\
\text{Socrates is mortal}
\end{align*}
\]

is perfectly plausible. The extension of ‘Socrates’ is part of the extension of ‘man’ and the extension of ‘man’ is part of the extension of ‘mortal’, thus the extension of ‘Socrates’ is a part of the extension of ‘mortal’.

In an important sense, Mignucci’s construal of individuals and universals by virtue of part and whole relations not only rescues Aristotle from the modern accusation of confusion, but supports our initial assertion that the universal is first and foremost an extensional notion, in contrast to which ‘with respects of parts’ and ‘in respects of particulars’ are usually indicated. In the next of chapter of our study, we will see how the part-whole relations importantly function in two types of demonstration.

Before moving to our critique of the axiomatic reading, we have to mark another significant aspect of universals besides the extensional one. Aristotle says that “universals are honorable (τίμων) because they make plain causes (δηλοί τὸ αἴτιον).”\(^{59}\) In a sense, much of Posterior Analytics I is devoted to explicating this sentence in the structure of what Aristotle calls demonstrative knowledge, while also making clear why some knowledge claimers—“those who does not have epistêmê think that they are in such a condition”\(^{60}\)—do not reach the true conditions of demonstration. Anyhow, the sentence can be understood literally in such a way

\(^{59}\) PoAn. I. 31, 88a5-6: Barnes’ translation is “Universals are valuable because they make the explanations plain.”

\(^{60}\) PoAn. I. 2, 71b14-16. The three types of mistake in the chapter 5, the distinction of hoti and dioti demonstration in the chapter 13, and the different types of demonstration in the chapters 24-26 are in the context of those that do not have reach the true conditions of demonstration.
that universals show (δηλοῖ) what the cause is that necessarily explains something’s being a case (having a certain property). Truly, this notion of the universal as cause, as Aristotle claims, should be traced back to Socrates’ quest for “universal definition” and his question of what it is: “But come on, you too try to keep your promise to me, and tell me what virtue as a whole (κότα ὄλου) is; and stop making many things out of one, as the jokers say every time anyone breaks something, but leave virtue whole (ὄλην) and sound, and tell me what it is (τί ἐστιν).”61 Socrates in the Meno and Aristotle in the Posterior Analytics are in the same mind to discover the one (ἐν) and only thing that explains something’s being the case, namely, the universal as cause.

The sentence can also be understood in such a way that universals are in themselves causal in relation with each other: Expressed in the language of the chapter 14 of Book II, some universals (terms) “follow” (ἀκολούθει) other universals, and “are entailed by others,” (ἐπται)62 revealing in themselves the causal connections with each other. This latter causal relation of universals is the aspect of universals that cannot be consummated or exposed by the extensional notion alone. We have already seen that the three immediate but counter-predicable terms are co-extensive, but one of them is causally prior to the other two terms and thus the cause of the others’ being connected with each other. In view of this aspect of the universal, the interpretation of “follow” and “being entailed by” as an inferential relation between concepts is wrong; the causal connection between universals is intensional.

Throughout the Posterior Analytics, when Aristotle remarks on some relationships between two terms or concepts, the extensional and intensional aspects of universal—the tension

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61 Meno,77a5-9.
62 PoAn. II. 14, 98a.
between *kath’ holon* and *kata meros*, and *causing* and *being caused*—should be carefully parsed. These two aspects of universals cannot be captured by taking proposition as a basic unit of Aristotelian demonstrative knowledge. Since we identified the basic object of demonstration to be universals, and also disclosed the two aspects of universals, let us reconsider in the sphere of universals the texts we examined already, which are *loci classici* of the axiomatic interpretation.

When we reviewed Aristotle’s description of knowledge *simpliciter*, text [A-1], it was noted that there is behind the two fundamental requirements—explanation and necessity—an important but implicit criterion of *universal knowledge*: if one tries to explain the reason-why (*dioti*) something is the case, he has to present the *maximally* universal cause (*aitia*) for its being the case. And we said that this point circumscribes the entire scope of the six conditions of principles: (a) true, (b) primitive, (c) immediate, (d) more familiar than, (f) explanatory of, (e) prior to conclusions. That is, the six conditions modify and thus specify the *aitia* that will be “in this way *appropriate* (*oikeitai*) to what is being proved.” With this in mind, now, we will challenge the axiomatic reading of our text.

First, contra Ross and other scholars, there is not any sign of Aristotle making a distinction between the conditions that demonstrative premises in themselves have to satisfy (A-series) and the conditions that they have to satisfy in relation to demonstrative conclusions (R-series): the only thing that the text says is that the six conditions all together serve for the *aitia* to be *appropriate* to what is being proved, i.e., the conclusion.

Second, it was noted that by the word “conclusion,” the axiomatic readers are inclined to interpret the six conditions as what the (first) premises of demonstrative science must comply with. But, however odd it may appear to contemporary readers, for Aristotle, “what is being
proved,” i.e., the conclusion, is not a proposition or statement. For this argumentative point, let us cite the passage we examined in the previous chapter.63

[C-3] There are three things involved in demonstrations: one, which is being demonstrated, or the conclusion (this is what holds of some kind in itself); second, the axioms (axioms are the items from which the demonstrations proceed); third, the underlying kind [subject genus] (τὸ γένος τὸ ὑποκείμενον) whose attributes—i.e. the items incidental to it in itself (τὰ καθ' ἀυτὰ συμβεβηκότα)—the demonstrations make plain.

Here, “what is being demonstrated,” “conclusion,” “attributes,” and what is “incidental in itself” all point to the same thing: in Aristotle’s way of thinking, what is being proved—“what the demonstrations make plain”—are attributes holding of some underlying subject. A contemporary reader might be dubious of this point, questioning what difference it would make, because attributes are anyway predicated of subjects, so that the conclusion in a proof is a proposition. That is just the first slip the axiomatic interpreter makes, who holds propositions are basic unit of knowledge. On the contrary, Aristotle’s way of thinking is conducted in the sphere of universals. He takes what we could call a ‘conceptual approach’ to knowledge.

Third, the last three conditions—(d) more familiar than, (e) prior to and (f) explanatory of conclusions—can be more clearly understood when they are put in the sphere of universals. For (e) and (f) conditions, we need only remember that among universals, some follow others, and are entailed by those others. In a demonstrative proof, the aitia as a universal must be prior to the attribute as a universal, because the aitia explains and makes plain the attribute’s existing in a subject. And regarding (d) condition, Aristotle directly mentions ‘universal’ in his explication of the two meanings of “more familiar” (γνωριμωτέρον): “I call prior and more familiar in relation to us items which are nearer to perception, prior and more familiar simpliciter items

63 PoAn. I. 7, 75a39-b2.
which are further away. What is most universal (τὰ καθόλου μᾶλιστα) is furthest away, and the particulars (τὰ καθ’ ἐκαστὰ) are nearest."64 This statement confirms exactly our previous assertion that in Aristotle’s view, individuals (particulars), next level universals, and higher level universals are continuously connected by the relation of parts and wholes.

Fourth, most axiomatic readers do not give special attention to condition (a), the truth condition. At most, ‘truth’ is considered to be “an unanalyzable consequence of Aristotle’s very minimal requirement that a demonstration must constitute a proof (or sound argument) for its conclusion,”65 i.e., the truth of premises of demonstrative proof. However, if we read the truth condition from the perspective of the conceptual approach, it reveals a frequently overlooked feature of Aristotle’s thought on truth.

Aristotle is well accepted as a pioneer of the correspondence theory of truth; truth and its opposite falsity “is founded in the combining and dividing activity of thought called διάνοια in relation to the combinations and divisions existing in things.”66 This aspect of truth is often called “propositional,” because a subject and a predicate are combined with or divided by the copula in a proposition. But Aristotle has in his view another aspect of truth, namely non-propositional or noetic truth, which is well recognized in the Aristotelian tradition but in contemporary scholarship suspected as strange and odd. After the account of propositional truth in Θ 10 of the Metaphysics, Aristotle describes the realm of the non-propositional truth of

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64 PoAn. I. 2, 72a1-5
65 M. Ferejohn, The Origins of Aristotelian Science, 21. Barnes accuses Aristotle of confusion because the example, ‘incommensurability’ (of the diagonal of a square with its sides) is a conclusion rather than a premise of an inference. Anyhow, Barnes thinks that the truth condition applies to the premises of a proof. Barnes, Aristotle: Posterior Analytics, 94.
“incomposite” things.\(^7\)

[C-4] With regard to incomposites (ἂσύνθετο)…contact (θιγεῖν) and assertion (φάνον) are truth (assertion not being the same as affirmation). For it is not possible to be in error regarding the question what a thing is, save in an accidental sense; and the same holds good regarding non-composite substance (for it is not possible to be in error about them)…. And about the things, then, which are essences (Ὅπερ εἰναι τι) and exist in actuality, it is not possible to be in error, but only to think (φαίνω) them or not to think them. Inquiry about their ‘what’ takes the form of asking whether they are of such and such a nature or not.

Unlike the propositional truth that combines or divides two universals (concepts/terms), the noetic truth here spelled out occurs in our mind’s action—“contact” (θιγεῖν) and “assertion” (φάνον)—to some simple object. What captures our attention here is Aristotle’s description of the two possible states of mind to a simple thing, i.e., the “what a thing is” (τὸ τί ἐστίν): On the one hand, the mind either just knows (φαίνω) it, or is ignorant of it, so that any act of combining and dividing does not occur; on the other, the inquiry about the ‘what it is’ takes the form of asking whether they are such and such a nature or not, so that there occurs some complex action of combining or dividing.\(^8\)

Now, our question is whether the truth condition for demonstrative principles can be understood in terms of noetic truth instead of propositional truth. As commonly indicated, Aristotle’s description at 71b26-27 is too short and the choice of the example by Aristotle is in a sense careless, because the ‘commensurability’ (of a diagonal) as a composite thing can be

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\(^7\)Meta. Θ. 10, 1051b17-33.

proved to be false. But the notion of noetic truth can at least give us a clue to loosening the interpretive difficulty that we faced in considering the cryptic phrase in the description of the prior condition; “prior, if they are explanatory and we already know (προγινωσκόμενα) them not only in the sense of grasping (ἐγνιέναι) them but also of knowing that they are the case (ὅτι ἐστι)” (71b 31-33). It is evident that the graphic or sensory image of “grasping” something is very similar to the image of “contacting” inposites. And we find the same contrasting difference between “grasping” and “contacting” one the one hand and “knowing that they are the case,” and “inquiring whether they are such and such a nature” on the other. Moreover, considering the close connections of the “what-it-is” and essences in Θ 10 of the Metaphysics and causes and principles in I.2 of the Posterior Analytics, we can assert that a context of noetic truth is implicated, even if not obviously, in the description of the prior knowledge of principles. This means that demonstrative knowledge as an act of dianoetic thinking is grounded on the prior noetic grasp of simple and incomposite universals (concepts). That Aristotle indicates that there is noetic grasp of prior principles is a precursor to his treatment of the same issue in Posterior Analytics II.19. For in the context of how we come to know the first principles of demonstrative knowledge, Aristotle describes concept formation, that is, the process that enables noetic grasp of universals.

Fifth, we approach the remaining two conditions of knowledge simpliciter, the condition (b) primacy, and (c) immediacy, which, we appraised, prompt axiomatic interpreters to inflate the scope of Aristotle’s demonstrative knowledge. Because these conditions are intimately related, for Aristotle, with the idea of the indemonstrable (ἀναποδείκτον) at 71b27 and 72a5-8, on a naïve axiomatic understanding the three terms would be considered to be co-extensive.
Smith argues, however, that the immediacy condition cannot be reduced to the primacy one: the latter, even taken together with indemonstrability has only an epistemic content; since no other propositions entail the primaries, they are known in themselves, per se gnotum. And he goes on to argue that the meaning of the immediacy can be illuminated only in the context of Aristotle’s philosophical—in Smith’s term, proof-theoretical—defense against the skeptic form of the infinite regress argument. The use of syllogism in the Analytics is to provide the framework in which the infinite regress of premises is impossible.

It seems true that one of the concerns of Aristotle in the treatise is to show that the process of seeking the reason-why (dioti) in demonstrative inquiry should stop at some point, because otherwise no true knowledge will be established: “Again, we seek the reason why up to a certain point, and we think we know something when it is not the case that it comes about or exists because something else does—in this sense the last term is an end and limit.” But this point does not necessarily imply that Aristotle tries to solve the infinite regress problem by axiomatizing the whole structure of scientific knowledge. As we claim in the previous chapter, Aristotle’s Posterior Analytics is on a par with Plato’s Meno rather than the Euclid’s Elements.

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69 R. Smith, “Immediate Propositions and Aristotle’s Proof Theory,” 48. Maybe this is the point where rationalistic construction of Aristotle’s first principles starts off; the principles for Aristotle are “self-evident,” for which only some form of intuition is permissible. T. Irwin’s book represents at some points a recent rationalistic interpretation. T. Irwin, Aristotle’s First Principles, chaps. 6-7.


71 PoAn. I. 24, 85b28-30.

72 For the common interpretive tendency to relate the Posterior Analytics with Elements, see Sorabji’s assertion: “Aristotle has a vision of how a scientific text book should ideally be set out. His scheme is in some ways like, though in other ways unlike, that adopted by Euclid a generation later. The scientist would start with definitions of
Let us see if Aristotle’s uses of the two key terms in other places allow for our conceptual approach, and if his uses of the terms extend beyond what we set for the six conditions, namely, the *aitia* as the maximally possible universal for what is to be proved.

Aristotle uses the word “primary” or “primitives” (τὸ πρῶτον, τὰ πρῶτα) in at least four different contexts: (a) primary cause (τὸ πρῶτον ἀιτίου) or primary middle (τὸ πρῶτον μέσου) in the sense that a particular cause is the *proximate* cause;\(^{73}\) (b) the primaries of (in) the genus (τὸ πρῶτον τοῦ γένους), which is non-demonstrable (76a26-30, 76a31-33, 88a8, 90b27, 96b16); (c) the arbitrary primacy (τὸ τυχόν πρῶτον), of which its particular attribute holds most universally (maximally) (73b33, 39, 40, 74a5); (d) the so-called common axioms (τὰ κοινὰ ἡξιώματα), which are non-demonstrable and, thus, "the primaries from which one demonstrates" (72a15-18, 76b14, 76a38-39, 88b27-29).

Initially, it should be noted that throughout these four contexts the primary or primitives mean not some propositions but rather certain concepts, except in the case of axioms that need syntactic modification.\(^{74}\) Now, what is at issue for us is whether the senses of (b), (c) and (d) can be condensed to the sense of (a) the primacy of proximate cause. The sense of primacy in (c) that we examined in the previous chapter can be easily reduced to the sense of (a) proximate causes, except that the notion of the arbitrary exhibits a particular and perceptible case in a proof.\(^{75}\) And the sense of (d) primacy of the common axioms seems analogical (κατ’

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\(^{73}\) Being near is the primary cause of the planets' not-twinkling (78a39-b3); the screening of the earth between the moon and the sun is the primary cause of a lunar eclipse (93a30-36); the solidifying of the sap at the connection of the stem is the primary middle term in the account of shedding leaves (99a25-29).

\(^{74}\) Aristotle takes for example “equals taken from equal leave equal” as a one whole.

\(^{75}\) If it is proved that two right angles holds of *this particular* triangle, then “it holds universally of *this primitive* item, and the demonstration applies to it universally in itself.” PoAn. I. 4, 74a 3-4.
αναλογίαν), as Aristotle says at 76a38-39, in that hypothesis, definition and axiom are the three indemonstrable principles of demonstrative knowledge.

Then, the sense of (b) primitives of (in) the genus remains. Peculiar to this sense is the context in which it occurs. While other applications of the ‘primitive’ are mostly found in the context of proof or explanation, the primitives in a genus occurs when Aristotle supposes a kind of structural viewpoint on knowledge.76

[C-5] I call principles in each kind (ἐν γένει) those items of which it is not possible to prove that they are (ὅτι ἐστὶ). Now what the primitives (τὰ πρῶτα) and what the items proceeding from them [derivatives] mean is assumed; but that they are must be assumed for the principles and proved for the rest.

We already examined this passage in §1 and §3 of the previous chapter, revealing the meaning of being (“that they are”) of the primitives and derivatives: the distinction between them is those predicates for which the particular exemplifications—e.g. “this is a line”—can be identified as such without a justificatory account, and those predicates whose inherence in given particulars—e.g. “this triangle is 2R”—must be proved through a demonstration. Not surprisingly, axiomatic interpreters read the passage so as to distinguish two entities—“epistemic substances”77 and their derivatives—that demonstrative sciences deal with. In a genus of a demonstrative science, there are basic (primitive) entities like units and magnitudes, by whose definition the derivative entities are proved in a chain of syllogisms, and thus the definitions of the basic entities should serve as the first propositional premises. The above passage is not the only one that leads axiomatic readers to support the (pseudo) distinction of two entities of demonstrative sciences.78

[C-6] Of some things there is something else which is their explanation (αἰτίων), of

76 PoAn I. 10. 76a31-36.
78 PoAn. II. 9, 93b21-28
others there is not. Hence it is plain that in some cases [X] what something is (τι ἐστι) is immediate and a principle; and here you must suppose, or make clear in some other way, both that the thing exists and what it is… But in cases [Y] where there is a middle term and something else is explanatory of the essence, you can… show what something is through demonstration (δι ἀποδείξεως) without demonstrating what it is.

A full analysis of the passage, however difficult it is, awaits our next chapter. But one thing seems clear, namely, that Aristotle makes a distinction between the two cases, one of which has no causes outside themselves, and the other of which has a middle term. In the second cases, something else is explanatory of its essence. Would this passage [C-6] provide axiomatic readers with confirmation of the passage [C-5] that there are in a genus of a science the two distinct entities?

While explicating the method of division, Aristotle mentions, once again, the primitive in a genus somewhat differently: 80

[C-7] When you are dealing with some whole, you should divide the kind into what is atomic in form, i.e. into the primitives…Then you should try to get definitions of these items…After this..., you should study its proper attributes through the primitive common items. For the characteristics of the items compounded from the atoms will be plain from the definition, because definitions and what is simple are principles of everything.

Though what is “atomic,” i.e., the primitives, include here what should be regarded as the derivative ones according to the passage [C-5], like “straight line and circle and right angle,” the scheme is plainly the same: items of the compounded should be explained by the definition of what is atomic.

However enticing these passages [C-5, 6, 7] are to the axiomatic interpreters, the ideas that there are two distinct entities in a genus of demonstrative science—primitive vs. derivative,

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79 Note the differences of the object of proving in the passages of [C-5] and [C-6]: Proving that something is the case (ὅτι ἐστι) in [C-5] vs. showing what something is (τι ἐστι) in [C-6]. This discrepancy is related to the fact that there is no mention in Book II of the hypothesis as a starting point of demonstrative knowledge. We will seek the rationale for this omission in the next chapter.
80 PoAn. II. 13, 96b15-25
immediate vs. mediated, and atomic vs. compounded— and that the ‘what-it-is’ of the latter is proved or explained by the definition of the former, both have serious difficulties. Commenting on the passage [C-6], Bolton indicates the difficulties:81

There is, however, simply no way to derive by demonstration the definition of triangle, say, solely from the definitions of point and line. Aristotle was quite aware of this. . . Aristotle does say there [I.10] that the existence of the secondary objects must be proved (though not demonstrated—*deikunai*, not *apodeiknunai*). But this proof, whatever it amounts to, cannot involve any proof of the basic definition of the secondary objects, since this cannot be proved (76a31-2).

We should not be misled by Aristotle’s wordings of ‘primitives and derivatives in a *genus* of sciences’. Points and lines are not the primitive subject of (in) a genus, geometry, whose attributes or derivatives are triangles, circles, two right angles, squaring of circles, etc. And definition of the latter cannot be derived from definition of the former: Both should be given prior to any actual proofs. However, to think thus would be turning demonstrative proof upside down. It is rather the case that what is *subject* is ‘this figure’, ‘the moon’, or ‘the planets’, when we try to prove demonstratively “this figure has two right angles,” “the moon is eclipsed,” or “the planets are not twinkling.” In these cases, ‘triangle’, ‘being near’ and ‘the screening of the earth between the moon and the sun’ are considered to be primitive in the sense of maximally (and proximately) *causing* their subjects to have the attributes. Therefore, definitions—say, what triangle means—are one of the principles or starting-points (*not premises*) of demonstrative proof along with axioms and hypothesis as setting up the facts. Of course, our interpretation of demonstrative knowledge and its starting-points is to be further explicated by our discussion of the types of definition and stages of inquiry that appear in Book II.3-10 of the *Posterior Analytics.*

Again, by the term ‘genus’ or ‘subject genus’ \((\text{genos hypokeimenon})\), Aristotle should not be misunderstood to inflate the scope of true knowledge \((\text{epistêmê})\) to extend to the whole body of knowledge of a science, which will inevitably have some definitions of basic entities as axioms or premises. In regard to the ‘primitive in a genus’, there is clear textual evidence for our own contention in \textit{Posterior Analytics} I.9. There, Aristotle mentions Bryson’s proof of ‘squaring the circle’\(^{82}\) as an example of a proof that even though the premises are true, non-demonstrable, and immediate, the proof itself is not scientific but incidental, since it does not proceed from what holds of a subject \textit{as such} \((\text{h3} \mid \text{au})\). Rather it proceeds from something beyond the scope of the subject: thus, the middle term is not of the same kind. At the end of the chapter, Aristotle says: \(^{83}\)

\[ \text{[C-8] It is difficult to be aware of whether one knows or not. For it is difficult to be aware of whether we know from its own principles or not—and this is to know something. We think we know if we have a deduction from something true and primary but that is not so, but it must be of the same genus as the primaries (\text{συγγευ̃η} δέ\ έιναι τοις πρώτοις).} \]

In this passage, Aristotle is clearly adding another qualification for the primary condition of knowledge \textit{simpliciter}. The primary cause \((\text{aitia})\) should be in the \textit{same genus} of the subject, some attribute of which is to be proved in the conclusion. But, more importantly, he warns throughout the chapter not to extend the scope of the \textit{subject}, when seeking causes, which in turn will be predicated of the subject \textit{as itself}. With this consideration, and the preponderance of evidences for ‘the primacy as proximate cause,’ we can assert that Aristotle does not generalize demonstrative knowledge to an axiomatic system by means of the primacy condition or by what

\(^{82}\) Bryson proves that the circle can be squared by making the assumption that "things which are greater and less than the same things respectively are equal." Aristotle’s point is that this assumption as a principle is a way beyond the scope of what is to be proved. For this, see T. Heath, \textit{Mathematics in Aristotle} (Oxford: Oxford Uni. Press, 1970), 47; W. Knorr, \textit{The Evolution of The Euclidean Elements} (Dordrecht: Reidel, 1975), 71.

\(^{83}\) \textit{PoAn}. I. 9, 76a25-30. Barnes’ translation omits the last phrase, “as the primaries.”
is primitive in a genus.

Now, regarding the condition of immediacy (*amesos*), we already examined a few of its characteristics: the intimate relationship of the immediacy condition with the syllogistic frame of demonstrative knowledge; the non-identity of immediate propositions with first premises of demonstration; thus the connotation of indemonstrability not necessarily being connected with the immediacy condition. That is, when we approach the immediacy condition propositionally, we cannot clarify why the condition is almost every time conjoined by Aristotle with the notion of indemonstrability. The notion of an immediate proposition (premise) as such does not imply that there is no prior causal term which explains either of the two extremes.

Throughout the uses of the ‘immediate’ in the *Posterior Analytics*, it is difficult to know whether Aristotle is mentioning immediate premises (propositions) or immediate terms or concepts, except in a few clear cases (72a7, 85a1, 88b18-19, 99b21) of “immediate proposition” (*aimesos protaosi*). On the other hand, Aristotle states at some places (75a12-17, 78a22-28, 89a16-22, 93a35-36) that the demonstration “through immediates” (*di amesov*) makes plain the reason-why (*dioti*) as well as its being the case (*hoti*). In these cases, it seems that the *amesos* has another meaning, which is the maximal universal cause of something’s being the case, thus it appears to be closer to concepts than to propositions. “Immediate term,” however, viewed from a propositional approach, is a non-sense, since it means a term which does not have the middle term. As commentators often complain, does Aristotle lack in this context a clear-cut distinction between concepts/terms and premises/propositions? On this point, we can see frequent

84 De Rijk is one of a very few scholars who maintains that the alleged ambiguity in Aristotle between terms and propositions is mistaken: “To object to the idea of there being a ‘deep-seated ambiguity’ in II.19 inasmuch as the starting-points seem to vacillate between primitive propositions and primitive terms is not to say that there is no difference between terms and propositional units in connection with Aristotle’s view of starting-points and their
switching back and forth from terms to propositions and *vice versa* in Aristotle’s description of

the “thickening the middle” at the chapter 23 of the first book:

[C-9] It is clear too that when *A* holds of *B*, then if there is a middle term you can prove

that *A* holds of *B*, and *the elements (στοιχεία) of this are as many as the middle terms.*

(It is *the immediate propositions which are the elements, either all of them or the universal ones.*) But if there is no middle term, then there is no longer demonstration—rather, this is the path to the principles. 85

[C-10] When you have to prove something, you should assume what is predicated primitively of *B*. Let it be *C*; and let *D* be similarly predicated of *C*. If you always continue in this way, *no proposition and no term* holding outside *A* will always be thickened (*πυκνοῦται*) until they become *indivisible (ἀδιαίρετα)* and *single (ἐν).* They are single when they become *immediate*, and a single proposition *simpliciter* is an *immediate* proposition. In other areas the principles are simple, though they are not the same everywhere: in weight, the ounce; in music, the semitone; and other things in other cases. So too in deduction the unit is the immediate proposition, and in demonstration and understanding it is *comprehension (νοῦς).* 86

Clearly in the passage [C-9], Aristotle refers to a same thing, once the elements as middle *terms* and at the next sentence elements as immediate *propositions*. And in the passage [C-10], both terms and propositions are said to be thickened until (*εν*) they become indivisible and *single*. However strange it may be that propositions are indivisible and single, Aristotle mentions as examples of the single and indivisible, some terms or concepts, “ounce,” and “semitone,” and “nous.”

What we see in this passage is the use of immediate terms and propositions interchangeably without any friction. Now, we need to describe and say why the *Aristotelian way* of treating both terms and propositions interchangeably in some contexts of demonstrative

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86 PoAn. I. 23, 84b31-85a1.
knowledge does not make Aristotle guilty of ambiguity in his thinking. While we examined the two aspects of truth, we showed that concerning the object of the what-it-is, our mind can have two intimately related states: on the one hand the mind either just knows (νοεῖν) it or is ignorant of it, on the other when our inquiry about the ‘what-it-is’ arises, it takes the form of asking whether a thing is such and such a nature or not. This means that coming to know a universal (concept) and stating it propositionally is different, but in some contexts saying both indifferently causes no problem for Aristotle.

Then, let us look back to the passage [C-10] once again. Aristotle asserts that during the process of thickening the middles—the consecutive inquiries for the what-it-is, we will end up with a final one that is indivisible and simple, the one (ἐν), which is instantly identified with the immediate principle. Peculiar here is the fact that Aristotle no longer depends on the notion of indemonstrability but on the notion of oneness in order to explicate the immediacy. As we noted, the idea that the answer to the question of what-it-is should be something simple is not original to Aristotle. It can be traced back to Socrates: the Socratic ‘what-it-is’ question does not anticipate plural and various answers, but one answer and a simple one. And when Aristotle modifies the immediate with the end or the limit in the demonstrative inquiry, he seems to mean the same sense that we have now this one cause to explain why subject things are such-and such. For Aristotle, just before connecting this maximal cause to the conclusion, there should arise this simple universal (concept) itself, which is grasped as a simple and incomposite thing at once. Then, it is not implausible that by immediacy Aristotle implies a kind of relationship between a knower and a thing known: nothing mediates between the knower and the known simple. To repeat, it is one thing and the first thing to grasp the universal, and it is another thing to explicate
it propositionally; and sometimes as in the passage [C-10] it is allowed to speak both of them altogether, since demonstration concerns, above all, explanation.

What we have argued so far shows the way to the final and sixth critique of the axiomatic understanding of definition as a principle. Our construal of the immediate and primary will illuminate the final sentence of the passage [C-10]: “So too in deduction the unit is the immediate proposition, and in demonstration and understanding it is comprehension (νοῦς),” and the passage [B-6] we skimmed:

[B-6] We assert that not all understanding is demonstrative; rather in the case of an immediate item understanding is indemonstrable…. We argue in this way; and we also assert that there is not only understanding (ἐπιστήμην) but also some principle of understanding (ὁρχήν ἐπιστῆμης) by which we get to know the definitions (ὁρῶς).

If we follow the path of our arguments about the immediate and primary, what the two passages describe seems plain: It is all about the noetic apprehension of the immediate and primary terms, which will in turn serve to explain why subject things are necessarily thus and so. Thus, the sentence “there is not only understanding but also some principle of understanding by which we get to know the definition,” should be re-translated or interpreted such that there is not only demonstrative knowledge but also the (noetic) ground of the knowledge, by which we apprehend the primary and immediate terms (ὁρῶς).

Now we need to consider the crucial contention of axiomatic interpretation that definition as a principle is the indemonstrable premise (proposition) of demonstrative syllogism. If axiomatic readers find their textual evidence for this in the passages [B-6] or [C-10], we can say that they are not only far from the dual aspects of Aristotelian truth but also ignorant of the conceptual realm where the primary and immediate are aitia. It is at best partially justifiable that definition as a principle is an indemonstrable first premise (proposition). But even the partiality
can have its value only when it is rightly located within the whole view of types of definition and stages of demonstrative inquiry in Book II. Furthermore, the axiomatic view of definition does not have any theoretic space for the notion of nominal definition—what a name, basic or derivative, means—which occurs sporadically in the first book. Related with the theoretic space of nominal definition is Aristotle’s claim that definition as a principle is not an assertion (proposition, protasis), a point of which axiomatic interpretation also does not take account.

Before moving to the next section, we should take note of a misunderstanding not unique to axiomatic interpreters in regards to demonstrative knowledge in general. The misunderstanding stems from Aristotle’s seeming rejection of particular things or terms as belonging in demonstrative knowledge. In Posterior Analytics I.14, Aristotle says that “of the figures, the first figure syllogism is most scientific (ἐπιστημονικόν),” and the whole of chapter 24 is devoted to arguing that “universal demonstration is better than particular demonstration.” Moreover, Aristotle holds throughout the treatise that demonstrative knowledge is of universals, and that there are only definitions of universals, and not of particulars. This statement seems to make it impossible that particular terms enter by any means into demonstrative syllogisms.

What seems an impossibility exposes a serious problem, though. If demonstrative knowledge is all about universals, what distinguishes it from Plato’s dialectic knowledge, apart from its being syllogistically structured? Since Aristotle departs from the Platonic position that universals are ontologically primary and exist independently from particulars, he faces the obstacle of having to explain how demonstrative knowledge bears upon particulars at the same time it can only be of universals, without reducing this knowledge of universals to knowledge of

87 PoAn. I. 14, 79a18.
88 PoAn. I. 24, 85b14-15
The common misunderstanding that demonstrative knowledge is composed of only universal terms is false and, for Aristotle, particulars and universals are interwoven uniquely with each others in demonstrative knowledge. The misunderstanding is rather due to our lack of recognition that knowledge (epistêmê) for Aristotle is a kind of capacity (dunamis) like perception, experience, and intellect. Also, we can say that the misunderstanding is due to there being in the Posterior Analytics no explicit distinction between knowledge in potentiality and knowledge in actuality. In Metaphysics M, Aristotle draws the distinction: 89

The statement that all knowledge is universal, so that the principles of things must also be universal and not separate substances, presents indeed, of all the points we have mentioned, the greatest difficulty, but yet the statement is in a sense true, although in a sense is not. For knowledge (ἐπιστήμη), like knowing (ἐπιστασκεῖον), is spoken of in two ways—as potential (δυνάμει) and as actual (ἐνέργεια). Potentiality, being, as matter, universal and indefinite, deals with the universal and indefinite; but the actuality, being definite, deals with a definite object,—a being a ‘this’, it deals with a ‘this’. But per accidens sight sees universal colour, because this individual colour which it sees is colour; and this individual a which the grammarian investigates is an a…. But evidently in a sense knowledge is universal, and in a sense it is not.

Knowledge in potentiality is what Aristotle usually calls “knowledge” (epistêmê) in the Posterior Analytics, especially when he claims that knowledge is of universals. Its object is indefinite and universal in the sense that a geometer, for example, is able to prove that triangle has angles equal to two right angles, regardless whether it is a particular triangle constructed in a given line, or a particular triangle inscribed in a particular semi-circle, or whatever it may be as far as it is a triangle.

Though a geometer as a potential knower does not always have to contemplate the theorem about triangle, when he actually proves a certain case—being a certain this of a certain

89 Meta. M. 1087a10-25
this, he always deals with a particular triangle and angle at a particular setting.

Likewise, a meteorologist deals with a certain cloud making a more or less loud sound, when he demonstrates that quenching of fire is the cause of that particular sound. And a politician, when he contemplates “why the Persian war came upon the Athenians, and what is the explanation of the Athenians’ being warred upon?” has to think the actual “Athenians” as the minor term, and “being warred upon” and “being first to attack” as the major and the middle respectively.

The object of knowledge in actuality is always definite and thus demonstrable by a definite pronoun, “this.” But the definite and particular that knowledge in actuality deals with should not be confused with bare particulars. In an actual demonstration of why “this” particular figure has a certain particular property of having two right angles, the figure is conceived not as to its particularity but as to its universality, i.e., this figure in as much as (qua) it is a triangle. In the previous chapter when we were explicating the meaning of exposition (ekthesis), we characterized this feature of particulars in demonstrative proof as representational or operational in the sense that the particular entities have to be conceived first as an instantiation of a universal, and that after the proof, it is operationally applicable to any particulars that come under the scope of the same universal.

Such an insight on knowledge in actuality distinguished from knowledge in potentiality will demand tremendous revision of the traditional understanding of Aristotelian demonstrative knowledge. First, it is evidently only one half of demonstrative knowledge (the potential aspect) that it is composed only of universal terms. Second, particulars for Aristotle have a unique onto-epistemic status in the activity of demonstration. Not only do particulars retain their ontological primacy in Aristotle’s view of demonstrative knowledge, they also have to occur epistemically as

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90 PoAn. II. 11, 94a
instantiation or saturation of universals in the actual processes of demonstrations. Third, as we will discuss further in the next two chapters, only within the perspective of knowledge in actuality is the important distinction between ‘that-it-is’ and ‘what-it-is’ in demonstrative knowledge illuminable. Aristotle’s mentions of the ‘that-it-is’ and the ‘what-it-is,’ each closely related with hypothesis and definition as the starting-points of demonstration, become understandable in the sphere of actual processes of demonstration, i.e., knowledge in actuality.

§2.3. Definition, Per Se Predication, and the ‘What it is’ Locution

Earlier we indicated that chapters 2-4 of the first book of the Posterior Analytics constitute the backbone of Aristotle’s theory of demonstration. As normally understood, it seems true to say that while Aristotle’s claim about the conditions of principles in chapter 2 gives us the formal account of demonstrative knowledge, his treatment of the ‘per se’ and the other predications in chapter 4 provides very important information about the material contents of demonstrative knowledge. As a matter of fact, these so called “scientific predications” are not only the key ingredients of demonstrative knowledge, but also a stepping stone for understanding Aristotelian essentialism. For Aristotle, showing how these predications are

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91 Ferejohn deals with these scientific predications under the title of “the explanatory content of demonstrations” in contrast with the structure of demonstration. Ferejohn, The Origins of Aristotelian Science, vii.
93 With the influence of the contemporary revival of metaphysical essentialism, Aristotelian essentialism has received fresh attention from many scholars. A now classic study by Sorabji is a salient example of investigating Aristotle’s essentialism focusing on the per se predicate, with Kripke and Putnam’s essentialism clearly in mind. R. Sorabji, Necessity, Cause and Blame: Perspectives on Aristotle’s Theory. chapters. 11, 12. Refer also on this regard: R. Tierney, “The Scope of Aristotle’s Essentialism in the Posterior Analytics,” Journal of the History of Philosophy vol. 42, no. 1 (2004): 1-20.
interconnected with each other in what we could call the net of demonstration is one prime task of the *Posterior Analytics*.

Despite their importance, as we will see shortly, Aristotle’s thoughts on the *per se* and other predications are not by any means a well-refined part of his theory of demonstration. Sometimes, important distinctions are blurred. The clear cut distinction between *per se* versus *per accidens* predications in chapter 4 is not maintained when Aristotle mentions the second type of *per se* predication in chapter 22. Additionally, the notorious issue of fitting ‘*per se incidentals* (attributes)’ into the theoretical framework of Aristotle’s other remarks about the *per se* leads readers astray. What makes the exegetical difficulties even worse is not so much confusion or lack of clarity on Aristotle’s part as it is various presuppositions that commentators make in their interpretations. In line with the previous section that takes a critical stance toward the axiomatic-deductive reading of knowledge *simpliciter* and principles, this section aims to account for *per se* and other important predications, as far as possible freeing them from axiomatic presuppositions. Our strategy of argument is to peel off these presuppositions layer by layer.

The first and widespread presupposition about the *per se* and other scientific predications concerns their subject matter. Let us see how these predications are introduced by Aristotle:

[4-a] Since it is impossible for that of which there is understanding (knowledge) *simpliciter* to be otherwise, what is understandable in virtue of demonstrative understanding will be necessary... A demonstration, then, is a deduction which proceeds from necessities. We must see, then, from what items, *i.e.* from what kind of items (ἐκ τινῶν καὶ ποίων), demonstration proceed. First, let us define what we mean

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94 In chapter 22. 83b17-24, the second type of *per se* predication is clearly grouped together with incidentals, even though *per se*, because it is predicated of an underlying subject.

95 Tiles holds that it is not possible “to exonerate Aristotle from the charges of error and confusion over these matters.” J. Tiles, “Why the Triangle has Two Right Angles Kath’ Hauto,” *Phronesis* 28, no. 2 (1983): 2.

96 *PoAn*. I. 4, 73a21-27.
by “of every case (κατὰ παντός)”, by “in itself (καθ’ αὑτό)”, and by “universally (καθόλου).

It is clear that here Aristotle sets out to articulate the second fundamental requirement of knowledge simpliciter—(FR₂: Necessity), i.e., someone has to know the necessity of something’s being the case—that he leaves untouched in chapter 2, after he defines knowledge simpliciter. It must be noted first that what are at stake here, in the respect of being necessary, are first and foremost conclusions of demonstrative proof. For Aristotle, ‘knowledge in the strict sense’(epistêmēhaplōs) is not accomplished solely by the fact that we have successfully explained something’s being the case by revealing the cause (aitia) that satisfies the six conditions of principles, that is, the possibly maximal universal cause. Knowledge in the strict sense should show that because of the cause, something’s being the case (the conclusion of demonstration) cannot be otherwise. ⁹⁷ This idea that sciences, or rather broadly, ‘knowledge in the true and strict sense’ deal with necessary facts—the necessary connection between subject and predicate of demonstrative conclusion—is Aristotle’s undeniable philosophical belief. His belief accords with Plato’s view of knowledge in the Theaetetus, however unattractive it may be to the post-Humean philosophers of science.

Since it is obvious that Aristotle’s concern for necessity is centered on the demonstrative conclusion, his following explications of the three predications serve in one way or other to elucidate the necessity of demonstrative conclusion. Most commentators suppose, however, that Aristotle’s discussions and arguments about the predications are not about the conclusions but

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⁹⁷ This point could account for a probable case of a pseudo-knowledge claimant who thinks that he gives a satisfactory and successful explanation of something’s being a case, even though in reality it is a contingent fact. Aristotle presents this case as follows: “Otherwise you will understand neither the reason why nor that it is necessary for it to be the case: either you will wrongly think that you know it (if you believe to be necessary what is not necessary) or else you will not even think you do (equally whether you know the fact through middle terms or the reason why through immediate).” Po An. I. 6, 75a14-17.
rather about the premises of demonstration. For an instance of this supposition, let us examine Ferejohn’s introductory treatment of the *per se* predication: “Aristotle thinks that all sentences that can serve as *scientific premises* are necessary (73a21), and that their necessity is a consequence of their being *per se* predications.” ⁹⁸

Ferejohn distances himself from other straightforward axiomatic interpreters, claiming that the whole process of Aristotelian demonstration is a two-stage affair, at one stage of which, what he calls the “presyllogistic stage,” all premises of demonstrative proof are already provided by Aristotle’s reformed method of division, advocated in *Posterior Analytics* 2.13 and *Prior Analytics* 1.27-32. These premises meet the two extensional conditions of demonstrative premises, that is, ‘in every case’ (*kata pantos*), and ‘qua itself’ (*hei auto*). He holds that now “in *Posterior Analytics* 1.4 the intensional condition on demonstrative *premises* is addressed by subcondition (ii) on catholic predications, namely that their predicates apply *καθ’ αὐτό* to their subjects.” ⁹⁹

Leaving aside appraisal of Ferejohn’s understanding of the extensional and the intensional conditions of demonstrative premises, we can state that his overall view of Aristotelian demonstration is still guided by the axiomatic-deductive interpretation. That is, though he appeals to the method of division instead of intuition, induction, or dialectic method, which are the various ways that axiomatic interpreters talk about the acquisition of principles and premises, he is still on the side of axiomatic interpreters in construing demonstrative knowledge as deduction from basic principles and definitional premises to lower derivative theorems in a

⁹⁹ M. Ferejohn, Ibid., 72.
science. Sharing this commitment, he naturally expects Aristotle to be portraying *material contents* of demonstrative premises in the discussion of the *per se* predications in chapter 4. This is because the *formal-structural* account of principles is given in chapter 2.

Returning to our text, the passage itself in *PoAn* I.4 carries an implication that make some think that this passage is all about necessity conditions of demonstrative premises: “A demonstration, then, is a deduction which proceeds *from* necessities. We must see, then, *from what items, i.e., from what kind of items* (ἐκ τίνων καὶ ποίῶν), demonstration proceed.” Since Aristotle evidently recognizes the possibility of deducing a necessary conclusion from non-necessary premises, as much as the case of deducing truth from falsity, Aristotle’s assertion should not be understood as simply arguing from the necessity of the conclusion *as* the subject matter of knowledge *simpliciter* to the necessity of premises. As Bolton rightly pointed out, it means that “for a demonstration or deductive proof to be the instrument by means of which we come to know some conclusion *as* an item of unqualified scientific knowledge and thus as a necessary truth, its premises or other bases must be necessary and known as such.”

Bolton’s view is based on the different translation of the phrase—“ἐκ τίνων καὶ ποίῶν”—as “*from* which things and *of which sorts of things* there are these demonstrations,” the rendering of which he finds strongly in Greek commentators like Philoponus and Themistius. It follows, according to him, that subsequent discussion of necessity applies equally to premises and conclusions of demonstrations as well. Then, Bolton concentrates on the fact that

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100 *PoAn*. I. 6, 74a1-5: “When the conclusion holds from necessity, nothing prevents the middle term through which it was proved from being non-necessary. For you can deduce a necessity from non-necessities, just as you can deduce a truth from non-truths.”


throughout the chapters 4-6, Aristotle distinguishes and expounds three different types of
demonstrative conclusions, all of which are necessary and thus legitimate candidates for being
knowledge simpliciter. Examples of the three demonstrative conclusions gleaned by Bolton are:
(a) Plurality belongs to number, (b) The noise of thunder belongs to a cloud, and (c) Having
interior angles of two right angles belongs to triangles. These conclusions are, Bolton assesses,
respectively the clear cases of (a) the first type of per se predication, (b) the second type of per se
predication, and (c) the universal attributes predication, what is normally called the
‘commensurate universal’.

Bolton’s claim has some problems, nevertheless. It is a very difficult question whether
the three different types of demonstrative proof that respectively have the three different types of
conclusions have equal philosophical value in Aristotle’s thinking. Taking this question in
another way, we cannot easily answer the question of which demonstrative proof among the
three types Aristotle would consider as the ideal case of demonstration. Furthermore, it is a
controversial issue whether (c) the universal attributes predication is really distinct, or can be
reduced to either of the first two predications, i.e., the first or second type of per se.

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103 Bolton presents the demonstrative proofs of the first two cases as follows, while he is reticent or doubtful about
the possibility of syllogistically presenting the controversial case of (c):
(a) Plurality belongs to what is measured by units
  Being measured by units belongs to number.
  Therefore, plurality belongs to number.
(b) The noise of thunder belongs to the extinguishing of fire in a cloud.
  This extinguishing of fire belongs to a cloud (as subject).
  Therefore, the noise (of) thunder belongs to a cloud.
Bolton, Ibid., 132-133.
104 Bolton seems to think so. McKirahan also distinguishes three different types of demonstration by three different
types of conclusions: universal subject-attribute demonstration, demonstration of existence, demonstration of
essence. R. McKirahan, Principles and Proofs, chapters 13, 15, 16.
105 Regarding this point, there is a rich tradition among medieval commentators of the Posterior Analytics, who seek
the highest form of demonstration (demonstratio potissima) and debate on the nature of the scientific knowledge
resulting from it. See a recent study: J. Longway, Demonstration and Scientific Knowledge in William Ockham: A
Translation of Summa Logicae III-II: De Syllogismo Demonstrativo, and Selections from the Prologue to the
Ordination (Indiana: University of Notre Dame Press, 2007), Introduction.
Notwithstanding these serious problems that lurk below the surface in Bolton’s claim, his argument is noteworthy for criticizing the hasty judgment of axiomatic interpreters that the subject matter of *per se* predications is premises of demonstrative proofs.

Before proceeding to examine Aristotle’s direct remarks on *per se* predications, we can consider the second presupposition of axiomatic-deductive interpretation while inspecting Aristotle’s remarks on ‘in every case’ predication: 106

[4-b] I say that something holds of every case (κατὰ παντός) if it does not hold of some cases and not of others, nor at some times and not at others. E.g. if animal holds of every man, then *if it is true to call this (τόνδ’) a man*, it is true to call him an animal too. . . Similarly if there is a point in every line. Evidence: this is how we bring objections if asked whether something holds of every case—we object either it does not hold in some cases or if it does not hold at some time.

There seems to be no disagreement among commentators that ‘in every case’ predication is a purely extensional notion concerning subject and predicate in demonstrative proof. The predicate must apply truly over the entire extension of the subject term: For every x, if x is a member of A (subject), then x is a member of B (predicate). We should not be deterred by the fact that the second example of ‘point and line’ cannot stand in the relation of predications. Rather, we should pay attention to the phrase, “*if it is true to call this (τόνδ’) a man.*” For here is a kind of proof procedure that sets out (*ektthesis*) a particular case x for proving x-being-B in as much as (qua) x is A. 107

The rationale for reading out this proof procedure in the ‘κατὰ παντός’ predication is that ‘in every case’ predication is a sub-condition of ‘universal’ (καθόλου) predication. The main theme of the second half of *PoAn* I.4 is undoubtedly ‘universal’ predication and ‘universal’ proof, which Aristotle defines by the three predications, ‘in every case’, ‘in itself’, and ‘as itself’

106 *PoAn*. I. 4, 73a27-34.
107 We gave a detail analysis of this proof procedure in our Chapter 1, section 2.
Right after the definition, Aristotle makes ‘in itself’ and ‘as itself’ equivalent and mentions ‘triangle’s having two right angles’ as an example of ‘in itself’ cum ‘as itself’ predication. Then he proceeds to the issue of ‘universal’ proof, determining two conditions that should be met, if a proof that $F$ holds of $x$ is to count as a proof that $F$ holds universally of $x$: (1) $F$ must be proved for an arbitrary ($τυχόν$) $x$; (2) $x$ must be a primitive ($πρῶτος$) subject of $F$.

Whereas the discussion of the ‘primitive’ requirement is extended throughout chapter 5, being correlated with ‘as itself’ predication, the ‘arbitrary’ condition is articulated in the last part of chapter 4 as follows: “it may be possible to prove of a figure that it is 2R, but not of an arbitrary figure, nor does one use ($ξρῆται$) [it as] an arbitrary ($τυχόντι$) figure while proving ($δεικνύσ$) it.” 108 The language here clearly refer to one of the initial procedures (ekthesis) of geometric proof that introduces a particular case as an instantiation of universal terms. Now our point here is that ‘in every case’ predication should be read in its correlation with the first requirement of ‘universal’ proof, as much as the ‘as itself’ predication is correlated with the second requirement. In other words, Aristotle prepares by ‘in every case’ predication the requirement that ‘universal’ proof should be performed at the level of particulars. 109

This point gives further support to our previous claim: the presupposition that demonstration consists of only universal terms is not only too narrow but disregards (and distorts in some cases) the active side of demonstrative knowledge, knowledge in actuality. In this respect, Barnes’ comment on 73a25 that “the rest of the chapter gives a rigorous expansion of the

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109 On this point and other valuable details on primary-universal proof, see P. Hasper, Ibid. 252-284.
common Aristotelian slogan that knowledge is of the universal \(^{110}\) is clearly off the mark for a correct interpretation of demonstrative knowledge.

Now we come to the third and important presupposition of axiomatic-deductive interpretation regarding per se predications. \(^{111}\)

[4-c] One thing belongs to another in itself (καθ’ ἄυτο) both [(i) per se-1:] if it belongs to it in what it is (ὑπάρχει τε ἐν τῷ τί ἔστιν)—e.g. line to triangle and point to line (for their substance (ὁμοίωσις) depends on these and they belong in the account which says what they are)—and also [(ii) per se-2:] if the things it belongs to themselves belong in the account which makes clear what it is (ἐν τῷ λόγῳ ἐνυπάρχουσι τῷ τί ἔστι δηλοῦντι)—e.g. straight belongs to line and so does curved, and odd and even to number, and prime and composite, and equilateral and oblong; and for all these there belongs in the account which says what they are in the one case line, and in the others number. And similarly in other cases too it is such things that I say belong to something in itself; and things that belong in neither way I call incidental (συμβεβηκότα), e.g. musical or white to animal.

In this passage, two distinctions are made: firstly what belongs to something in itself (καθ’ ἄυτο) is distinguished into two types (per se-1 and per se 2), and secondly, both of them, i.e., what belongs to something in itself is itself demarcated from what belong to something incidentally (συμβεβηκότα). An initial puzzlement in this passage is what the broader distinction, ‘καθ’ αὕτω’ vs. ‘συμβεβηκότα’ is all about. Since the passage is within the topic of necessity of demonstrative knowledge, and the necessity, as Bolton claims, applies equally to premises and conclusions of demonstrative proof, we may assert that the distinction is a sort of criterion for the relations between subjects and predicates that legitimately occur in syllogisms that are demonstrative.

Nonetheless, this assessment of kath’ hauto predication, which is predominant throughout the history of commentaries on Posterior Analytics I.4 does not seem to present the exact domain

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\(^{110}\) Barnes, Aristotle: Posterior Analytics, 111.

\(^{111}\) PoAn. I. 4, 73a34-b5
of the above passage, even though it is not outright wrong. The suspicion that it is inadequate comes from the following considerations. First, the distinction pertains not only to ways of predicking (belonging) between subject and predicate, but also to the items that belong in these different ways. This seems clear, since Aristotle uses the term “incidentals” (συμβεβηκότα) instead of ‘incidentally’ (κατά συμβεβηκός) in speaking of the items. There is no corresponding nominal form of ‘καθ’ αὐτό’.¹¹²

The second suspicion of the inadequacy of the customary interpretation of these predications arises when we read chapter 22 of the Book I, where we face the same narrow distinction (per se-1 vs. per se-2):¹¹³

[22-a] Demonstration applies to what holds of the objects in themselves—in themselves (καθ’ αὐτό) in two ways: both the items [per se-1] which holds of the objects and inhere in what they are (ἐν τῷ τί ἐστιν), and also the items [per se-2] for which the objects of which they hold inhere in what they are (e.g. odd of number—odd holds of number and number itself inhere in its account; and conversely, plurality, or divisibility, inhere in the account of number).

And we find the broader distinction (‘καθ’ αὐτό vs. ‘συμβεβηκότα’) presented in a somewhat different mode earlier in the same chapter 22.¹¹⁴

[22-b] We have supposed that one thing is predicated of one thing and that items which do not signify what something is (ὅσα μὴ τί ἐστι) are not predicated of themselves. For these are all incidental (συμβεβηκότα) (though some hold of things in themselves (καθ’ αὐτό) and some in another way), and we say that all of them are predicated of an underlying subject (καθ’ ὑποκειμένου), and that what is incidental is not an underlying subject.

Here, the broader distinction is between ‘items that do signify what it is (τί ἐστι)’¹¹⁵ and

‘incidentals that are said of the underlying subject’, and then incidentals are distinguished into

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¹¹³ PoAn. I. 22, 84a11-14
¹¹⁴ PoAn. I. 22, 83b17-22
one that holds of in themselves (καθ᾽αὐτά) and the other that holds of in another fashion. Then, the incidentals that hold of things in themselves must be the second type of ‘καθ᾽αὐτά’ predication (per se-2) that is mentioned in the chapters 4 and the passage [22-a]. What is notable in this passage is the occurrence of the underlying subject that serves to explicate the identifying characteristics of incidentals. The broader distinction that accompanies the underlying subject has been already introduced in the same chapter before the above passage: [22-c] Again terms which mean substances (τὰ οὐσίαν σημαίνοντα) mean, of what they are predicated of, just what is that thing or just what is a particular sort of it (Ὅπερ ἐκείνο ἢ ὅπερ ἐκείνῳ τι σημαίναι). Terms which do not mean substances but are said of some other underlying subject which is neither just what is that thing nor just what is a particular sort of it, are incidental.

Here again, a distinction is made between ‘terms that signify substances (οὐσία)’ and terms that do not signify substances (terms that are said of the underlying subject), i.e., incidentals. Right before the above passage, Aristotle mentions the same broader distinction in terms of simpliciter predication vs. incidental predication: [22-d] Let us suppose that what is predicated is always predicated simpliciter (κατηγορεῖται ἀπλῶς), and not incidentally (κατὰ συμβεβηκός), of what it is predicated of; for this is the way in which demonstrations demonstrate. Hence when one thing is predicated of one, either it is in what the item is (ἐν τῷ τί ἐστιν) or it indicates that it has some quality or quantity or relation or is doing something or undergoing something or is at some places or time.

116 As Tierney precisely indicates, here new lines are drawn by Aristotle: “old lines distinguished what is incidental from what belongs to something either in itself-1 or in itself-2. The apparently new lines suggest that what is incidental is to be distinguished only from what belong in itself-1 (i.e., what is predicated of something in what is), and now includes what belong to something in itself-2 (i.e., those incidentals that belong to something in itself—but are not predicated of it in what it is—as distinct from those that belong to it in another fashion). R. Tierney, “On the Senses of ‘Symbebekos’ in Aristotle,” in Oxford Studies in Ancient Philosophy vol. XXI (Oxford: Oxford University Press, 2001), 64. Tierney’s identification goes: per se - 2 (PoAn. I. 4) = incidental - per se (PoAn. I. 22) = inseparable incidental (Physics, I. 3). Of course, it should be distinguished from what is called ‘per se incidentals’ such as two right angles predication of triangle.
117 PoAn. I. 22, 83a 24-28
118 PoAn. I. 22, 83a18-23.
It turns out that the broader distinction is the *distinction among the categories*. That is, it is a distinction between what is said *in the category of* ‘*what it is*’ (ἐν τῷ τί ἐστιν) and what is said in the rest of the categories.\(^{119}\) It is plain that Aristotle means the same thing throughout these passages: ‘items which *do* signify *what something is*’ [22-b], ‘terms which mean *substances*’ [22-c], and ‘what is said in the category of *what it is*’ [22-d]. Aristotle proclaims above that this same thing is the domain of demonstration: *this is the way in which demonstrations demonstrate*. And if we look closely at the phrase in [22-c], “just what is that thing or just what is a particular sort of it (ὦπερ ἐκεῖνό ἡ ὦπερ ἐκεῖνό τι σημαίναι) in the context of the passage, it should not escape our attention that the “that thing” (ἐκεῖνο) denotes the underlying subject.

Let us recapitulate the domain that chapter 22 circumscribes for demonstrative knowledge. There is an *underlying subject*, and there are items that reveal the *substance* (οὐσία) of it in terms of—in virtue of—*what it is* (τί ἐστι). And the rest are *incidentals* that are only said of the underlying subject. This is exactly the same domain of the *Categories*: the onto-semantic analysis of the things in the world, or thing that are said to be. Apparently, the technical languages of the *Categories*—‘that are *said of a subject*’ vs. ‘that are *said in a subject*’—are changed into another technical languages of the *Posterior Analytics*—what is *in itself* (καθ’ σύμτο) and what is *incidental* (συμβεβηκότο), and ‘what is in itself’ is more finely grained into the two types (*per se*-1 and *per se*-2). Needless to say, the difference between the

\(^{119}\) We have dealt with this passage in the previous chapter. What can be added here is that the list of categories in this passage reflects the list of the *Topics* rather than *Categories*: “Now then, next after this we must distinguish the categories of predications in which the four (types of) predications mentioned are found. These are ten in number: what-it-is, quantity, quality, relation….It is clear at once that an (expression) signifying the what-it-is will sometimes signify a substance, sometimes a quantity, and sometimes one of the other categories.” R. Smith, *Aristotle* *Topics*: Books I and VIII (Oxford: Clarendon Press, 1997), 8. For the categories, see: M. Frede, “Categories in Aristotle,” in his *Essays in Ancient Philosophy* (Minneapolis: University of Minnesota Press, 1987), 29-48.
two treatises is that there is no spirit of demonstrative inquiry (searching for causes) in the domain of the *Categories*.

We started our survey of *Posterior Analytics* I. 22 in order to find out the exact domain of the broader distinction in chapter 4 between what is *in itself* and what is *incidental*, which will accordingly illuminate the sphere of the narrow distinction within the what is *in itself* (*per se*-1 and *per se*-2). To accomplish this purpose, let us review finally what is classified as the third type of ‘in itself’ (*per se*-3), which is conceived not as a mode of predication but a mode of being.\(^\text{120}\)

[4-d] Again, certain items are not said of some other underlying subject: e.g. whereas what is walking is something different [from] walking (and similarly for what is white), substances (\(\omega\upsilon\sigma\iota\alpha\)), i.e. whatever means this so-and-so (\(\tau\omicron\upsilon\delta\epsilon\ \tau\iota\)), are not just what they are in virtue of being something different. Well, *items which are not said of an underlying subject I call things in themselves*, and those which are said of an underlying subject I call incidental.

Commentators are baffled by the alleged ‘ontological use’ of ‘in itself’ (\(\kappa\alpha\theta\' \\alpha\upsilon\tau\omicron\'))—“items which are not said of an underlying subject I call things *in themselves*,” which is abruptly inserted during the logical discussion of *predication*.\(^\text{121}\) Thus, most commentators marginalize the third type of ‘in itself’ (*per se*-3) from the two centers of ‘in itself’ (*per se*-1 and *per se*-2) so that they consider *per se*-3 as irrelevant to the discussion of necessity—the topic of chapter 4—and the predications relevant to the ground of necessity, and accordingly, to demonstrative knowledge in general.

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\(^{120}\) *PoAn*. I. 4, 73b5-10

\(^{121}\) Barnes says that “It is sometimes said that Aristotle here leaves logic and turns to ontology; but this ‘ontological’ use of ‘in itself’ is founded on considerations of predication.” His concluding remark that “in the third use of ‘in itself’, S is or exists in itself if X is Y is never an unnatural predication,” is completely off the track of Aristotle’s intention. *Barnes, Aristotle: Posterior Analytics*, 114, 117.
However, we should not read the above passage [4-d] as a separate paragraph that classifies another type of ‘in itself’. Obviously, there is no indentation of the passage in the Greek text. That means that the path of Aristotle’s thought flows from the passage [4-c] that introduces the first two types of ‘in itself’ on to this passage [4-d]. If we read the two passages as a whole, it is not hard for us to see that Aristotle’s thinking matches exactly the thought of chapter 22. There is an underlying subject, and there are items that reveal the substance (οὐσία) of it in terms of the what it is (τὸ τί ἐστι), i.e., the two types of ‘in itself’. That is, Aristotle is creating in the passage [4-d] a reference point on which the two types of ‘in itself’, i.e., the elements of demonstrative knowledge, are based. In other words, he illuminates the center of demonstrative knowledge, the underlying subject that the above passage expresses also as ‘substance’ (οὐσία) and ‘whatever means this so-and-so’ (τὸ ἄλλο τί). We explained in our Chapter 1 that the notion of ‘underlying subject’ in the Posterior Analytics has no metaphysical connotation of matter; it is very close to the concept of the ‘bare perceptible entity’ that waits to be identified, and the identification of the underlying subject is always accompanied by a universal character, i.e., ‘x-being-F.’ That is why Aristotle uses the expression, ‘this (τὸ ἄλλο) so-and-so (τί)’ to denote once again the underlying subject.

Then, the whole meaning of the above passage is made clear: Saying (legein) of the underlying subject incidentals of the subject is saying something different, but saying of the underlying subject ‘what is in itself’ of the subject is not saying something different of the subject; “items which are not said of the underlying subject,”—the two types of ‘what is in itself’—“I call in themselves,” because they are not something different from the underlying

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122 Here, it clearly means primary substance as individuals, whereas the substance at the passages [4-c] and [22-c] means secondary substance of the Categories, i.e., the substance of x. Somewhat mixed uses of the term seem to be a sign of residues of Aristotle of the Categories.
subject. That is, the meaning of ‘in itself’ is highlighted by the contrast of identity and difference that an underlying subject have each with the items of ‘what is in itself’ and incidentals. Simply put, here is no introduction of the third type of ‘in itself’ (καθ’ αὐτό).

By the same token, we can maintain that there is no introduction of the so called fourth type of ‘in itself,’ which is described at 73b10-16 right after the so called third type. 

[4-e] Again, in another way what holds of something because of itself (δι’ αὑτό) holds of it in itself (καθ’ αὐτό), and what does not hold because of itself is incidental. … But what holds of because of itself holds in itself—e.g. if something died while being sacrificed, it died in the sacrifice since it died because of being sacrificed, and it was not incidental that it died while being sacrificed.

However awkward the examples are to the eyes of contemporary readers, Aristotle intends to show by these examples of the so called per se-4 that the two items (terms) in the two types of ‘in itself’—e.g. line and triangle, straight and line—are not only necessarily connected but also causally—‘because of itself (δι’ αὑτό)—conjoined with each other. This is clearly confirmed by Aristotle’s concluding remarks of the whole paragraph (73a34-73b24), which includes the description of the so called four different types of per se: 

[4-f] Thus in the case of what is understandable simpliciter, whatever is said to hold of things in themselves (καθ’ αὑτά) in the sense of inhering in what is predicated [per se-1] or of being inhered in [per se-2], holds of them both because of themselves (δι’ αὑτό) and from necessity (ἐξ αὐτηγῆς).

The reason why Aristotle mentions only the first two types of per se in these concluding remarks is not that the last two types are irrelevant to demonstrative knowledge, as most commentators

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123 PoAn. I. 4, 73b10-16
124 McKirahan says that “This passage sits awkwardly in its context. Unlike the other kinds of per se relation, this does not focus on subjects and attributes and their relations. The examples present pairs of events (the occurrence of lightning, some ones’ walking: x’s dying, the cutting of x’s throat).” His conclusion about per se-3 and per se 4 is that Aristotle identifies two more per se by finding different ways of using ‘accident’, and these are not central to the theory of demonstrative science. R. McKirahan, Principles and Proof, 95.
125 PoAn. I. 4, 73b16-18
conceive. But it is because that he did not even classify them. In this regard, Bolton seems to be a rare reader who does not interpret Aristotle’s discussion of the ‘because of’ predication as a distinct type of ‘in itself’ (per se): “Here Aristotle connects the necessity which obtains in the case of the essential connections in question with the fact that where there are these essential connections one thing belongs to another ‘because of itself.’” So the necessity attaching even to those cases of definitional or essential καθ’ αὐτό predication, which occur in scientific conclusions, seems to be importantly connected with the fact that such καθ’ αὐτό predication is an instance of δι’ αὐτά predication. What Aristotle means by the latter has already been introduced in 73b10-16\(^{126}\) Bolton’s recognition that καθ’ αὐτό predication is an instance of δι’ αὐτά predication can be put in a different way: ‘because of itself’ locution is a kind of device to link the ‘necessity’ requirement with the ‘explanation’ requirement of knowledge simpliciter.

At the start of our examination of the per se predications, we were suspicious of the supposition that the broad distinction between per se and incidental is a criterion of the legitimate predication relations between subjects and predicates that occur in demonstrative premises and conclusions. Even though it is not downright false, the reason that the supposition does not exactly capture the domain of demonstrative knowledge is the following: What one confronts at the outset of demonstrative concern is not premises or conclusions, but a state of affairs that need to be proved by the one demonstrating; ‘the moon is eclipsed,’ ‘those clouds make a loud (thunderous) sound,’ ‘this figure (drawn in sand) has interior angles equal to two right angles,’ ‘this figure (drawn in sand) is an equilateral triangle,’ or even ‘this side of the square is not commensurable with this diagonal.’ All these subjects in the state of affairs are underlying subjects (substrate), i.e., ‘this (τόδε) so-and-so (τι),’ which are affected by some

attributes (‘eclipsed’, ‘having two right angles’, etc.). Then, our Aristotelian demonstrator will ask, for example, “Does this figure have in itself or incidentally interior angles equal to two right angles?” If it looks most likely\textsuperscript{127} that the figure has the property in itself, then he will search for or hunt out (θηρηεύειν)\textsuperscript{128} the reason or explanation (ἀιτία), because of which attributes holds of the underlying subject. Surely, this state of affairs will become the conclusion of demonstrative proof, after the demonstrator successfully finds the cause in the items of what-it-is (ἐν τῷ τί ἐστὶν) and as soon as he constructs a demonstrative syllogism.

Our argumentative point against axiomatic deductive interpreters is that they do not bring into the scope of their view on demonstrative knowledge the very activities involved in demonstration, such as seeking and revealing the reason and explanation. These actions are plainly performed within the domain of demonstration. Demonstration, as Aristotle depicts it in a domain capable of demonstration, does not just reside in deducing conclusions from axioms and premises, in whatever way they have been procured. Rather Aristotle’s main concern here in chapter 4 is to show what kind of cause and explanation should be sought for something’s being the case (substrate-being affected by-attribute)\textsuperscript{129} in terms of the three types of predications (‘in every case’, ‘in itself’, ‘as itself’), and further, his discussions of these predications are anchored by the ‘universal’ (καθόλου) demonstration treated in the last part of the chapter 4 and

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\textsuperscript{127} Here resides the Meno’s paradox, which we will discuss in our next two chapters.

\textsuperscript{128} PoAn. II. 13, 96a20-2: “I have said earlier how what something is can be elucidated in the terms of a deduction….Let us now say how we should hunt out (θηρηεύειν) the items predicated in what something is (τά ἐν τῷ τί ἐστὶν καττηγορούμενα).”

\textsuperscript{129} See Aristotle’s way for expressing ‘substrate-being affected by-attribute’ in terms of ‘cause’ at PoAn. II. 17, 99a: “An explanation (τῷ ἀιτίῳ), the feature of which it is explanatory (ὀ ἀιτίον), [attributes] and item for which it is explanatory (ο ἀιτίον) [substrate], are interrelated in the following way.”
throughout the chapter 5. Now then, we need to consider whether the universal demonstration has this feature of active inquiry over the domain that we have examined so far.¹³⁰

[5-a] So when do you not know *universally* (καθόλου), and (καί) when do you know *simpliciter*? Well, plainly [you would know *simpliciter*]¹³¹ if it were the same thing to be a triangle and to be equilateral (either for each or for all) (ἡ ἔκοστω γὰρ πᾶσιν) But if it is not the same but different, and if something holds of them as triangles, then you do not know it. [5-b] Does it hold of them as triangles or as isosceles? [5-b*] And when does it hold of something [in itself and] *primitively* (πρῶτον)? And what does the demonstration apply universally? Plainly, to the first item (πρῶτον) after removal (ἀφαίρομενόν) of which it does not hold. E.g. two right angles will hold of bronze isosceles triangles—and also when being bronze and being isosceles have been removed. But not when figure or limit have been. But they are not the first. Then what is first? If triangle, it is in virtue of this that it holds of the other items, and it is to this that demonstration applies universally.

This passage is the conclusion of the whole chapter 5 of Book I, the main purpose of which is to describe and exemplify the three sources or ways in which someone makes the *error* of thinking that he makes a ‘universal’ proof, although his proof does not actually meet the qualification of the ‘primitive’ requirement. We have already mentioned the two requirements of ‘universal’ proof: If a proof that $F$ holds of $x$ is to count as a proof that $F$ holds *universally* of $x$: (1) $F$ must be proved for an arbitrary ($	auυχόν$) $x$; (2) $x$ must be a primitive ($πρῶτος$) subject of $F$.

The above passage has two separate arguments that are internally connected with each other so that it is not easy to determine where the second argument begins—[5-b] or [5-b*]. Wherever it ends, the first argument must be related with the first *source* of error — “when there is nothing higher (ἀνωτέρου) we can take apart from the particular case (παρὰ τὸ καθ’ ἔκοστον)”¹³²—and the second *example* of error—“Again, if there were no triangles other than

¹³⁰ PoAn. I. 5, 74a32-74b4. Another important text for ‘universal proof’ is PoAn. II. 13, 96a20-96b14 and II. 17, 99a33-35.
¹³¹ Notice that this bracket is Barnes’ addition in his translation.
¹³² PoAn. I. 5, 74a7-8
isosceles, then having two right angles would be thought to hold of them as (ὡς) isosceles.” The reason for such a reading is that the second example and the protasis of the second line of the above passage [5-a] refer to very similar counterfactual situations. Another reason can be found in the same vocabulary present in the first source and the third line of [5-a], ‘particular’ (ἐκατόν). Then, the first argument should be interpreted in the context of Aristotle’s claim that even in the counterfactual situation in which there were no triangles other than isosceles, it is an error to think that two right angles (2R) belongs to isosceles as (qua) isosceles, since someone fails to take apart (grasp, λοξίζειν) ‘something higher’ (triangle) from the ‘particular’ cases (each isosceles). Aristotle’s claim here has two important philosophical implications. First, the ‘primitive-universal’ sought after in ‘universal’ demonstration is not an extensional notion that is commensurate with its ‘each and all’ instances; for in the counterfactual situation the extension of ‘2R’ would be commensurate with the extension of ‘isosceles’.

Second, we need to direct our attention to the objective aspect of ‘primitive-universal,’ which is sharply contrasted with subjective fallibility about the ‘primitive-universal.’ In the counterfactual situation that each and all triangles are isosceles, it would be extremely difficult to come up with a higher concept, ‘triangle.’ Aristotle’s extreme demand for some objective ‘primitive-universal’ represents his metaphysical realism in the sense that the objective ‘primitive-universal’ can sometimes be located beyond the subjective epistemological boundary of our thoughts on it.

133 PoAn. 1. 5, 74a16-17.
134 Thus to construe ‘primitive universal’ extensionally as ‘commensurate universal’ is a serious misunderstanding. The same point is made by the fourth example.
135 It would be interesting to compare the counterfactual situation in which triangles are isosceles with the Popperian falsification situation in which all observed swans are white. Probably one falsifying instance of a triangle that is not an isosceles would lead us to find the universal more primitive than the one that we thought was universal. We will further consider the problem of demonstrative fallibility in the next chapter.
If we understand the first argument at [5-a] in the context articulated above, the main thrust of the argument is almost the same, though some tricky interpretive details require a revision of the translation. The two questions at the beginning, one negative and the other positive, do not seem to be separate questions, if we read the ‘and’ (καί) epexegetically so that it means: ‘When do you not know universally, that is, when do you merely know (ὅτι δὲν υἱὸς ζητὼν)’? Then, the two following conditional statements should be read as: In the counterfactual situation that being triangle and being equilateral are the same, someone might think that he knows universally, but he merely knows (being in the state of error), and in the actual situation that being triangle and being equilateral is different, he does not know universally when he think that 2R holds of x as being equilateral.

The second argument sets out by asking a question that somewhat veils the domain, which will be presented shortly, since this question seems to presuppose the setting of the first argument: “Does it hold of them as triangles or as isosceles?” But by the second question of asking when it (attribute: 2R) holds of something primitively, which implies a certain movement of thoughts (in a demonstrative inquiry), we can observe that the setting is switched into the domain of seeking the ‘primitive-universal,’ which will explain the fact of ‘x-being-2R’. And in the domain lies a substrate (x) which is a certain figure en-mattered in bronze. There must be some interval between the second and the third question, during which intensive searching for the items ‘in what it (x) is’ (ἐν τῷ τί ἐστιν) is going on, with the result that the items in ‘what it

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136 The possibility of this reading is rightly suggested but soon rejected by M. Gifford. The rational for his rejection is based on his distinction between ‘universal’ knowledge and ‘primitive’ knowledge, and the former is conceived as an extensional notion in the sense of ‘commensurate universal’. But there is no such distinction in Aristotle’s remarks. M. Gifford, “Lexical Anomalies in the Posterior Analytics, Part I,” Oxford Studies in Ancient Philosophy XIX (Oxford: Oxford University Press, 2000), 214-220. See also Apostle’s translation who omits the negative particle in the first question. H. Apostle, Aristotle’s Posterior Analytics, 9-10.
is’ and also some (incidentals) are put forward in an orderly way as follows: limit-figure-triangle-isosceles-(bronze). Then the third question is asked: to what (among these items) does the demonstration apply universally (i.e., primitively)? Aristotle answers that “plainly, to the first item (πρώτῳ), after removal (αφαίρουμένων) of which it (2R) does not hold.” It is remarkable here that Aristotle’s method of reaching the ‘primitive-universal’ is a kind of abstraction. Therefore, when ‘bronze’ and ‘isosceles’ are abstracted, but not when ‘limit’ and ‘figure’ are abstracted, we find the ‘primitive-universal’ that explains the fact of ‘x-being-2R’, ‘triangle’: x is 2R as (qua) a ‘triangle’. Now if we construct a demonstrative proof, the ‘triangle’ as the primitive-universal serves as the middle (medium demonstrationis in medieval terminology) in the sense that x is 2R because of its-being-triangle.

What becomes apparent from our review of ‘universal’ demonstration in chapters 4-5 is that demonstrative inquiry aims ultimately at a ‘possibly maximal universal cause,’ which was already enunciated and illuminated by the six conditions of principles in chapter 2. But a prominent difference we find in the discussion is that the inquiry toward the ‘possibly maximal universal cause’ is executed by the crucial device of ‘items in the what-it-is’ (ἐν τῷ τί ἐστιν). This locution is, as we will articulate, the decisive factor for distinguishing two types of ‘in itself’.

The rest of this section will be a close examination of ‘items in the what-it-is’, specifically the two types of ‘in itself’ and their relationship with the ‘what is in itself incidental’, normally known as ‘per se incidental’. In the course of this examination, the final presupposition of the axiomatic deductive interpretation will be addressed. We go back to the distinction between per se-1 and per se-2.
[4-c] One thing holds of an item in itself (καθ’ ἀυτὰ) both [(i) per se-1:] if it holds of it in what it is (ὑπάρχει τε ἐν τῷ τί ἐστὶν)... (for their essence (substance) (οὐσία) comes from these items, which inhere in the account which says what they are)—and also [(ii) per se-2:] if what it holds of itself inhere in the account which makes clear what it is (ἐν τῷ λόγῳ ἐνυπάρχουσι τῷ τί ἐστι δηλοῦντι).

Before we start to articulate these two types of per se predication, we should keep in mind that the reference points of these predications are an underlying subject (substrate) and its attribute, i.e., what are at stake in a demonstrative inquiry. If we forget the domain of these predications that we have taken pains to reveal up to this point, the predications may be easily thought to be two different logical relations between two universal terms.137

The most neutral formalization of the two types of per se would be:

[Per se-1] A holds of B per se = A holds of B and A inhere in ‘the what it is’ of B.
[Per se-2] A holds of B per se = A holds of B and B inhere in ‘the what it is’ of A.

Undoubtedly, the key to understanding the two types of per se hangs on how to figure out the locution, ‘the what-it-is’ (to ti esti). The most widely accepted conception of it is to regard it as definition. Accordingly, the two types of per se can be given a little clearer intention as follows:138

[Per se-1] A holds of B per se = A holds of B and A inhere in the ‘definition’ of B.
[Per se-2] A holds of B per se = A holds of B and B inhere in the ‘definition’ of A.

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137 When Tierney investigates per se predications, he makes a similar point, but it is not clear on what ground he makes his argument: “Since a demonstrative science is largely concerned with kinds of substances, rather than with individual substances, as such, it is easy to suppose that in drawing his essentialist distinctions within this context, Aristotle intends that those distinctions should apply primarily to kinds. This appears to be a supposition that commentators have indeed been prone to make, but one that has seriously interfered with our understanding of Aristotle’s essentialist distinctions. For those distinctions, I would argue, are intended to apply primarily to individual substances, and only secondarily and derivatively to kinds of substances.” R. Tierney, “The Scope of Aristotle’s Essentialism in the Posterior Analytics,” 3. Contrastingly, see the comments by Sorabji: “When Aristotle talks of predicates attaching necessarily to their subject, provided they attach definitionally, it is natural to suppose that the subjects he has in mind are kinds like triangle or man, not the members of a kind. For only kinds have definition; individuals do not.” R. Sorabji, “Analytic or de re,” 189-190.

138 J. Barnes, Aristotle: Posterior Analytics, 112.
A more classic rendition of it is to add a metaphysical connotation to the locution.139

An attribute belongs *per se*-1 to a subject, if the attribute is an element of the essence of the subject.

An attribute belongs per se-2 to a subject, if the subject is a part of definition of the attribute.

Notice that in this rendition, the preposition ‘in’ is transformed into ‘an element’ or ‘a part.’

Almost all commentators in their interpretations of *per se* predication regard ‘the what-it-is’ locution as ‘definition’ or ‘essence’, and in most cases as meaning the both. Here are the typical examples of this reading:

The general thrust of A.4 is clear enough. Aristotle starts from the fact that the object of understanding—and hence of demonstrative understanding—are necessary; and he asks, in effect, what is the ground of their necessity. He answers that the necessity is ultimately grounded in essential or definitional connections.140

Aristotle discusses statements giving the essences of kinds in *An. Post.* I 4-6…. He lays down a very strict requirement for a predicate attaching *necessarily* to a subject: it must belong to the subject in itself (*kath’ hauto*). This means that subject and predicate must be definitionally connected in one or other of two ways. For subject and predicate are said to have an ‘in itself’ relation, if either belongs in the definition which says what the other is (*ti esti*).141

His (Aristotle’s) general position is that the necessity of the principles or first premises of demonstrative science is definitionally based, in an Aristotelian sense. That is, the first principles are necessary because they express or capture, in the one way or the other, essential connection, or features of the essences of the things they concern.142

Such a predominant interpretation is certainly based on the belief that for Aristotle definition is a statement or account (*logos*) of ‘the what-it-is’ (*to ti esti*),143 and that ‘the what-it-is’ is a concept that has almost identical intention with ‘essence’ (*to ti ēn einai*). As a matter of fact, Aristotle mentions the two terms in the above passage: “essence (substance) (*ōūd'ōa*) comes from these

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140 J. Barnes, *Aristotle: Posterior Analytics*, 120.
141 R. Sorabji, “Analytic or de re?” 188.
143 *PoAn.* II. 10, 93b29: “Since a definition is said to be an account of what something is…” *Topics*, I. 5, 101b38: “A definition is an account that signifies the essence.”
items, which inhere in the account which says what they are,” and “the account which makes clear what it is (ἐν τῷ λόγῳ ἐνυπάρχουσι τῷ τί ἐστι δηλοῦντι).” However, the rendition of ‘the what-it-is’ either as definition or as essence has serious interpretive shortcomings.

First, let us examine a difficulty that arises, when we render ‘the what-it-is’ as definition. In the case of per se-1, if A is predicated of B, A is a part of—in—the definition of B. Then, since the ‘what-it-is’ is definition and that definition is composed of ‘genus’ and ‘differentia’ as it is depicted at the Topics,\textsuperscript{144} differentia should be included in the per se-1 predications. For example, if we suppose that the definition of man is two footed land animal, ‘two-footed’ should be a per se-1 predication of the subject, ‘man’. But clearly this is not the case for the system of Aristotle’s per se predications, since differentia is conceived by Aristotle as a case of per se-2 predications. We will get back to this point in a while.

Second, if we render ‘the what-it-is’ as essence, and want to hold the conception of the clear-cut distinction, ‘essential vs. accidental (incidental)’, the picture of Aristotelian essentialism is distorted immediately at least in the discussion of per se predication. In the case of per se-1, if A is predicated of subject B, A is a part (element) of essences of B, and thus we may say that A is essentially predicated of B. But in the case of per se-2 predication, if A is predicated of subject B, can we say that A is essentially predicated of B, by the fact that the definition of predicate A includes the subject B? For example, can we say that predicate ‘curved’ is essentially predicated of subject ‘line’? We cannot, because for Aristotle the scope of the term ‘essential’ is vague between the two drawn lines, one of which excludes, and the other of which

\textsuperscript{144} Topics, VI. 4, 141b26,
includes what is ‘per se but incidentals’. 145 The ambivalent attitude of Aristotle towards ‘per se but incidental’ can be witnessed in the passages of the same chapter 22 that we already reviewed. When Aristotle says in the passage [22-b], “items which do not signify what something is (ὅσα μὴ τί ἐστι)—items that are not per se— are not predicated of themselves. For these are all incidental (συμβεβηκότα) (though some hold of things in themselves (καθ’αὐτά)—per se but incidental—and some in another way),” he evidently excludes ‘per se but incidental’ from the scope of ‘what is essential’, i.e., items (terms) which mean substances or items which signify essences (τὰ σωσίαν σημαίνοντα). On the other hand, he includes in the same chapter the ‘per se-2’ within the scope of what demonstration deals with: [22-a] “Demonstration applies to what holds of the objects in themselves—in themselves (καθ’αὐτά) in two ways: both the items [per se-1] which holds of the objects and inhere in what they are (ἐν τῷ τί ἐστιν), and also the items [per se-2] for which the objects of which they hold inhere in what they are.” Accordingly, if we say that Aristotelian demonstration deals with ‘what is essential’, the scope of ‘what is essential’ should embrace ‘what is per se but incidental’ i.e., per se-2. Contrastingly, when we say normally that Aristotelian essentialism consists in the distinction of ‘essential vs. incidental’, the distinction should be understood as the one between ‘what is not-incidental’ and ‘what is incidental.’ All this implies that we should be very cautious to render ‘the what-it-is’ directly as essence.

145 We use this locution ‘per se but incidental’ instead of ‘per se incidental’ in order that we can limit the use of ‘per se but incidental’ to the case of chapter 22. But soon it will be shown that for Aristotle both means the same thing.
At this point, someone might doubt our identification of the ‘per se-2’ at chapter 4 with the ‘per se but incidental’ at chapter 22. To relieve their doubt, we need only to quote the following passage: 146

An incidental is either that which may or may not belong to the subject, or that in whose account (ἐν τῷ λόγῳ) the subject of which it is an incidental is involved. Thus sitting is an example of a separable incidental, while snubness contains the account of nose, to which we attribute snubness.

For Aristotle, ‘snubness’ is a stock example of a per se-2 predicate, as much as male/female and straight/curbed are per se-2 predications respectively of ‘animal’ and ‘line’, because the subject, ‘nose’ has to occur in the account of snub. And here it is definitely said to be one kind of incidentals (per se but incidental). 147

Now then, if we have to distance ourselves from rendering ‘the what-it-is’ either as definition or as essence, how should we comprehend the locution that is at the center of per se predication, and simultaneously at the ground of Aristotelian demonstrative necessity? In a series of studies on per se predications in which he approaches the subject from different angles, 148 Tierney insists consistently that ‘the what-it-is’ should be considered as a metaphysical primitive: “What the ti esti of a substance is, is not defined in terms of any other concepts and, in particular, it is not defined in terms of the definition of a thing (in fact, the reverse is the case), nor in terms of what belongs to a thing necessarily (although various aspects of a thing will belong to it necessarily in virtue of belonging to a thing to it in its ti esti).” Truly, ‘the what-it-is’ locution is at the foundation of Aristotle’s metaphysics and the theory of demonstrative

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146 Physics, I. 3, 186b18-23
147 See also, Metaphysics, Z. 5, 1030b15-27.
knowledge. Therefore, we will be better off leaving τί ἐστι as ‘what-it-is’ instead of rendering it by other concepts.

However fundamental and undefined it may be, though, *ti esti* holds the original meaning of ‘item that answers for ‘What is it?’ question. For Aristotle, the ‘what is *x*?’ question, unlike any other ordinary questions, is the one charged with a philosophical implication that the answer should reveal the *x*’s being-ness (*ousia*). When he deals with genus and species in the *Categories*, he claims: \(^{149}\)

For only they [genus and species], of things predicated, will reveal the primary substance. For if one is to say of the individual man what he is (τί ἐστιν), it will be in place [appropriate] to give the species or the genus …; but to give any of the other things would be out of place—for example, to say ‘white’ or ‘runs’ or anything like that. So it is reasonable that these should be the only other things called substance (οὐσία).

The reason that genus and species can be called as ‘substance’ (*ousia*) is that ‘animal’ and ‘man’ serve to answer the ‘what is *it*?’ question, when ‘*it*’ points out an individual man, whereas ‘white’ and ‘runs’ fail to answer the ‘what is *it*?’ question. The relationship between the ‘what is *x*?’ question and *ousia* is so close that in the *Topics*, Aristotle names the first category as ‘what-it-is’:

“These are ten in numbers: what-it-is, quantity, quality, relation, time, position, possession, doing, undergoing.” \(^{150}\) And, shortly after that, he extends the applicability of the ‘what is *x*?’ question to all categories: “It is clear at once that an <expression> signifying the what-it-is will sometimes signify a substance, sometimes a quantity, sometimes quality, and sometimes one of the other categories.” \(^{151}\)

There is a subtle difference between the two occurrences of ‘the what-it-is’ in the *Topics* that we cannot clarify except to say that, while the former are related with (ontological) classification of ‘things’, the latter bears on the semantic identification of things

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149 *Categories*, 2b29-37.
150 *Topics*, I. 9, 103b23-24
151 *Topics*, I. 9, 103b27-29. Cf. 140a34, b5, 146b3.
that are said. We will not go into, at this moment, the intricate matter of how Aristotle comes up with the list of categories, particularly in terms of the two possible ways that Ackrill elucidates, where the ‘what is x?’ question is a key factor despite “its terminological instability.” But what is clear is that when Aristotle tries to explicate the two types of \textit{per se} predication by means of the locution ‘the what-it-is’, the background of the locution presupposes the onto-semantic analysis of the \textit{Categories} and \textit{Topics}. With this in mind, let us investigate the first and second type of \textit{per se}.

For clarification of \textit{per se} -1, we need first to pay attention to the parenthetical remarks that follows immediately upon Aristotle’s explication and examples of the \textit{per se}-1: “their substance (\textit{ousia}) comes from (\textit{ek}) these items, which inhere in the account which says what they are (\textit{en t\o\ logos t\o\ le\gyonti ti estin evypar\chi\v}i).” The remarks without doubt refer back to the passage of the \textit{Categories} quoted above: “only they [genus and species], of things predicated—among the answers to the question of ‘what is it?’ (\textit{ti esti})—reveal the primary substance”, so that these should be the only other things called substance (\textit{ousi\a}). It means that the ‘\textit{ousia} of \textit{x} comes from or is composed of ‘genus and species of \textit{x}, since genus and species constitute logos which say ‘what \textit{x} is’; genus and species of \textit{x} is in the ‘\textit{ti esti}’ of \textit{x}. It is evident that Aristotle envisages the ordered items in the series of genus and species, when he explicates the \textit{per se}-1.

According to one of the onto-semantic rules of the \textit{Categories}, individual substance (Socrates) and secondary substances (species/man, genus/animal) are featured by the ‘\textit{said of}’ relation, which some scholars call ‘strong predication’\textsuperscript{153} in contrast to ‘inhere in’ relation. And

\textsuperscript{152} See: M. Ferejohn, \textit{The Origins of Aristotelian Science}, 75-9: 89. \textsuperscript{153} T. Irwin, \textit{Aristotle’s First Principles}, 52-66.
the most salient characteristic of the ‘said of’ relation is that items in the ‘said of’ relation are transitive: “if something is said of a subject both its name and its definition are necessarily predicated of the subject. For example, man is said of a subject, the individual man, and the name is of course predicated…, and also the definition of man will be predicated of the individual man.”

The transitive relation that holds in the items of per se-1 is presented syllogistically in the Posterior Analytics: “Now if A holds of every B in what it is, and B is said universally of every C in what it is, then necessarily A is said of C in what it is.” Truly, the transitivity of the ‘said of’ relation is the very foundation of necessity of demonstrative knowledge. If we view the transitivity rule together with the thesis of the Topics that the items in the other categories also have a ‘ti esti’, the examples of per se-1 can be illuminated: triangle-figure-line-limit are ordered items of a species-genus series as much as Socrates-man-animal-living body-body are ordered items in the series.

Concerning the per se-2, let us start with our observation that the parenthetical remarks by Aristotle are limited to the per se-1. That is, the ousia of something is composed only of items in the per se-1 predications. If items in the per se-2 do not constitute the ousia of something, it is a big question how per se-2 predications enter into the transitive relation of per se-1 predication. Unlike per se-1 that is relatively easy to explain, commentators are perplexed in the case of per se-2: (1) What is the nature and extent of per se-2 predications? (2) Where

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154 Categories, 2a19-24
155 PoAn. II. 4, 91a18-21.
156 For statement of the puzzlement, see among many studies: Barnes, Aristotle: Posterior Analytics, 113-114, 120-122. R. MacKirahn, Principles and Proofs, 87-93, 164-171.
does the necessity of per se-2 predication reside? (3) How does per se-2 predication function in a demonstrative syllogism?

Regarding the nature and extent of the per se-2, we set out to inspect the linguistic form of the examples of per se-2 predication: straight/curved to line, even/odd to number, prime/composite to number, equilateral/oblong to square. All these mathematical terms of the per se-2 are adjectives, that is, these are adjectival attributes of nominal subjects. This point is visibly contrasted with the fact that per se-1 items are all nominal forms. We should recall the onto-semantics of the Categories, where Aristotle characterizes ‘substances’ including individual and secondary substance in the four ways, the two positive, the two negative*: (a) every substance seems to signify a certain ‘this’; (b) it seems most distinctive of substance that what is numerically one and the same is able to receive contraries; (c)* another characteristic of substances is that there is nothing contrary to them; (d)* substance, it seems, does not admit of a more or less.\textsuperscript{157} All these characteristics of substances are a result of Aristotle’s careful observation on the difference of linguistic forms between (countable: certain this) nominal substances and (non-countable: contrary, more or less) adjectival attributes. Then, we are able to assert that at the background of the distinction between strong ‘said of’ predication and ‘inhering in’ predication rests the linguistic observation of nominative versus adjectival usage.

Nonetheless, there is an item in the onto-semantics of the Categories that allows the relation of strong predication, even though it does not reveal or belong to ousia:\textsuperscript{158}

This is not, however, peculiar to substance; the differentia (διαφορά) also is not in a subject. For footed and two-footed are said of a man as subject but are not in a subject; neither two-footed nor footed is in man. Moreover, the definition (λόγος) of the

\textsuperscript{157} \textit{Categories}, 3b10-3a21
\textsuperscript{158} \textit{Categories}, 3a21-28.
differentia is predicated of that of which the differentia is said. For example, if footed is said of man the definition of footed will also be predicated of man; for man is footed.

Here are the anomalous differentiae in the onto-semantics of the Categories.\textsuperscript{159} The strict distinction between nominal subjects and adjectival attributes collapses in the case of differentia, since differentia of a substance is strongly predicated of the substance. Yet, if someone answers a differentia, e.g. “this man is two-footed” for the question of “What is it?” this answer must fail the question, strictly speaking. In the Topics, Aristotle claims that “a thing’s differentiae never signifies what it is (τι ἐστι), but rather some quality (ποιόν τι) as do walking and biped.”\textsuperscript{160} This would lead us to think that the differentia is a kind of quality, but Aristotle does not agree with this view. Despite its nearness to quality and its adjectival form, Aristotle distinguishes differentia from other mere adjectival characteristics, because differentia can be reduced into accounts of species: “If we just say ‘Man is a biped’, it is natural to ask ‘Biped what?’”\textsuperscript{161} Then the second answer would be “biped animal,” that is, species ‘man’ so that to predicate differentia is to some extent to predicate the species, by mentioning something else about it.\textsuperscript{162} This view suggests that the ordered items of a species-genus series of per se-1 have an implicit reference to differentiae in each successive node.

Returning to the examples of per se-2, it is a very important point that these adjectival attributes can receive the same linguistic surgery as differentiae above: ‘straight what?’; ‘even what?’; ‘prime what?’; ‘equilateral what?’ Then we have to mention their ‘host-genus’:\textsuperscript{163} ‘line’.

\textsuperscript{159} For an excellent analysis of the anomaly of differentia, refer: T. Irwin, Aristotle’s First Principles, 64-66. See also, A. Bäck, Aristotle’s Theory of Predication (Leiden: Brill, 2000), 151-158.

\textsuperscript{160} Topics, IV. 2, 122b16-17, cf. 128a20-29, 139a28-31, 142b25-29.

\textsuperscript{161} T. Irwin, Aristotle’s First Principles, 65.

\textsuperscript{162} The testimony that Porphyry calls differentia ‘quale quid’, a hybrid of substance and quality is closely related with this feature. On this, see: A. Bäck, Aristotle’s Theory of Predication, 152.

\textsuperscript{163} The term, ‘host-kind’ is used by Tierney, but his understanding of the per se-2, especially its relation with differentia is on the wrong footing because he thinks that differentia is included in the per se-1 items. R. Tierney,
‘number’, and ‘figure’. The defining characteristic of per se-2—that it has its subject ‘in its account which shows what it is’—seems to be no other expression than the above linguistic or logical feature of per se-2. From the similarity of the linguistic and logical feature of per se-2 predication with differentia, we may assert that per se-2 predications are—at least include—differentiae.164 Or, more cautiously, we assert that Aristotle’s idea of per se-2 predications originated from his ongoing thoughts about differentia in the Categories and Topics. Let us recapitulate our arguments about the nature and extent of the per se-2 predications: first, per se-2 is one of the incidentals (per se but incidental), inasmuch as it does not reveal the ousia of a subject x, that is, it does not belong to the what-it-is of x; second, the defining characteristic of per se-2 predication is related to the linguistic-logical characteristic of differentia; third, per se-2 predication at least includes differentia.165 This recapitulation, however, does not circumscribe the entire boundary of the per se-2 predications, the discussion of which we have to postpone for a while.

About the necessity of per se-2 predication, scholarly opinions diverge by claiming either, one the one hand, that the necessity is of logical entailment between two terms,166 or on the other hand, that the necessity is between disjunctive terms belonging to their genus: ‘odd necessarily entails number’, or ‘number is necessarily odd or even’. The latter opinion is based

164 Ferejohn supports this view. His explication of two types of per se predications seems on the right track, especially in the respect that he does not appeal to ‘definition’ in his discussion of the per se-1 concept. But he does not pursue his reading into the role of per se predications in demonstrative knowledge. Furthermore his interpretation of per se-4 with per se incidental is a misunderstanding. M. Ferejohn, The Origins of Aristotelian Science, 75-99.

165 Granger argues a similar point, although his obsession with the disjunctive feature of per se-2 seems to blur his argument. H. Granger, “Differentia and Per Se Accident in Aristotle,” Archiv für Geschichte der Philosophie 83, no. 2 (1981): 118-129.

166 McKirahan understands this way: “It is worth stressing that the directions of necessity are opposite: if A belongs per se 1 to B and A is predicated of B, then all B’s are necessarily A. If A belongs per se 2 to B and A is predicated of B, then all A’s are necessarily B. R. McKirahan, Principles and Proofs, 90-91.
on Aristotle’s remarks in which he seems to restate the second type of per se in terms of necessity: \(^{167}\) “For it is not possible for them not to hold, either simpliciter or as regards the opposite—e.g. straight or curved of line, and odd or even of number. For a contrary or privation is a contradictory in the same kind.” There is a huge misunderstanding surrounding these remarks and also on the subject of the necessity of per se-2 predication as well. Neither of the scholarly opinions on per se-2 stated above catches Aristotle’s real intention.

In the characterization of per se-2 that the predicate has its subject ‘in its account which shows what it is’, the ‘it’ is not just an attribute but an attributed thing. Recall our linguistic-logical analysis of differentia whereby for Aristotle, the differentia is not just an attribute, but an attributed something—odd something (what), quale quid in its medieval term. A serious confusion on the part of interpreters in the case of per se-2 attribution is that it is a predication between subject (genus) and predicate (differentia)—e.g., ‘line is straight’. Actually, there are three semantic components in the per se-2 relation: the attributed thing, the subject of the attribute, and the host-genus. Tierney seems to capture this point in the following: “And note, further, that the host-kind is not the genus of the attribute…, but of the subject to which the attribute belongs.”\(^{168}\) Among the three semantic components, the subject of the attributed thing is not visibly exhibited in Aristotle’s description of per se-2 relation. This is the reason why Ferejohn states as follows: \(^{169}\)

\(^{167}\) PoAn. I. 4, 73b18-24: “For it is not possible for them not to hold, either simpliciter or as regards the opposite—e.g. straight or curved of line, and odd or even of number. For a contrary or privation is a contradictory in the same kind.”

\(^{168}\) A better statement of his point is: “It is not that the subject, to which an attribute belongs, can be just any item in what it (the attribute) is, in order for the attribute to be said to belong to its subject in itself-2. It is that the genus to which the attribute’s subject belongs—i.e., the host-kind—must be specified when giving an account of what the attribute is.” R. Tierney, “The Scope of Aristotle’s Essentialism in the Posterior Analytics,” 11.

Admittedly, this passage [73a38-b4] does not contain anything more about the relation between *differentia* and *differentiated species*—indeed, discussion of that matter is put off until the *Metaphysics*—but it does at least go some way toward specifying the relation between a *differentia and the genus* whose species it differentiates [italics mine].

Ferejohn could have recognized the truth about *per se*-2, but he didn’t. Seemingly, Aristotle’s description of the *per se*-2 is about the relation between differentia and genus. But *per se*-2 is a relation between differentia and differentiated species; ‘man’ is in itself (*per se*-2) ‘biped’, and thus ‘man’ is necessarily ‘biped’, since in the account (what-it-is) of ‘biped’, man’s host-genus, ‘animal’ inheres.

It is ill-fated that Aristotle himself blurs his intention that *per se*-2 predication is between differentia and differential species by his choice of examples. As a matter of fact, in the examples of ‘straight’ or ‘even’, the subject of the attributed thing is disguised in the ‘straight line’ or ‘even number’ so that the *per se* relation becomes trivial such as ‘straight line is straight’ or ‘even number is even’.170 Whereas, in the case of ‘snubness’, another stock example of *per se*-2, the three components become apparent:171

> there is nose, and concavity, and snubness, which is compounded out of the two by the presence of the one in the other, and it is not by accident that the nose has the attribute either of concavity or of snubness, but in virtue of its nature.

Despite the interpretive difficulty of this passage, including the complexity of the following paragraph in terms of the possibility of definition of compounded terms, what is obvious is that ‘snubness’ is the subject of the attribute, ‘concavity’, whose account of what-it-is (what concavity is) involves the host-genus, ‘nose’.

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170 Aristotle seems to realize the aspect of obscurity of this case in the *Metaphysics* Z. 5,10315-10: And if this is true, coupled terms also, like ‘odd number’, will not be definable (but this escapes our notice because our formulae are not accurate).”

In any case, if we do not grasp the point that *per se*-2 predication and its necessity lie in the relation of attribute and its subject (not host-genus), we will be left with the many complaints of commentators that they cannot figure out how the second type of *per se* predication could occur in demonstrative syllogism. Now we will try to answer the third question, the role or function of *per se*-2 predication in demonstrative proof. McKirahan, once apprised of the fact that the *per se*-2 relation is unexpectedly important in the structure of sciences, straightforwardly denies the role of the *per se*-2 predication in the usual ‘subject-attribute’ demonstrative proof. He acknowledges the transitivity of *per se*-2 predication, since he thinks of the necessity of the predication in a way in which ‘odd entails necessarily number’. But he asserts:

An example of this sort of argument is this: odd belongs per se 2 to number, number belongs per se 2 to multitude, so odd belongs per se 2 to multitude…This process of moving to wider and wider subjects yields universal affirmative relations characteristic of *per se* 2…but it is hard to believe such arguments will have much theoretical interest.

This view is evidently based on the mistaken reading that the differentia is a *per se*-2 predicate of the *genus*. Yet, Aristotle says in the *Categories* that a differentia’s name and its account are strongly predicated of its subject *species*. This means that differentia can be inserted into the transitive relation of species and genus, and thus into the net of demonstrative of knowledge.

We note, conclusively, man is *in itself* [*per se*-1] animal, and man is *in itself* [*per se*-2] two-footed. These two types of ‘in itself’ are the ground of necessity of demonstrative knowledge.

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172 Inwood directly denies the role of *per se*-2 predication in demonstrative proofs: “but type 2 is of little scientific interest and an example of it is hard to find in the *Analytics*.” B. Inwood, “A Note on Commensurate Universals in the *Posterior Analytics*,” *Phronesis* 24 (1979): 326.


174 For example: ‘man is rational, being rational is being two footed (land animal), therefore man is two footed (land animal)’.
At this point, we ask: Is the necessity of two types of ‘in itself’ predication analytic? Or putting it more modestly: Is ‘in itself’ predication conceptually true? To some interpreters of Aristotle’s theory of science, it seems so.\(^\text{175}\)

But even with the class of scientific propositions enlarged to include both types 1 and 2 per se predication, that still leaves the subject matter of Aristotelian science severely restricted to what we might now call analytic truths [italics mine].

At this point, we face the fourth presupposition of axiomatic deductive interpretation of the Posterior Analytics, namely, that Aristotelian science is dependent on definitional truths,\(^\text{176}\) which are in turn based on the analytic or conceptual truth of per se predications. The final task of this section is to argue against this presupposition by examining an outstanding example of demonstrative knowledge, ‘triangles having two right angles’ theorem.

Initially, a few mentions need to be made about a plausible genealogy of Aristotle’s thoughts on demonstrative knowledge. We have already confirmed the influence of the ontosemantics of the Categories on the domain of demonstrative knowledge in general, and the two types of per se predications in specifics. In the course of time when Aristotle’s thoughts on the two types of per se became stabilized around species, genus and differentia, we conjecture, his attention might have already been drawn to other things that could not possibly be excluded from the domain of demonstrative knowledge. Among them are the property (ἰδιωτική) of the Topics and the ‘per se incidentals’, the representative of which is the theorem of ‘triangles having two right angles’.

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\(^{176}\) McKirahan’s overall view of demonstrative science is condensed in the following statements: “Definitions of subjects and attributes are on kind of proper principle (I. 10 76a37ff). Together with existence claims they contain the indemonstrable facts about the subject genus. Since the role of existence claims is to introduce certain items as legitimate subject of proofs, but not to describe their nature, the information contained in the definitions must somehow entail all the nonimmediate facts that the science demonstrates.” R. McKirahan, *Principles and Proofs*, 80.
angles (2R), the one that “any scientifically educated Greek of Aristotle’s day would recognize as a paradigm case”¹⁷⁷ of knowledge in the sense of epistēmē.

Much scholarly scrutiny has been given to the ‘per se incidental’ in recent years.¹⁷⁸ The point of debate in the scholarly discussions is whether the 2R theorem can be classified among the four types of per se predication in PoAn. I.4 and to which classification it belongs.

Undoubtedly, the debates are against the traditional view of the typical case of demonstrative proof in which the conclusion of the ‘subject-attribute’ propositional form is deduced as per se-2 type. This view is offered by Ross:¹⁷⁹

The original premises of demonstration (if we leave out of account ὀξιώματα and ὑποθέσεις) are definitions (72a14-24), which ascribe to subjects predicates of the first kind [per se]. From these original premises (with the help of the ὀξιώματα and ὑποθέσεις) are deduced propositions predicating of their subjects attributes καθ’ ἀυτὸ of the second kind [per se]; and by using proposition of both kinds further propositions of the second kind [per se] are deduced.

The problem is, though, that nowhere in his commentary does Ross give a detailed example of this sort of demonstrative proof, showing how a per se-2 predication (conclusion) is deduced from per se-1 predications (premises/definitions) with the help of axioms and hypotheses. Let us consider the problem in connection with the 2R theorem.

In the case of the 2R theorem, the predicate ‘having two right angles’ can have many names: first and foremost, it is ‘in itself’ and ‘as itself’ predication (73b33-34), and accordingly;

¹⁷⁹ W. Ross, Aristotle’s Prior and Posterior Analytics, 580.
second, it is ‘universal’ predication of the subject ‘triangle’ (74b3-4); third, it is an ‘incidental’ predication: \(^{180}\)

‘Accident’ [Incidental] has also another meaning, i.e. what attaches to each thing in virtue of itself (καθ’ αὐτό) but is not in its substance (οὐσία), as having its angles equal to two right angles attaches to the triangle. And accidents of this sort may be eternal (διάδοσις), but no accident of the other sort is.

The reason 2R is incidental is evidently stated above: it is not because 2R is not included in the definition of triangle, as it is usually understood, but rather because it does not reveal (is not in) the ousia of triangles, i.e., figure-line-limit-quantity. In other words, 2R is not a per se-1 predication of triangles. Then, it will naturally lead us to think that 2R is per se-2 predication. But, according the view of per se-2 that we reviewed and criticized, it is not such a trait, because ‘triangles’ is in no sense included in the definition of 2R, \(^{181}\) whatever it may be. \(^{182}\) Remaining are the options to conceive 2R either as a property of triangles, consequently not being classified under the four types of per se, or the fourth type of per se.

Unfortunately, these two options are not enough to offer successful arguments. For, if 2R is a property of triangles, it becomes puzzling that Aristotle mentions the 2R theorem so many times during the following discussions of per se in I.4-6. We might save Aristotle from the charge of vagueness, by asserting that propria are actually considered by Aristotle as one type of per se incidentals, \(^{183}\) since propria shares with per se incidentals the same feature that they do

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\(^{180}\) *Metaphysics, Δ.30, 1025a30-34.*


\(^{182}\) Probably, in order to define 2R, we need the definition of ‘right angle’, which is in Book I, definition 10 of Euclid’s *Elements.* See also: J. Tiles, “Why the Triangle has Two Right Angles *Kath’ Hauto,*” 10.

\(^{183}\) For the similarity and difference between per se incidental and property, see J. Barnes, “Property in Aristotle’s Topics,” 136-155; W. Graham, “Counterpredicability and per se accidents,” 30-35.
not reveal substance (οὐσία) or ‘what-it-was-to-be’ (τὸ τί ἦν ἐίναι) of subject.\textsuperscript{184} Still, the problem remains: to which type of per se does property belong?\textsuperscript{185} Also the other option is unsatisfactory: To include per se incidental (2R) in the fourth type of per se is not an argument but rather an appeal as a last resort.\textsuperscript{186}

Notwithstanding the recent attempts to comprehend per se incidentals under the enlarged first type of per se,\textsuperscript{187} then, what is needed is to restore and complement the traditional understanding of the typical demonstrative proof, in which a subject-attribute conclusion is deduced as per se-2. We underscored that per se-2 predications is not the relation between attribute and genus of attribute, but between subject and attribute, since the ‘what-it-is’ of the attribute includes the host-genus of the subject. Then, let us examine the three components that stand in the 2R theorem. There is, however, a tricky difference in the 2R theorem in Aristotle’s descriptions, since in most cases he mention just ‘two-right-angles’ as the attribute of triangle, not in its full description, ‘internal angles-equal to- two right angles’. In its full description, the three components would be: triangles (subject), ‘internal angles-equal to-two right angles’ (attribute), ‘plane figure’ (host-genus). On the other, in its abridged description, they would be:

\textsuperscript{184} The other feature of ‘property’ is its convertibility with subject. \textit{Topics}, I. 5, 102a18, 120b23. ‘Property’ must be a serious issue for Aristotle in the \textit{Posterior Analytics}, viewing that his attitude to convertible terms are very cautious in some places, and receptive in another places. For the former case: I. 3, 73a6-20; I. 13, 78a22-29. For the latter case: II. 17, 99a30-39

\textsuperscript{185} Ferejohn, after identifying 2R with \textit{per se propria}, says: “But since he makes it a characteristic feature of per se propria predications that they are not definitionally true, their inclusion in types 1 and 2 is ruled out, and this leaves type 4 as the only remotely plausible place where they could be included.” M. Ferejohn, \textit{The Origins of Aristotelian Science}, 128.


\textsuperscript{187} McKirahan argues that typical subject-attribute proofs prove that the attribute belongs per se 1 to the subject. His argument is based on his thesis of ‘fat definition’ that includes all intrinsic information about subjects, whether they are immediate or mediated. Appealing as it may be, it is dubious that Aristotle has such a view on definition. Furthermore, his idea of ‘fat definition’ is guided by the axiomatic reading of demonstrative science. With a similar idea, Tierney asserts that 2R is one of the per se 1 incidentals, what he calls a ‘logical incidental’. As we indicated, his understanding of per se 1 and 2 is on the wrong footing by construing differentia to be included in the per se-1. R. McKirahan, \textit{Principles and Proofs}, 169-171; R. Tierney, “On the Senses of ‘Symbebēkos’ in Aristotle,” 70-80.
‘triangles’ (subject), ‘two-right-angles’ (attribute), straight line (host-genus). It is plain to anyone who knows Euclid’s definitions in the *Elements* that in the two descriptions, the ‘what-it-is’ of the attribute must include the host-genus, ‘plane figure’ or ‘straight line.’ \(^{188}\) From the passages in other treatises, we can confirm that Aristotle’s construal of the 2R theorem is in the abridged form:\(^{189}\)

Necessity in mathematics is in a way similar to necessity in things which come to be through the operation of nature. Since a straight line is what it is (ἐπεὶ γὰρ τὸ ἑυθὺ τοῦ ἔστιν), it is necessary that the angles of a triangle should equal to two right angles. But not conversely; though if angles are not equal to two right angles, then the straight line is not what it is either.

There seems to be much left unstated in Aristotle’s assertion that a triangle’s having two right angles is necessarily inferred from what straight line is. We notice the antecedent of the inference, “since a straight line is what it is (ἐπεὶ γὰρ τὸ ἑυθὺ τοῦ ἔστιν),” which means literally that “since *this* is a straight line,” or “since a straight line is *this*.” This must refer to an actual proof procedure, where a straight line is drawn. At what point of the proof procedure would Aristotle mention “since this is a straight line”? Following the proof procedure we inspected in §1.2, we can see that the mention could be made in the nearly final procedure: after a triangle is drawn (setting forth: ekthesis), then after an additional straight that is parallel to the base line is drawn (construction: kataskeuē), then after the two angles in the base line are recognized to be respectively equal to the two angles in the parallel line; then he says “since this

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\(^{188}\) Definition 4: ‘A straight line is a line which lies evenly with the points on itself’; Definition 7: A plane surface is a surface which lies evenly with the straight lines on itself’; Definition 14: A figure is that which is contained by any boundary or boundaries’; Definition 10: When a straight line set up on a straight line makes the adjacent angles equal to one another, each of the equal angles is right, and the straight line standing on the other is called perpendicular to that on which stand.’ T. Heath, *Euclid The Thirteen Books of the Elements: Translated with Introduction and Commentary* Vol. 1 (New York: Dover,1956), 153

is a straight that together is 2R,” which means that ‘an angle produced at every point in a straight line makes two right angles.’

The proof of the theorem that triangles have two right angles, as we show here, is not a single deduction from definitions or definitional propositions. Not only should there be given before the actual proof, ‘what triangle means,’ ‘what straight line means,’ ‘what parallel line means’, and an equality axiom, but also there must be painstaking investigations that make it possible to draw \textit{creatively} a parallel line. Given all these, the following statement of Aristotle is rather humble: \cite{PrAn. I. 35, 48a32-39}

\begin{quote}
Let $A$ be two right angles, $B$ stand for triangle, $C$ stand for isosceles. Then, $A$ belongs to $C$ through $B$, but it belongs to $B$ through nothing else (for the triangle possesses two right angles of itself); consequently, \textit{there will be no middle term of }$AB$, although it is demonstrable. For it is evident that one must not always take the middle as a particular ‘this’ but rather sometimes as an \textit{account} ($\lambda\dot{\omicron}g\gamma\nu$), which is just what happens in the example given.
\end{quote}

The above statement is humble, because the single word ‘\textit{logos}’ does not reflect all the complexity of reasoning involved in the proving the 2R theorem.

The traditional understanding of the typical demonstrative proof, in which a subject-attribute conclusion is deduced as \textit{per se-2}, is roughly right, according to the scheme of proving the 2R theorem as we examine here. It is \textit{right} since 2R as an attribute of a triangle is a \textit{per se-2} predicate of a triangle. But it is \textit{roughly} right since the what-it-is or whatness of a triangle, i.e., ‘straight line’, which is surely a \textit{per se-1} predicate of a triangle, is \textit{used} not directly as a premise but as a prerequisite along with other definitions and the axiom. We will explicate more in the next chapter how definitions as a principle are used in a demonstrative inquiry.

\cite{PrAn. I. 35, 48a32-39}
Let us, then, reconsider whether *per se* predications, that is, the ground of the necessity in Aristotle’s theory of demonstration are analytic as they are viewed according to some axiomatic interpreters. From our presentation of the proof of 2R theorem, we can say, they are *analytic* in the sense of the ancient tradition of Greek geometry. For the proof of the necessity of the 2R theorem, we have to *analyze* or trace back the theorem to all the ingredients of the what-it-is of the subject and the predicate. Thus *per se* predications are necessary by analysis. This is what ‘analysis’ means in the ancient geometry and Aristotle’s *Analytics*, as we examined in our §1.2. However, *per se* predications are *not analytic* or conceptually truthful in the modern sense of the term at least after Kantian philosophy. Rather, they are synthetic in the terminology of Kant’s philosophy, and Kant is right in his claim that mathematical judgments are not analytic.  

A philosophically significant term, ‘analytic’ has gone through different stages of connotation in the history of philosophy. It is, therefore, not only a mistake of interpretation but also an anachronism to assert that *per se* predications are analytic, and thus Aristotelian sciences are founded upon conceptual truth. Setting aside the biological and physical investigations of Aristotle, where experience and observation are rudimentary backgrounds of saying ‘items in what-it-is’, we cannot maintain that for Aristotle, even mathematical truths are analytic in the modern sense.

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193 The following statements may represent the non-linear and tortuous way of biological investigations: “One might say that investigation of a (new) species is a matter of looking carefully at a number of specimens, checking whether features are in fact common to the species, possibly discounting some variation as accidental, possibly even deciding to reclassify some putative specimens as a different species. Then one illustrates the truth of the (provisionally) final classificatory statement by appeal to undisputed and representative exemplars of the kind in question.” M. Otte, “Proof-Analysis and Continuity,” *Foundations of Science* 11 (2006): 128.
Chapter 3

Demonstrative Knowledge:
The Dynamism of Demonstrative Inquiry

Introduction

To prepare for our exploration in this chapter of Aristotelian demonstration and its relation with definitions and essences, it will be useful to recapitulate a few of the significant results of our previous chapters concerning hypothesis and definition as principles. Our arguments in the first chapter revealed, contra axiomatic interpretation, that hypothesis as a demonstrative principle is a setting forth of a particular fact. The fact is a substrate being instantiated by a universal, which in turn awaits a demonstrative inquiry for its explanation or the reason why (dioti). The second chapter argued, again contra axiomatic interpretation, that Aristotle’s mentions in I.2 and 4 about knowledge simpliciter, its six conditions, and the crucial predications including ‘per se’, ‘as itself’ and ‘primitive-universal’ are all condensed into his persistent requirement for the explanatory middle to be a maximal universal cause. Along with our examinations of these two important chapters, we could not find that definition as a principle had any direct bearing on these issues, contrary to the claim of axiomatic interpreters who say these predications are directly related with definitional premises.

In one way, this chapter is a further criticism of the axiomatic interpretation that demonstrative knowledge or Aristotelian sciences are linear deductive processes from axioms and definitions to lower theorems. What we will try to show here is that the Aristotelian demonstrative inquiry displayed in the II.7-10 is rather a bi-directional process between factual knowledge (hoti) and reasoned knowledge (dioti).
In another way, this chapter is a bridge that connects the previous chapters to the next chapter. Not only will we see how definitions are used (chrôntai) and what is their standing in several stages of demonstrative inquiry, the issue that we left unresolved in the previous chapters. But also we will delve into a semantic problem of Aristotelian scientific inquiry: how and where in the middle of inquiry does a demonstrative inquirer come to grasp or contact the essence (ousia) of a subject (substrate) at issue? Answering this question will be connected with discerning an epistemic agenda of the Posterior Analytics, which we will pursue in the next chapter.

In the first section, after examining Aristotle’s aporetic treatment of definition and demonstration in II.3-7, we will review the recent debates among scholars about the role of so-called nominal definition, the result of which is to confirm that nominal definition is a first stepping stone that triggers demonstrative inquiry.

In the second section, we will observe the ideal case of demonstrative inquiry, where two separate stages of inquiry, equally important and interdependent with each other, are identified as ‘the stage of establishing facts’, and ‘the stage of revealing causes’. In the third section, we will explore non-ideal cases of demonstration with a view to pondering the fallibility of demonstrative inquiry. Following the recent studies by Lennox, Kosman, and De Groot, demonstrative inquiry, we will show, is a dynamic process moving back and forth in between both partial (kata meros) and quia demonstration, and plausible propter quid demonstrations. The dynamic process of demonstrative inquiry, it will be argued, is a continuous movement that retains semantic contact with essences.
§3.1 The Starting Point of Demonstrative Inquiry and the Issue of Nominal Definition

Let us recall the provisional conclusion regarding definition as a principle that we drew when reviewing some important passages in the first book of the *Posterior Analytics*: definition and the basic assumptions of primitive and derivative items in I.2 and 10 are very close or identical to the notion of ‘nominal definition’ in II.7-10. First of all, we need to confirm this point, before we proceed to explicate the role of nominal definition in demonstrative inquiry.

Let us recall Aristotle’s analysis of elements and the structure of demonstrative proof in I.10:¹

[I.10] Proper too are the items which are assumed to exist and concerning which the science studies what holds of them in themselves (τὰ ὑπάρχοντα καθ’ ἀυτά)…. They assume (λαμβάνουσι) that there are such items, and that they are such-and-such. As for the attributes of these items in themselves, they assume what each means (signifies: σημαίνει)… and they prove that they are, through the common items and from what has been demonstrated. Astronomy proceeds in the same way.

Here we reconsider Aristotle’s fundamental idea of what demonstrative proof consists of in the first book. First and foremost, before any demonstrative proof sets off, there should be “taking hold of” (λαμβάνουσι) what primitive and derivative items *mean* or *signify*. That is, the definitions of what ‘unit’, ‘line’ or ‘straight’ mean, and the definitions of what ‘odd’, ‘quadrangle’, ‘inflexion’, or ‘verging’ signify as well, are to be given. And the basic element of demonstrative proof, i.e., the conclusion to be proved in a demonstration is a particular fact or a state of affairs, *pragma*, that an attribute—“what holds of them in themselves”—is predicated of a subject (substrate). Thus, Aristotle says above: after these assumptions are given, “they prove that they are (δεινότως ὅτι δ’ ἐστι),” which implies not, as normally misunderstood, that (they prove) a derivative items *exists*, but that (they prove) an “in itself” (*per se*) attribute inheres in an underlying subject.

¹ *PoAn*. I. 10, 76b2-12.
The same idea of the structure of demonstrative proof is found in the second book of the
*Posterior Analytics:*^2

[II.3] There is no demonstration of anything of which there is a definition. For
definitions are of what something is, i.e. of its essence (τι ἐστι καὶ οὐσία); but *all
demonstrations clearly suppose and assume* (λαμβάνουσι) *what a thing is* —e.g.
mathematical demonstrations assume what a unit is and what odd is; and similarly for
other demonstration. Again, *every demonstration proves something of something*
(τι κατὰ τινὸς), i.e. that it is or is not; but in a definition nothing is predicated of
anything else (οὐδὲν ἕτερον ἕτερον κατηγορεῖται)—e.g. neither animal of two-footed
nor this of animal, not indeed figure of plane (for a plane is not a figure nor is a figure a
plane).

Again, proving what something is is different from proving that it is. Definitions
show what something is, whereas demonstrations show that this is or is not true of that.

Not only does this passage confirm that all demonstrations *assume* definitions of what some
terms mean, but also it tells, against those who construe ‘that it is’ *existentially,* that a subject
matter of a proof, i.e., a conclusion of a proof, is a state of affairs—predicating “something of
something” (τι κατὰ τινὸς). In addition, we find here Aristotle’s contention in I.2 that
definition is not a proposition in the sense specified at 72a 8-14: Aristotle says that “a
proposition is one part of a contradictory pair, one thing said of one,” and clearly affirms at
72a21-22 that definition does not “assume either of the parts of a contradictory pair.” In the
above passage, he reiterates the same contention with the sentence: “but in a definition nothing is
predicated of anything else (οὐδὲν ἕτερον ἕτερον κατηγορεῖται).”

Later at the beginning of II.7, Aristotle repeats once again the same point in different
language, and in a slightly different problem setting:^3

[II.7a] Then how will a definer prove the essence of something or what it is? He will not,
as in a demonstration, show *from items agreed to be the case* (ἐξ ὁμολογουμένων ἐίναι)
that if they are the case then necessarily *something else is the case* (this is demonstration);
nor, as in an induction, will he show by way of the particulars, which are plain, that

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^2 *PoAn.* II. 3, 90b30-38

^3 *PoAn.* II. 7, 92a34-92b3.
everything is thus-and-so inasmuch as nothing is otherwise (for an induction does not prove what a thing is, but rather that it is or is not). What other way is left? He will hardly prove it by perception or by pointing his finger.

The problem setting of this passage is how a definer proves (δεικτι) the essence of something or what it is, and Aristotle’s answer is that a definer cannot prove what it is, in the manners of demonstration, induction, or even indexical pointing. What is important for our purpose in the passage, though, is Aristotle’s thought on what demonstration is—“this is demonstration”: demonstration shows from “items agreed to be the case” (definitions) that if they are the case (premises) then necessarily something is the case (conclusion). It seems to be a significant point that Aristotle indicates here definitions with the expression “items agreed to be the case.” Does he mean that all definitions in demonstration are conventional in the sense that what ‘triangle’ means is agreed upon by its language users? It seems so, if we read the following passage in the same chapter:

[II.7b] It is clear too that, in the current methods of definition, definers do not prove that anything exists. Even if there is something equidistant from the middle, why does what has been defined exist? And why is this a circle?—You could say that it was a definition of mountain-copper (Δαιχάλκου). Definitions do not show that what they describe is possible, nor that the definitions are of what they say they are—it is always possible to ask why.

Although it is difficult to fully illuminate Aristotle’s real intention in this passage, the main message appears evident that definitions at least “in the current methods of definition” are conventional in the sense that, to give an extreme example, even the name of ‘mountain-copper’

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4 PoAn. II. 7, 92b19-25.
5 It seems that, by “the current method of definition,” Aristotle refers to the method of division in the Academy, because he deals with the method of division in II. 5. However, this is uncertain considering the mathematical example that follows immediately. Then, is he criticizing the way in which mathematical terms are defined by then-current mathematicians? Barnes makes a connection between this problem and the distinction between definition that shows a reason versus definition that looks like a conclusion in DeAn. II. 2, 413a11-19. Barnes, Aristotle: Posterior Analytics, 216.
is applied to the definiens of ‘circle’, a certain thing of which we know only names, but we do not know what it is, or whether it really exists. Moreover, given enough consideration to the fact that chapters 3-7 of Book II are aporetic treatments of the demonstrability of definition or what it is, the last two sentences show indisputably that Aristotle believes that definition itself has nothing to do with something’s existence or the fact that a thing is the case.

In a similar venue, but with a critical distinction in mind, Aristotle mentions once again the general structure of demonstration in the same chapter:

[II.7c] Next, we say that everything which a thing is (ἀπαν ὁ τί ἔστι) must be proved through a demonstration—except its essence (οὐσία). But existence is not the essence of anything; for the things that exist (τὸ ὄν) do not constitute a kind (γένος). There will therefore be a demonstration that the item exists. And this is what the sciences (ἐπίστημα) as a matter of fact do: a geometer assumes what triangle means (σημαίνει) and proves that triangles exist (ὅτι δ’ ἔστι). So what will a definer prove if not what a triangle is? But then he will know by the definition what it is and yet not know if it exists; and this is impossible.

Except for the last two sentences of the above passage, this passage confirms the same boundary of demonstrative knowledge or epistêmê that Aristotle has given persistently throughout the Posterior Analytics. Demonstration assumes what terms signify, both primitive and derivative, and then proves “everything which a thing is,” with the exception of its ousia. As we saw in our §2.3, since only genus and species, strictly speaking, constitute the ousia of something, here “everything which a thing is” undoubtedly refers to attributes of an underlying subject—including differentia, property, and per se incidentals—that will stand in the place of the predicate of a conclusion in a demonstrative proof. In view of these clearly stated details of Aristotelian demonstration, Barnes’ translation of the second sentence—“But existence is not the essence of anything; for the things that exist (τὸ ὄν) do not constitute a kind (γένος)” —

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6 Plato, Critias, 114a.
7 PoAn. II. 7, 92b13-18.
completely misleads readers. The context of the sentence shows that the phrase Barnes translates as ‘existence’, “τὸ δ’ ἔστι” refers back to “everything which a thing is (ἀπὸ τί ἔστι),” the being or inherence of which in a subject is the object of demonstrative inquiry. We can suppose, thus, that the distinction here between ‘everything else that is the object of demonstration’ and ‘that which constitutes ousia’ prepares the crucial distinction later in II.9 between ‘some things of which there is something else which is their explanation’ and ‘others of which there is not’.

Before we approach the two important passages left in II.7, which are at the heart of Aristotle’s aporetic arguments, let us summarize what we have discovered so far in order to answer the question we raised at the beginning, that is, whether definition as a principle is nominal definition or not. Within the structure of demonstrative inquiry that Aristotle conceives in both books of the Posterior Analytics:

(Df-1) definition as a principle should be given before an inquirer sets off investigating an explanatory middle and constructing a demonstrative proof;

(Df-2) definitions are what items (terms) mean or signify;

(Df-3) definitions themselves do not involve ‘existential import’ or rather factual (hōti) connotation;

(Dm-1) demonstrations prove scientific facts (substrates-being-attributes), which will be proved as the conclusions of constructed proofs.

(Dm-2) demonstrations cannot prove the essences (ousia) of some underlying things.

(Dm-2*) essences of some underlying things cannot be conclusions of demonstration.

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8 We see the same exegetical mistake in Whitaker’s comments: “A definition expresses what something is; demonstration, however, does not show what something is, but only that it is or is not (92a38f.). Before the definitendum can be defined, it must be identified as actually existing. This, however, is merely a preliminary step, and does not contribute to the definition of the thing; for merely establishing that something exists does not place it in a genus, since being is not a genus (92b14) [italic mine].” C. Whitaker, “Appendix III: Signification and Definition,” in his Aristotle’s De Interpretatione (Oxford: Clarendon Press, 1996), 213-214.
These persistent ideas on definition and demonstrations seem to be challenged by Aristotle himself, however, in the middle of the aporetic treatment of the demonstrability of definition or what it is.  

[II.7d] Again, how will you prove what something is? Anyone who knows what a man or anything else is must also know that it exists (ὅτι ἔστιν). (Of that which does not exist, no one knows what it is. You may know what the account or the name signifies when I say “goat-stag”, but it is impossible to know what a goat-stag is.) But if you are to prove what something is and also that it exists, how will you prove them by the same argument? Definitions make a single thing plain, and so do demonstration; but what a man is and that men exist are different.

In this passage, two theses of our summary, (Df-2) and (Df-3) are in danger of obscurity and collapse. First, the problem of so called nominal definition here arises. Given that Aristotle here distinguishes ‘what $X$ is’ from ‘what the name or account of $X$ signifies’—following the tradition, we call it nominal definition—, it becomes obscure whether the definition in thesis (Df-2) should be construed as nominal definition or real definition. At this point, we leave aside the question whether definition is by convention or stipulation that we took into account in our review of the passages [II.7a-b]. Does Aristotle consider, say, ‘what triangle means or signifies’ in geometrical proof as nominal definition? 

Second, Aristotle here claims that anyone who knows ‘what $X$ is’ also knows ‘that $X$ exists’, because “of what does not exist no one knows what it is.” As long as we cannot deny that Aristotle indicates definition by the ‘what $X$ is’, this claim directly contradicts thesis (Df-3) that definition itself does not involve existential import or factual (hoti) connotation. How should we square this claim with the statement in [II.7c] that “a geometer assumes what triangle

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9 Ross says that the chapter 7 is apparently written by Aristotle “to clear his own mind on a question the answer to which was not yet clear to him.” Ross, Aristotle’s Prior and Posterior Analytics, 626.

10 PoAn. II. 7, 92b4-12

means and proves that triangles exist?” These two claims by Aristotle—the distinction between nominal vs. real definition, and the existential import of definition—are conjoined in the case of the signification of non-existing things like ‘goat-stag’, that is, we know what the name ‘goat-stag’ signifies, but we do not know what goat-stag is. We are reaching a deeper level of Aristotle’s thoughts on the signification of names, the level on which Aristotle’s two claims and the two problems that we face are to be explicated and resolved. For a moment, though, we need to look at Aristotle’s further discussion on the nominal definition in the next following passage:¹²

[II.7e] Then if a definer proves either what something is or what its name signifies, and if there is certainly not a proof of what it is, then a definition will be an account which signifies the same as a name. But this is absurd. First, there will be definitions of non-substances (μὴ ὄνσιαν) and of things which do not exist (μὴ ὄντων)—for you can signify things which do not exist. Again, all accounts will be definitions; for you can assign a name to any account whatever—and we shall all talk definitions and the Iliad will be a definition. Again, no demonstration would demonstrate that this name shows this—so definitions do not show this either.

Here, “the account which signifies the same as a name” is what we understood as nominal definition in [II.7d]. Aristotle thus seems to assert unacceptable consequences of nominal definition, that is, it will allow in its extension definition of non-substances,¹³ definition of non-existing entities,¹⁴ and the feasibility of any account or phrase being a definition. However, in view of the fact that Aristotle confines the extension of nominal definition later in the concluding part of the non-aporetic chapters (II.8-10), saying “an account is one in two ways:

¹² PoAn. II. 7, 92b26-34
¹³ Ross asserts that ousia here means essence rather than substance, since “there is nothing paradoxical in saying that things that are not substances can be defined.” Ross, Aristotle’s Prior and Posterior Analytics, 627. Following Ross, Bolton says that “there is no worry at all in the Posterior Analytics over whether nonsubstances can be defined.” R. Bolton, “Essentialism and Semantic Theory,” The Philosophical Review 85 (1976): 527 n.21. In contrast, Aristotle says in the Metaphysics that only substance is definable in the strict sense. See; Metaphysics, Z.5, 1031a1-14.
by connection, like the *Iliad*; and by showing one thing of one thing, non-incidentally, “15 we should not take the unacceptability of all consequences equally and at face value.

So far, we have not confirmed whether definition as a principle in demonstrative knowledge is nominal definition. Before proceeding to that question, we should ponder Aristotle’s overall purpose in inserting the *aporetic* chapters between the chapters (II.1-2) which deal with four different questions of demonstrative inquiry and the chapters (II.8-10) that resolves the *aporia* exposed in the middle. Then, what is the aporia or puzzlement exposed in chapter 3-7? Bolton and others16 glimpse a version of *Meno*’s paradox of inquiry in Aristotle’s claim in II.7 that anyone who knows ‘what X is’ must know in advance ‘that X exists’.

That objection, which may be inferred from the concession, is that one *must* know “what something is” in advance of knowing whether it exists or not. Otherwise how could one come to know that it exists or not? The objection poses a version of the paradox of inquiry well known to Aristotle from Plato’s *Meno* (80d-e). The objection is forestalled by the claim that we can know enough merely by knowing what the name of a kind signifies to enable us to be aware of the existence of an object of that kind and to fix on them for study.17

Throughout the *aporetic* chapters, Aristotle lays emphasis on the fact that definition is about ‘what X is’, while the task of demonstration is ‘that X is’, and accordingly that definition and demonstration cannot be put on the same plane. Following Bolton, then, we could think that Aristotle is implicitly tossing together the paradox of inquiry with the two different kinds of knowledge, knowing ‘that X is’ and knowing ‘what X is’, as if these two presupposed each other

15 *PoAn*. II. 10, 93b36-37.

16 For another example, Whitaker identifies the puzzle: “The other horn of the dilemma is provided by the fact that demonstrations must begin from prior principles; it is necessary to know what things are that are being talked about before performing demonstration on them (A Po. 71a 13ff). Aristotle thus has the dilemma that demonstration that something is the case can only begin if there is previous knowledge of definitions, and definitions cannot be sought for without knowledge that the definienda exists, which can only be established by demonstration. Definitions and demonstration threaten to form a closed circle, where each can be undertaken after the other.” C. Whitaker, *Aristotle*’s De Interpretatione (Oxford: Clarendon Press, 1996), 214.

in a vicious circle. Nevertheless, it seems uncertain that the device of nominal definition resolves the implicit paradox of inquiry as Bolton supposes. As we will argue shortly, the paradox resides rather in the stage of establishing scientific facts.

Anyhow, the thesis that knowing ‘what it is’ presupposes knowing ‘that it is’ in demonstrative inquiry has already been established in the first two chapters of book II. Aristotle made it clear that the two scientific questions, ‘the fact’ (hoti), and ‘if something is’ (ei esti) precede the other two question, ‘the reason why’ (dioti), and ‘what it is’ (ti esti), and he added that the ‘what it is’ and ‘why it is’ are the same question in the sense of seeking ‘what the middle is’. What should not escape our attention is that in the discussion of the scientific questions and inquiry in II.1-2, there is no mention of definition. The object of seeking, i.e., ‘what X is,’ in these chapters must be different from the definition of ‘what x is’ that should be given even before demonstrative inquiry sets off. To put it simply, the definition of ‘what triangle is’ is to be given, before seeking ‘what X is that is explanatory of ‘triangle’s having two right angles’.

Probably, the most puzzling thing in the aporetic chapters is that Aristotle does not make explicit intentionally the distinction between ‘what X is’ as the object of seeking and ‘what x is or signifies’ as a preexistent definition.

Without making the clear distinction, Aristotle’s main thrust of the aporetic chapters is to push “the one who defines (ὁ ὁριζόμενος)” or anyone who follows “the current method of definition”—referring implicitly to Academicians—to the limit of admitting that they cannot prove definition or what X is. Apparently, then, Aristotle’s real intention in these chapters is not to divide definitional practice from demonstrational practice as these appear on the surface but to
incorporate definitional practice into his framework of demonstrative inquiry. The intention can be explicitly confirmed in the concluding remarks of chapter 8.\textsuperscript{18}

\[\text{[II.8a]}\] Although there are no deductions and no demonstration of what something is, nevertheless what something is is made plain (\(\delta\)\(\hat{n}\)\(\lambda\)\(\omicron\)) through deduction and through demonstration (\(\delta\)\(\iota\) \(\alpha\)\(\pi\)\(\omicron\)\(\delta\)\(\epsilon\)\(\iota\)\(\xi\)\(\epsilon\)\(\omicron\)\(\omicron\)). Hence without a demonstration you cannot get to know what something is.

Aristotle’s strategy to include the Socratic-Platonic tradition of pursuing ‘what \(X\) is’ within his new method of demonstration is ingenious: “Without a demonstration you cannot get to know what something is,” even though it is not possible to prove or demonstrate directly what something is. This is the whole import of Aristotle’s non-

\[\text{[II.10a]}\] Since a definition is said to be an account of what something is, it is clear that one type of definition will be an account of what its name (\(\lambda\)\(\omicron\)\(\gamma\)\(\omicron\)\(\tau\)\(\omicron\) \(\tau\) \(\iota\) \(\sigma\)\(\mu\)\(\alpha\)\(i\)\(v\)\(e\) \(\tau\)\(\omicron\) \(\omicron\)\(\omicron\)\(\alpha\)), or some other name-like (\(\omicron\)\(\omicron\)\(\omicron\)\(\omicron\)\(\omicron\)\(\tau\)\(\omicron\)\(\omicron\)\(\omicron\)) account, means—e.g. what triangles means. When we grasp that this exists, we seek why it is. But it is difficult to take anything in this way if we do not know that it exists. The explanation of the difficulty was given earlier: we do not even know whether it exists or not, except incidentally.

What is apparent at first sight is that ‘what triangle means or signifies’ is nominal definition. It implies that in Aristotle’s view, all definitions which are to be given before demonstrative inquiry are conceived as nominal definition, i.e., our thesis (Df-2) definitions are what items (terms) mean or signify. Therefore, we can officially assert that definition as a principle of demonstrative knowledge is no other than nominal definition as a starting point of demonstrative inquiry. Yet, it seems somewhat trivial and misleading as well to call what ‘triangle’ signifies the nominal definition of ‘triangle’, since it gives the impression that there is a real definition of

\textsuperscript{18} PoAn. II. 8, 93b16-19.
\textsuperscript{19} PoAn. II. 10, 93b29-35.
triangle in contrast to the nominal definition. In fact, it will be more appropriate to say that the real and nominal definitions are run into one definition in this case, since it is meaningless to divide real and nominal definitions in mathematics.\(^{20}\)

At this point, we need to recall our claim in §1.4 that there is a conceptual difference between *establishing facts* in mathematics and *establishing facts* in natural sciences. In mathematical problems-solving and theorem-proving, certain facts—a simple figure from which to construct a complicated one, or theorems to be proved such as the 2R theorem—are already *given*, whereas in natural science a fact, ‘whether it is the case or not,’ is to be *sought*. ‘The given’ in mathematics is in most cases actualization of—setting forth (*ekthesis*)—some definitions, for example, ‘this is a straight line’, or ‘this is a triangle’, actually drawing a triangle and a straight line. That is, the role of definition in mathematics is to be *used* (\(\chiρ\dot{\omega}νται\))\(^{21}\) to *introduce* certain facts in problem solving and theorem proving. Likewise, we can suppose that nominal definitions in natural sciences are *used to seek* of a certain scientific fact ‘whether it is the case or not.’ Our supposition will be shortly confirmed, with the additional fact that nominal definitions in the domain of the natural sciences are neither as transparent nor unique as those in mathematics.\(^{22}\)

\(^{20}\) Demoss and Devereux are confused on this point: “However, not all nominal definitions can figure as conclusions of what something is....Since it is not possible to show what a triangle is through a syllogism....Yet in the first sentence of chapter 10 Aristotle mentions “triangle” as an example of the sort of thing which can be defined with nominal definition.” D. Demoss and D. Devereux, “Essence, Existence, and Nominal Definition in Aristotle’s *Posterior Analytics* II 8-10,” *Phronesis* 33.2 (1988), 136-137. Aristotle’s remark at chapter 9 that there are two different types of entities, i.e., ‘things that are immediate’, and ‘things that have a middle term’ leads many commentators to assume two ontological or epistemic entities for nominal and real definition. See also our argument in chapter 1 against Goldin’s concept of ‘epistemic substances’. Rather the distinction concerns ‘everything else that is the object of demonstration’ and ‘that which constitutes *ousia*’.

\(^{21}\) PoAn. I. 10,76a37.

\(^{22}\) One might criticize this claim by saying that some mathematical definitions as well are not transparent and unique. For example, Euclid’s definitions of points and lines are on the one hand ‘the extremities of a line’, and ‘the extremities of a plane’, on the other ‘that which has not part’ and ‘breadthless length’. Even granted this point, the
Returning to the passage quoted above [II.10a], while the first half of the passage defines ‘nominal definition,’ the last half—“When we grasp that this exists (ὅτι ἐστι), we seek why it is (διὰ τί ἐστιν). But it is difficult to take anything in this way if we do not know that it exists. The explanation of the difficulty was given earlier: we do not even know whether it exists or not, except incidentally”—tells exactly that (1) without establishing facts (ὅτι ἐστι), it will be difficult to proceed to explaining the facts (διὰ τί ἐστιν); (2) to establish facts—that something is the case—is also a difficult task, because to determine whether the facts are incidental or non-incidental is not easy. Then, the whole passage [II.10a] implies that there is a close connection between nominal definition and establishing facts.

Since the reason “given earlier” why it is a difficult task can be found in chapter 8, let us examine the two important adjacent passages:\footnote{nominal definitions in the natural sciences can be given in much more variant forms. On Euclid’s notion of definition, see R. McKirahan, \textit{Principles and Proofs}, 140.}

[II.8b] Just as we seek the reason why (τὸ διότι) when we grasp the fact (τὸ ὅτι) (sometimes indeed these two things become plain at the same time—but it is not possible to get to know the reason why \textit{before} the fact), in the same way we plainly cannot grasp what it is to be something (τὸ τί ἔστιν ἔσωσι) without grasping that it exists; for we cannot know what something is when we do not know whether it exists. [II.8b*] But as to whether it exists, sometimes we grasp this incidentally, and sometimes by grasping something of the object itself (τί αὑτοῦ τοῦ πρόγματος)—e.g. thunder, that it is a sort (τίς) of noise in the clouds; of an eclipse, that it is a sort (τίς) of privation of light; of man, that he is a sort of animal; or soul, that it is something which moves itself.

[II.8c] When we know incidentally that something exists, necessarily we have no grasp on what it is; for we do not even know that it exists, and to seek what something is without grasping that it exists is to seek nothing. But when we grasp something of the object, the business is easier. Hence, in so far as we grasp that it exists, to that extent we also have some grasp on what it is (πρὸς τὸ τί ἐστιν).

\footnote{\textit{PoAn}. II. 8, 793a17-30.}
In the passage [II.8b], Aristotle holds that establishing facts (to hoti) is the task preceding explanation of the facts (to dioti)—“it is not possible to get to know the reason why before the fact.” And this point is once again emphasized in the next passage [II.8c] that “to seek what something is without grasping that it exists is to seek nothing.” What is most crucial in these passages, then, is that we may establish facts in either an incidental way or a non-incidental way. Aristotle expresses the non-incidental way with “grasping something of the object itself” in the passage [II.8b*] and “to that extent (πρὸς) we also have some grasp on what it is” in the passage [II.8c]. As examples of this non-incidental grasp of facts, Aristotle mentions the two famous cases that thunder is a certain noise in the clouds, and that eclipse is a certain privation of light from the moon.

During the last several decades, the above two passages have been closely investigated by scholars, producing many details of different opinions in addition to the traditional commentary on the relation of nominal definition and demonstrative inquiry. What is now fairly well agreed upon among scholars is that the non-incidental grasp of facts is directly connected with nominal definition in chapter 10. That is, to grasp the facts that thunder is a certain sound in the clouds, or eclipse is a kind of privation of light from the moon, is guided by the nominal

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24 The explanation that sometimes we may hit upon simultaneously both the fact and the reason is given at 90a 26-27. We indicated before that the example is somewhat awkward; how could a dweller on the moon observe the eclipse of the moon? We cannot find any other explanation or example in the text.

definition of what the terms ‘thunder’ or ‘eclipse’ mean for ordinary speakers. We can encapsulate the benefit of recent studies on II.8-10 thus: Insofar as establishing facts non-incidentally (X-being-y) is an indispensable prerequisite of knowing what X really is, and as long as the establishing of the (scientific) facts is guided by nominal definitions of some terms, Aristotle’s scientific theory, especially the part having to do with demonstrative inquiry, must be studied through his semantic theory of how names and terms signify things in the world.

Bolton’s contribution on this topic is that he initiated a new way of viewing nominal definition within Aristotelian scientific discovery, first by criticizing the traditional understanding of real and nominal definitions. In contrast to the old understanding where nominal definition is regarded as giving only the connotation or meaning of terms so that it has no existential import whatsoever. Bolton claims that nominal and real definitions are not concerned with two different types of entities—meaning and thing—but two different types of accounts of the same entities—things. Thus, regardless of existential import, both definitions refer or signify the same essential nature of things, with the proviso that nominal definition does not display the essential nature. In Bolton’s expression, the chief function of Aristotelian nominal definitions is to enable scientific inquiry to get off the ground by fixing on suitable objects for further investigation. This is possible because nominal definition contains in its descriptive phrase information about a part of the essence of a kind or a non- incidental feature

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26 The expression, ‘nominal definition’ originated from Aristotle’s term, ‘name-like account’. According to Ross, Aristotle never recognizes nominal definition by that name (logos onomatôdês). On his understanding, nominal definition is “not in the least of a name,” but non-causal definition of attributes or events. W., Ross, Aristotle’s Prior and Posterior Analytics, 635-636. Surprisingly, it is not recognized by any commentators that ‘name-like’ things could refer to items of differentia, property, or per se incidentals, since in Aristotle’s view these are close to substantial names, even though they are linguistically adjectival. We argued this point in the previous chapter.  
29 R. Bolton, Ibid. 521-525.
(per se property) of the kind. More than that, this enabling of investigation occurs because nominal definition is a formula whose understanding involves awareness of the existence of things denoted by the term defined. As a result, “the syllogisms which have nominal definitions as conclusions give the reason for, and hence, prove the existence of the kinds defined.”

According to Bolton, then, nominal definition performs a double job: Bolton says that “signification has two components one of which is reference; the other is not, however, sense or connotation in anything like Mill’s sense. It involves a fixing on a kind but not necessarily via a specification of the attributes that make up the kind.” Bolton’s concept of ‘fixing on a kind’ seems a merit and at the same time a disadvantage, since it is not clear whether nominal definition refers to instances of a kind and fixes simultaneously on the kind itself, or whether nominal definition fixes on actual instances of a kind and simultaneously refers (signifies) to the kind itself, i.e., the essences.

Anyhow, Bolton’s argument that what names and their accounts signify (σημαίνει) are the same thing as the real definition shows or display (δηλοῖ, δείκνυοι), i.e., essences (διὰ τί ἔστιν), influences later studies on the same issue. On the other hand, his claim that there is no room in Aristotle’s mind for any term with empty denotation, e.g. ‘goat-stag’, to have a nominal

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30 R. Bolton, Ibid. 523. Since he identifies nominal definitions with conclusions of demonstrative proofs, it implies that he thinks there are only three types of definitions, not four types. Ross also thinks so: “The sentence at 94a7-9 does not describe a third kind; having referred to the causal definition of thunder (a5), Aristotle reminds the reader that there can be a non-causal definition of it. There are only three kinds.” W. Ross, Aristotle’s Prior and Posterior Analytics, 636.

31 R. Bolton, Ibid. 528.

32 For Demoss and Devereux, nominal definitions as preliminary accounts of what something is are in contrast with real definitions that reveal the underlying causes. And for Sorabji, nominal definitions which allude to the essences are in contrast with definitions that specifies the essences. D. Demoss and D. Devereux, “Essence, Existence, and Nominal Definition in Aristotle’s Posterior Analytics II 8-10,” 135-136; R. Sorabji, “Definitions: Why Necessary and in What way,” 213-219.
definition, offers a more debatable point.\textsuperscript{33} As we will see later, Bolton’s thesis, ‘no existence, no (nominal) definition’, confines the boundary of nominal definition so narrowly that there is no place in his view of Aristotle’s theory of science to allow for fallibility of demonstrative knowledge.

Another notable study on the semantic issue of Aristotelian scientific inquiry is Irwin’s analysis of the concept of signification in Aristotle. On two critical points, he agrees with Bolton. First, for Aristotle, \textit{signifying} something is not \textit{meaning} something, because names and definitions “signify essences and essences are not meanings, but belong to non-linguistic reality.”\textsuperscript{34} But Irwin’s conception of signification differs somewhat from that of Bolton in Irwin’s claim that signifying is not the same as \textit{referring}, since the co-referential terms like ‘one’ and ‘being’ signify the same ‘in a way’ in which the essence of one and the essence of being are not the same (\textit{Metaph.} 1054a13-19).\textsuperscript{35} Then, how do words signify essences? Irwin responds:\textsuperscript{36}

Aristotle assumes that a word signifies an essence even if we do not know what the essence is; if we find out what the essence of sharks is we find out what ‘shark’ signifies and always has signified, and do not change its signification. Many competent speakers do not know what the essence of sharks, place, time, happiness or courage is, but they signify these essences by the use of the words none the less.

Here Irwin touches on the most crucial truth about Aristotle’s view on signification, namely, that words \textit{do not change} their signification regardless of whether we find out essences which the words signify or not. It tells us that our minds or thoughts are hooked up with essences \textit{via} terms even at an early or obscure stage of signification when we do not know the essences. We may

\textsuperscript{33} Demoss and Devereux claim that Bolton’s conception of nominal definition as existentially imported is wrong. They conceive nominal definition as ability to discern genuine instances when confronted with them. D. Demoss and D. Devereux, “Essence, Existence, and Nominal Definition in Aristotle’s Posterior Analytics II 8-10,” 145-146. Sorabji also criticizes Bolton on the same point: R. Sorabji, “Definitions: Why Necessary and in What way,” 216.

\textsuperscript{34} T. Irwin, “Aristotle’s concept of signification,” 246.

\textsuperscript{35} T. Irwin, Ibid. 247.

\textsuperscript{36} T. Irwin, Ibid. 248.
call this function of humanly generated terms ‘epistemic continuity’, by which we mean that our signification of essences via terms continues in the whole process of our coming to know essences. Unfortunately, though, Irwin does not seem to maintain his recognition. In order to see the reason, we need to present the second view in regard to which Irwin and Bolton are in accord.

Irwin thinks, like Bolton, that what names signify, i.e., nominal definitions are starting points of scientific inquiry and the real essences are discovered by inquiry: Aristotle “is committed to the view that this inquiry discovers what our names signify, since names signify essences and essences are discovered by inquiry.” But what Irwin conceives by scientific inquiry differs from what we normally understand by scientific inquiry, i.e., empirical investigations. Since terms and names signify things as conventional sign within our beliefs system, Irwin holds, our beliefs associated with some names should be revised and reconstructed. The revision and reconstruction method, which is Irwin’s view on Aristotelian (scientific) inquiry, proceeds from ‘what signifies to us’ to ‘what signifies by nature’. This distinction, especially the device ‘what signifies to us’ seems very appealing when Irwin deals with some difficulties of his thesis that names signify essences, one of which is the non-referring terms like ‘goat-stag’: goat-stag has no essence, even though we know what ‘goat-stag’ signifies; then how does the term ‘goat-stag’ signify? It signifies something to us but not by nature. Here,

37 T. Irwin, Ibid. 250.
38 Bolton asserts that nominal definition is of the same sort as that possessed in the early stages of scientific inquiry in the sense that it concerns ‘what is better known to us’, which is in turn identified with ‘experience’ (empeiria) in the Aristotelian sense. R. Bolton, “Essentialism and Semantic Theory in Aristotle,” 52-530.
Irwin seems to get in trouble: we should ask how ‘the signification to us’ is different from ‘the meaning of the term to us’.

In addition, when he deals with signification and essence in the Analytics, he says surprisingly that ‘what a name signifies’—nominal definition—and ‘the account that reveals essences’—real definition—are not the same:

\[41\]

The difficulty in these remarks is plain. While we found previously that Aristotle thinks names signify real essence, he seems to deny it in the Posterior Analytics. He seems to think at least that essences are not the only things that can be signified, and sometimes even seems to suggest that they are never signified—that the essence is always different from the significate. Must we then revise our earlier account of signification?

It is curious that Irwin could not maintain that both nominal and real definition signify the same essence, instead of asserting that nevertheless ‘definitions to us’ are quite suitable at the beginning of inquiry and we try to find the one correct ‘definition by nature’. Then, we should ask once again how ‘the definition to us’ is different from ‘the meaning of terms to us’.

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We learn much from Bolton and Irwin about Aristotle’s ideas about semantics that are implicated in his theory of demonstrative inquiry. Among them is the intractable case of ‘goat-stag’, the issue of non-referring terms, whose incorporation is not easy in the new interpretation of signification that for Aristotle names and definitions signify essences. Bolton escapes the difficulty by claiming ‘no existence, no definition’, while Irwin confronts the original problem that signifying something (to us) is not meaning something.

This is the point to sum up our arguments so far: Within Aristotle’s theory of
demonstrative knowledge:

\[41\] T. Irwin, Ibid. 259.
\[42\] Bolton correctly points out the pitfall of ‘signification to us’: “Up to the point where he introduces the distinction between what names signify to us and what they signify by nature he has been arguing that Aristotle is not interested in meaning and the theory of meaning because his concept of signification is not a concept of meaning. But Irwin then goes on to attribute to Aristotle another concept, signification-to-us, and he does nothing to show that what words signify to us is not what they mean.” R. Bolton, “Aristotle on the Signification of Names,” 155.
(1) Definition as a principle is nominal definition that must be given as a starting point of demonstrative inquiry.

(2) Nominal definition guides (in the case of natural investigations) us in establishing scientific facts that are to be proved as the conclusions of constructed demonstration.

(3) Both nominal definition as given and real definition as sought for, though they are distinct but interdependent, signify essences.

(4) The demonstrative inquirer’s signification of essences continues in the whole process of coming to know the essences. This is what we have called epistemic continuity.

In this section we have concentrated on confirming (1). In the next section we will continue to expand the arguments for (2) and (3), while in the next chapter we will explore (4) in a somewhat different setting.

§3.2 Types of Definition, Stages of Inquiry, and Essence

Men ask ‘why?’ At the base of the question, there is a fact that this is such-and-such. Can all questions of men be answered? Aristotle says that there are some that can be answered, while there are others that cannot. We will start this section by examining what kind of facts are the scientific (epistēmonikon) facts to be investigated in demonstrative inquiry for Aristotle, and how these facts can be established in a stage of demonstrative inquiry.

Let us get back to Aristotle’s distinction between the incidental grasp of facts vs. the non-incidental grasp of them.\footnote{PoAn. II. 8, 93a21-24.}

\[\text{[II.8b*] But as to whether it exists, sometimes we grasp this incidentally, and sometimes by grasping something of the object itself (τι ἀὑτοῦ τοῦ πρόγυματος)—e.g. thunder, that it is a sort (τὶς) of noise in the clouds; of an eclipse, that it is a sort of privation of light; of man, that the is a sort of animal; or soul, that it is something which moves itself.}\]
A person who has only incidental knowledge of the fact ‘that $X$ is $Y$’, where $Y$ is an incidental predication of $X$, is in no way in a position to proceed to the investigation of ‘what $X$ really is’. To seek what $X$ is in this case, Aristotle says, is to seek nothing. In contrast, a person, for example, who knows that thunder is a noise in the clouds is in a position to proceed by investigation to the discovery of its cause and thus to a full knowledge of what thunder is. The rest of the examples show, then, that the predicates—‘a sort of privation of light’, ‘a sort of animal’, ‘something which moves itself’—are *something* of the object itself—eclipse, man, or soul. What is that *something*? In the passage we quoted [II.8c]—“in so far as we grasp that it exists, to that extent we also have some grasp on what it is ($\tau\omicron\omicron\varepsilon\tau\omicron\nu\iota\tau\iota\iota\omicron$)”—and at 93a29—“when we grasp something of what a thing is ($\tau\iota\tau\omicron\omicron\tau\omicron\nu\iota\tau\iota\iota\omicron$),” the *something* is clearly connected with ‘what $X$ is’.

In an illuminating study on the passages we are considering (II.8-10), Ackrill suggests, without entirely endorsing, a view that ‘having something of the thing itself’ is knowing part of the definition.\footnote{J. Ackrill, “Aristotle’s Theory of Definition: Some Questions on *Posterior Analytics* II 8-10,” 373.} This view that the non-incidental grasp of fact is to know a partial definition of the subject kind, and the partial definition becomes the conclusion of the later fulfilled syllogism has a long history in the commentaries of the *Posterior Analytics*. An example of such a syllogism is as follows:

Thunder is quenching of fire in the clouds.

\footnote{Bayer distinguishes three possible kinds of the incidental knowledge of facts: One can identify $X$ incidentally, (1) if there is no actual thing to which an identifying term accords, e.g. goat-stag, void, infinity; (2) when one has the mistaken belief that a certain item $X$ can be reliably picked out by a certain phenomenon $Y$ that (in fact) only occasionally accompanies it; (3) if one misidentifies $X$ as a single entity, where there is in fact no such single entity, e.g. magnanimity. (1) and (3) are problematic, since (1) as misidentification is close to mis-categorization rather than incidental grasp of something, and (3) concerns the danger of misidentification of something by means of ambiguous terms. However, he seems right that the grasp of something incidentally or non-incidentally is all about identification. G. Bayer, “Definition through Demonstration: The Two Types of Syllogisms in *Posterior Analytics* II.8,” 246-249.}
Quenching of fire in the cloud is a noise in the clouds. Therefore, thunder is a noise in the clouds.

In this syllogism, the non-incidental grasp of thunder becomes the conclusion and a part of the full definition of thunder as well, i.e., ‘thunder is a noise in the clouds due to (because of) quenching of fire in the cloud’. It goes without saying, here, that the middle, ‘quenching of fire in the clouds’ is the definiens of the real definition of thunder. On this view, Aristotle’s import that there can be demonstration of what something is in some way at 94a14-15, i.e., the main thesis of II.8-10 is understood thus: Even though the real definition of thunder is not proved, it is shown or made plain (δῆλον) through (διά) the syllogism and through the demonstration that has the partial definition of thunder as the conclusion, because the answer to the questions ‘what is thunder?’ and ‘why does it thunder?’ is given through the syllogism. This interpretation seems, then, to accomplish a double success in retrieving the sense of ‘demonstrating what something is’.

For the partial definition of ‘what something is’ is actually demonstrated as the conclusion in the syllogism, at the same time the real definition of ‘what something is’ is made plain through the syllogism. A strong support for this view comes from Aristotle’s conclusive summary that there are three types of definition near the end of the chapter 10:

[II.10a] One type of definition, then, is an indemonstrable account of what something is; another is a deduction of what something is, differing in aspect from a demonstration; a third is a conclusion of the demonstration of what something is.

The first type of definition as “an indemonstrable account” would be, in our example, that thunder is quenching of fire in the cloud; the second type as “a deduction of what something is,

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46 PoAn. II. 10, 94a11-14
47 One might oppose anachronistically that this is not indemonstrable definition, but Aristotle also supposes that this definition could be provisionally indemonstrable at 93b13-14: “If there is another middle term for this, it will come from the remaining accounts.” All the more, the current meteorology does not reach a complete consensus about the cause of thunder. See: http://en.wikipedia.org/wiki/Thunder
differing in aspect from a demonstration” would be the full definition that thunder is a noise in clouds due to quenching of fire; the third type of definition would be the conclusion that thunder is a noise in the cloud. As a matter of fact, Aristotle definitely says at 94a7-9 “a definition of thunder is noise in the clouds; and this is a conclusion of the demonstration of what it is.”

The interpretation that a partial definition is demonstrated by another partial definition goes back to the ancient commentator, Philoponus who gives us an interesting example of such a demonstration.48

\[
\text{Anger is the desire for revenge. \hspace{1cm} (formal definition)}
\]

\[
\text{The desire for revenge produces boiling of the blood about the heart.}
\]

\[
\text{Therefore, anger is a boiling of the blood about the heart.} \hspace{1cm} (material definition)
\]

Here, the full definition of anger would be that ‘anger is a boiling of the blood about the heart due to the desire for revenge’. Such an interpretation is, however, criticized by the recent Aristotelian scholarship, starting with Ackrill.49 Behind the criticism is the plain fact that Aristotle denies that proving a partial definition from another partial definition is a legitimate case of demonstration at 93a14-16: “I have said earlier that this way will not be a demonstration; rather, it is a general deduction (\(\lambdaογικος \sigmaυλλογισμος\)) of what the thing is.”50 Ackrill’s contribution in this regard lies not so much in a direct critique of this interpretation as in the fact

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48 B. Landor, “Aristotle on Demonstrating Essence,” 118. See Landor’s account and criticism on the contemporary supporters of this interpretation including, Le Blond, S. Mansion and J. Barnes.
50 Landor argues, “Far from lending support to the view that Aristotle is committed to demonstrations of the essence in the form of partial definitions, this passage would provide decisive evidence against this position, if by ‘syllogisms of the essence’ Aristotle was referring in that passage to syllogisms which demonstrate partial definitions.” B. Landor, “Aristotle on Demonstrating Essence,” 122. For Aristotle’s criticism of ‘the general deduction of what something is’, see D. Charles, Aristotle on Meaning and Essence, chap. 7.
that he paved the way to for a new interpretation of the ‘thunder’ syllogism. He distinguishes two possible cases of the demonstrative syllogism at 93b7-14: 51

<table>
<thead>
<tr>
<th>I</th>
<th>II</th>
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</thead>
<tbody>
<tr>
<td>Thunder is quenching of fire in clouds</td>
<td>A noise is quenching of fire</td>
</tr>
<tr>
<td>Quenching of fire in clouds is a noise in clouds</td>
<td>Quenching of fire is (occurs) in clouds</td>
</tr>
<tr>
<td>Thunder is a noise in clouds</td>
<td>A noise is (occurs) in clouds</td>
</tr>
</tbody>
</table>

We have inspected the first syllogism by reference to the types of definition. In contrast, the second syllogism, Ackrill says, “proves that something exists by appealing to its cause—it is a συλλογισμός τοῦ διότι. To know only its conclusion is to know that there is a noise in clouds, but not why. On the other hand, there is no mention in syllogism II of thunder, nor does its conclusion look like any sort of definition.” 52 After weighing the pros and cons of the two syllogisms, the main difference still being that the conclusion is either ‘that something is’ or ‘what something is,’ Ackrill concludes that “although the two syllogisms are very different they can both serve Aristotle’s purpose.” 53

Ackrill’s view is insufficient to grasp that, for Aristotle, only (well-established) particular facts are the objects of demonstrative inquiry and that accordingly only facts become the conclusions of later constructed syllogisms as in the syllogism II. If we spell out more the conclusion of syllogism II, it could be that “the (more or less) rumbling noise (which shocks us) occurs in those clouds.” Recall here our distinction made in chapter 2 between ‘knowledge in potentiality’ and ‘knowledge in actuality’: The object of knowledge in actuality is always definite and is thus referred to by a definite pronoun, “this,” while the object of knowledge in potentiality is indefinite and universal in the sense that a geometer, for example, is able to prove

51 J. Ackrill, Ibid. 360.
52 J. Ackrill, Ibid. 361.
53 J. Ackrill, Ibid. 363.
that the triangle has angles equal to two right angles, whatever it may be insofar as it is a triangle; but when he actually proves a certain case—being certain this is of a certain this, he always deals with a particular triangle and an angle at a particular setting.

Now, if we suppose that a scientific inquirer is dealing with an actual phenomenon that a certain rumbling noise occurs in the clouds,\(^\text{54}\) then it is evident that the statement ‘a noise occurs in the clouds’ should stand in the place of the conclusion instead of the statement ‘thunder is a noise in the cloud’, once the inquiry for the reason has been accomplished. The second syllogism shows not only that but also why a certain attribute (property), noise, inheres in a certain concrete subject (substratum), the clouds. That is what Aristotle all through the Posterior Analytics says demonstrations do. In the middle of presenting the eclipse example, he reemphasized the point at 93a36-37: “When we discover it, we know at the same time the fact and the reason why—if we proceed from middle terms.” Let us, then, look at another famous example of eclipse:\(^\text{55}\)

When we grasp something of what a thing is (τι τού τι ἐστιν), suppose first that it is like this. Eclipse A, moon C, screening by the earth B. To ask whether it is eclipsed or not is to seek whether B is or not. This is no different from seeking whether there is an account of the eclipse; and if there is, we say that it is eclipsed. (Or: of which of the contradictory pair does the account hold—of its having two right angles or of its not having them?)

Barnes sorts out two possible syllogisms from the passage:\(^\text{56}\)

Deprivation of light \((A)\) holds of screening by the earth \((B)\).

I. Screening of the earth \((B)\) holds of eclipse \((C)\).
Deprivation of light \((A)\) holds of eclipse \((C)\).

\(^{54}\) It does not imply, nevertheless, that all natural phenomena are the objects of scientific inquiry and become the conclusions of constructed demonstrations. Above all, they should be scientifically explicable and well-established facts. This point will be discussed shortly.

\(^{55}\) PoAn. II. 8, 93a29-35.

\(^{56}\) Barnes, Aristotle: Posterior Analytics, 219-220.
Eclipse holds \((A)\) of screening by the earth \((B)\).

II. Screening by the earth \((B)\) holds of the moon \((C)\).

Eclipse \((A)\) holds of the moon \((C)\).

The characteristic of the syllogism I is, according Barnes, as follows: “The conclusion represents our knowledge of ‘something of the object’, and thus gives a partial definition of \(C\) (e.g. a lunar eclipse is a deprivation of light).”\(^{57}\) On the other hand, about the syllogism II, he says, “There [in syllogism I] we read a definition of \(C\) out of the syllogism as a whole: here [in syllogism II], the first premise is a definition of \(A\)….There, our antecedent grasp of ‘something of the object’ played an evident role in the argument; here, it seems to play no role at all.”\(^{58}\) The appraisal of the two syllogisms by Barnes is exactly correct. But neither syllogisms that he read off from the passage represents what the passage intends to describe syllogistically.

The evidence against Barnes’ reading is at the end of the passage, in the parenthesis: “of which of the contradictory pair does the account hold?” We mentioned several times that for Aristotle definition is not a proposition in the sense that a proposition is one part of a contradictory pair. It means that a statement of definitional form cannot be the conclusion of a demonstrative syllogism. Then, what is one part of the contradictory pairs? Aristotle tells us, e.g. “its [triangle’s] having two right angles.” That is the fact and the conclusion of what a geometer tries to prove by means of the nominal definition of what ‘triangles’ means. What Barnes conceives here by ‘something of the object’, e.g. the *something* of ‘eclipse’ is ‘a certain privation of light from the moon’. Then, the conclusion should be that ‘a privation of light holds of the moon’, rather than that ‘deprivation of light holds of eclipse’ as in the syllogism I, or ‘eclipse

\(^{57}\) Barnes, Ibid. 219.

\(^{58}\) Barnes, Ibid. 220.
holds of the moon’ as in the syllogism II. The difference may seem trivial but is significant for understanding the import of demonstration for Aristotle.

Hence, the right syllogism should be:

- Deprivation of light holds of screening by the earth.
- Screening of the earth holds of moon.
- Deprivation of light holds of the moon.

Notice that the conclusion of this demonstration, the fact that moon undergoes privation of light, contains a partial definition of eclipse, namely, ‘privation of light from the moon’. What it proves, as Landor rightly points out, “is not the definition qua definition but qua fact. It proves this by reference to the causal essence….Thus, this syllogism is a ‘demonstrating the essence’ in the secondary (‘weak’) sense that it exhibits the essence as the middle term.”

To understand this demonstration, we have to reappraise the role of nominal definition in demonstrative inquiry. While a person who knows that ‘thunder’ is a certain (tis) noise in the clouds is in a position to proceed by investigation to the discovery of its cause and thus to a full knowledge of what thunder is, it is evident now that the statement ‘thunder is a certain noise in the clouds’ does not directly become the conclusion of the later accomplished demonstration. Rather, the conclusion is ‘the (rumbling) noise (actually) occurs in the clouds’. What ‘thunder’

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59 B. Landor, “Aristotle on Demonstrating Essence,”123. In the same context, Landor claims, Aristotle’s statement at 94a8-9 that one kind of definition is the conclusion of a demonstration can be understood to mean that the definition is exhibited in the conclusion of a demonstration. Also, Bayer gives a plausible argument in agreement with Landor on this point by his distinction between ‘explanation syllogism’ and ‘identification syllogism’. The explanation syllogism provides ‘demonstration of what something is’, while the identification syllogism gives ‘demonstration that something is’.

1. Thunder belongs to extinguishing of fire.
2. A certain noise belongs to the clouds.

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B. Landor, “Aristotle on Demonstrating Essence,”123.

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B. Landor, “Aristotle on Demonstrating Essence,”123.

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B. Landor, “Aristotle on Demonstrating Essence,”123.
signifies, i.e., the nominal definition of ‘thunder’ guides the knower of the nominal definition to identify the actual instances of the kind ‘thunder’. This initial nominal definition disappears in the remaining procedures of the search for the middle. Through the identification of the actual instances, we get a fact that a concrete subject (substratum) is actually undergoing a certain concrete state (attribute or property of the subject). In this regard, the word “a certain sort” (tis) in the examples of nominal definitions has been given special attentions by some scholars, and has brought about a small debate among them: It is rendered by some to mean a definite and clearly identifiable specimen of a kind,\(^{61}\) while for others it means the not-yet-specified but only alluded to element of the subject kind in the nominal definition, i.e., the cause or the essence.\(^{62}\)

Regardless of the debate, the claim that the role of nominal definition is used to identify actual instances of the kind can be confirmed further:\(^{63}\)

What is ice?—Assume that it is solidified water. Water \(C\), solidified \(A\); the explanatory middle term is \(B\), complete absence of heat. Thus \(B\) holds of \(C\); and being solidified, \(A\), holds of \(B\). Ice is coming about if \(B\) is coming about; it has come about if it has come about; and it will be if it will be.

When the (nominal) definition of ‘ice’, ‘solidified water’ is given, we can identify actual cases of ice. Then the fact that it is ice—rather than ice exists—becomes the object of inquiry why the water is solidified here in this place, and then we search for the reason why, the middle \(B\), the complete absence of heat in this environment. In the syllogistic construction, the term ‘ice’ does not have any place, that is, the role of what ‘ice’ signifies just guides the reasoner to identify the fact that will be the conclusion of the syllogism.\(^{64}\) An additional interesting point in the above

\(^{61}\)R. Bolton, Ibid. 521-522. See also, G. Bayer, “Definition through Demonstration,” 247, no.16.

\(^{62}\)R. Sorabji, “Analytic or de re?” 196. See also, B. Landor, “Aristotle on Demonstrating Essence,” 130 & no.21.

\(^{63}\)PoAn. II. 12, 95a17-21.

\(^{64}\)Charles rightly points out that “the conclusions of the relevant syllogisms need not contain both definiens and definiendum, provided that they are systematically connected to the term defined.” D. Charles, Aristotle on Meaning and Essence, 197.
passage is the uses of past, present, and future tenses of things that happen regularly, supporting our assertion that demonstrative knowledge in actuality is performed in concrete and particular settings. If someone still has doubts about the centrality of particulars to demonstration, the horizon on which actual demonstrative inquiry is performed, we say, these particulars are not bare particulars as particular, but the particulars as \((qua)\) instantiation of universals.

Up to this point, we have dealt with one kind of non-incidental grasp of facts, in which the nominal definitions contain a part of essences to be investigated, e.g. thunder, eclipse, and ice. When we asserted that nominal definition as a principle is given as a starting point that sets off demonstrative inquiry, it was not implied that the nominal definitions as starting points are uniquely given in the same sense that the nominal definition of ‘triangle’ is so. This clearly seems to contradict Aristotle’s stricture on definition in *Topics* VI.4, where he says there should not be more than one definition of the same thing.\(^{65}\) However, in the same text, Aristotle raises the possibility of multiplicity of definitions by introducing the distinction between ‘what is prior and familiar to us’ and ‘what is prior and familiar without qualification’. Here, he says: \(^{66}\)

\begin{quote}
In dealing with persons who cannot recognize things through terms of that kind [prior and familiar terms without qualification], it may be necessary to frame the account through terms that are familiar to them. Among definitions of this kind are those of a point, a line, and a plane, all of which explain the prior by the posterior; for they say that a point is the limit of a line, a line of a plane, a plane of a solid.
\end{quote}

This passage clearly shows that Aristotle caught sight of a problem of definitional practice among his contemporary mathematicians, but could deal with the problem within his notion of ‘what is familiar to us’. The examples of nominal definitions that we examined so far are in a sense ‘definitions that are familiar to us’. They do not have to be unique. Also they do not have

\(^{65}\) *Topics*, VI. 4, 141a26-141b2.  
\(^{66}\) *Topics*, VI. 4, 141b16-22.
to be necessary conditions for us to identify the actual cases of a subject kind. It is widely
accepted now by scholars that the odd example of another nominal definition of eclipse, “not
being able to produce a shadow during full moon although nothing visible is between us and it,”
is a sufficient condition for us to identify the actual case of eclipse, and thus to establish the fact
to be explained by the further inquiries.\textsuperscript{67} Aristotle says at 93b2-3, therefore, “it is plain \textit{that} it is
eclipse but not yet \textit{why}; and we know \textit{that} there is an eclipse but do not know \textit{what} it is.” The
point to be made now is nicely documented by Ackrill in the following:\textsuperscript{68}

Let ‘\(Q\)’ stand for an investigator’s initial idea of \(X\). The stringent requirement is that only
where \(Q\) is part of the real definition can the investigator hope to achieve knowledge of
the real definition of \(X\). But there are surely many other cases where success may
reasonably be hoped for: where \(Q\) is (a) a property peculiar to \(X\) (\(\iota\delta\iota\nu\)), or (b) otherwise
necessarily connected with \(X\), or (c) not necessarily but in fact universally connected with
\(X\), or (d) not universally but nearly always connected with \(X\). In every one of these cases
the investigator is in some sort of position to investigate the right items and learn more
about them…

Ackrill speculates here about the possible candidates that will later become the predicate of the
conclusion to be constructed: (a) properties, (b) per se incidentals, (c) not-necessary but universal
predicates, (d) items true for the most part (\(\epsilon\pi\iota\; \tau\omicron\; \pi\omicron\lambda\omicron\). Strictly speaking, it is doubtful the
last two can be candidates, but there is a possibility for them to be hopefully incorporated into
the first two, not at the stage of establishing facts but at the stage of revealing the causes, since
the ‘universal’ and ‘for the most part’ predications will do their work by establishing facts in the
first stage of inquiry. One thing Ackrill misses here, though, is that these candidates apply only
to substantial entities. The subject kinds of demonstrative inquiry in the examples of chapters 8-
10, are not substantial entities—clouds, moon, water—but per se incidentals or properties of

Demonstration,” 250-253 ;
substantial entities—thunder, eclipse, ice.\textsuperscript{69} Then, only to the third example of nominal definitions, ‘man’, ‘a sort of animal’, will the four items be useful for establishing facts to be investigated—‘Man’ is a sort of a thing to be capable of learning grammar; ‘man’ is a sort of thing capable of laughing, ‘man’ is a sort of thing to live together, ‘man’ is a sort of thing to cook, ‘man’ is a sort of thing to be able to play games.\textellipsis

At the beginning of Book II, Aristotle says, “when we seek whether this or that is the case…, \textit{we are seeking the fact}…When we know the fact \textit{we seek the reason why}.” It is plain that there are two stages in the demonstrative inquiry: the first stage is to seek and establish facts, and the second stage is to reveal the reason for the facts. For Aristotle, to establish that something is the case is just as complicated as to reveal the cause of the fact. We have tried to show how nominal definitions, though not unique and sometimes not transparent, are used to seek and establish non-incidental facts, i.e., actual cases that something is undergoing (or is qualified by) a certain state non-incidentally. But to impart the whole burden of establishing facts only to the nominal definition would not be the Aristotelian way. In the passage we quoted earlier, Aristotle informs us that induction (ἐπαιγωγή) is another way, saying that induction “proves not what a thing is, but rather\textit{ that} it is or is not\textsuperscript{70} to the extent that “everything is thus-and-so inasmuch as nothing is otherwise.”\textsuperscript{71} Also Aristotelian \textit{empeiria}, as accumulated experiences, must contribute to the work of seeking and establishing facts in line with induction. In addition to these, a kind of identifying syllogism as Bayer argues for,\textsuperscript{72} or the inductive

\textsuperscript{69} In this case, the real definition is the major premise of demonstrative syllogism: 93b6-7 says “And this is the account of the one extreme [major term], i.e., in this case $A$; for an eclipse is a screening by the earth.” But in the case where substantial entities are subject kinds at issue, the real definition must be minor premises.

\textsuperscript{70} PoAn. II. 7, 92a39-92b1

\textsuperscript{71} PoAn. II. 7, 92a39.

\textsuperscript{72} See the earlier note about his argument.
syllogism (συλλογισμός ἐξ ἐπαγωγῆς) of the Prior Analytics might be used at the final phase of establishing facts. When both causes and effects as facts are at the near same level of perceptible as in I.13 of the Posterior Analytics—‘nearness of planets’ and ‘not twinkling of planets’, quia demonstration also will do the work of establishing facts. To seek and establish (scientific) facts, to an Aristotelian inquirer, is not a linear task done by a single method but a complicated task.

To establish correctly scientific facts is the inevitable first step to the next stage of revealing the cause. Hence, in the Nicomachean Ethics, Aristotle asserts:

“It is enough in some cases that the fact be well established (τὸ ὅτι δεῖξθαι καλῶς), as in the case of the first principles; the fact is a primary thing or first principle (τὸ ὅτι πρῶτον καὶ ἀρχὴ). Now of first principles we see some by induction, some by perception, some by a certain habituation, and others too in other ways….we must take pains to determine them correctly, since they have a great influence on what follows. For the beginning is thought to be more than half of the whole, and many of the questions we ask are cleared up by it.”

A fact is a primary thing or a first principle as a starting point, Aristotle says here, and we must take pains to determine them correctly by means of induction, perception, or a certain habituation, because to establish facts correctly is more than half of the whole.

What makes it so important and difficult as well to correctly establish facts in demonstrative inquiry? For this, we should recall the kind of paradox we disclosed during our examination of the scientific questions in II.1-2. When the four basic scientific questions—hoti, dioti, ei eistin, ti estin—are reformulated by Aristotle into the two more sophisticated questions,  

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73 PrAn. II. 23,68b15-38. Besides Ross’ useful account of induction, see the one by De Rijk: “In Aristotle the term epagogē, I take it, refers to a pre-argumentative procedure consisting in (a) the adduction of one or more particular instances, which (b) is directed towards disclosing a katholon element that enables us to understand the formal nature of the particular(s) and its (their) likes. The disclosure of the formal nature does not take place by formal, discursive inference, but is, as it were, jumped upon by an intuitive act of knowledge, and it is this intuitive act that enables us to recognize the particulars as instances of this or that formal nature.” L. De Rijk, Aristotle: Semantics and Ontology, 141-142.

74 Nicomachean Ethics, I. 7, 1098b1-8.
‘is there a middle?’ and “what is the middle?’ we raised the possibility of paradoxes lurking between the two question: {P1} how can we seek for the middle, before we know what it is?—temporal paradox; {P2} how can we know that there is a middle, even without knowing what it is?—logical paradox; {P3} how can we recognize the middle at the level of the hoti question, even if we come across it in the midst of hoti inquiry?—paradox of criterion of identification. A few scholars who address the issue, i.e., the paradox of inquiry between knowing ‘that X is’ and knowing ‘what X is’ find the resolution of the paradox in Aristotle’s assertion on the partial and thus non-incidental knowledge of X that can be provided by nominal definitions as we saw reviewing the study of Bolton.\(^7\) That is, we can set off to investigate ‘what X is’ from the partial and non-incidental knowledge of X, even though we do not know yet the real nature of X at the initial stage of inquiry. However, that cannot be a real resolution of the paradox, since to the partial-knowledge claimant who might have gone through the first stage of establishing facts and just begins the stage of revealing ‘what X really is’ we can still ask on what ground it is guaranteed that your partial knowledge is the knowledge of X.

Let us put this problem a little differently. In the view of Aristotle, when we inquire into facts we are searching for the existence of a middle term for a demonstrative proof; and when we inquire into the reason and ‘what it is’ we are searching for the nature of the middle, i.e., essences. Conversely, if we know a fact, we know that there is a middle, i.e., the reason (dioti). How could this be possible? How could it be possible to know the existence of a middle without knowing the nature of the middle? Without doubt, this problem is also connected to the two

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\(^7\) Charles argues that unlike Plato, Aristotle firmly distinguishes ‘what the name X signifies’ and ‘what X is’ so that this, in turn, allows him to respond satisfactorily to Meno’s paradox. D. Charles, “Types of Definition in Meno,” in *Remembering Socrates: Philosophical Essays*, ed. L Judson & V. Karasmanins (Oxford: Clarendon Press, 2006), 110-128.
conclusions of our previous section: (3) both nominal definition as given and real definition as
sought for signify essences;\(^\text{76}\) (4) a demonstrative inquirer’s signification of essences continues
throughout the whole process of coming to know the essences. Then, we have to ask: what
justifies the assertion of \textit{continuity of signification} at the initial stage of inquiry?

The following statements by Ackrill concern this same issue, though they do not directly
address the Aristotelian resolution of the paradox.

[Ack-1] What exactly is it that the scientific investigator has to know if he is to ask
question ‘why \(p\)?’ (or ‘what is \(X\)?’), and how does he come to know it? . . . But the
knowledge or \textit{supposition} [italics mine] that \(p\) (where \(p\) is a generalization) or that there
are \(X\)s, is not enough. The investigator must \textit{suppose} [italics mine] also that \(p\) is a
\textit{scientifically explicable} truth, derivable from basic scientific laws or starting points
(\(\alpha\rho\chi\alpha\iota\)). . . No such explanation (\(\delta\iota\omicron\tau\iota\)) can be found for accidental truths or casual
concomitances; and it is \textit{only if one supposes} [italics mine] that there is such an
explanation that one will ask what it is. Thus the necessary \textit{presupposition} [italics mine]
of the scientist’s enquiry ‘why \(p\)?’ is that explicable-p.\(^\text{77}\)

[Ack-2] But how can anyone be justified in making the move from \(p\) to explicable-\(p\)
\textit{before} finding out the explanation? Aristotle speaks blithely of our recognizing or
grasping that there is a middle term (89b38, 90a8; 90a22) and then going on to inquire
what it is. He does not say what leads us to \textit{suppose} [italic mine] or recognize that there
is a middle term, why and with what justice we go from \(p\) to explicable-\(p\) or from the
belief that \(p\) is true to the belief that it is necessarily true.\(^\text{78}\)

Ackrill points out brilliantly: It is \textit{because of} our \textit{supposition} and \textit{only if we suppose} that a certain
fact \(p\) or our belief that \(p\) is true is the explicable-\(p\), that \(p\) becomes a scientific fact. It is
grounded on our pre-supposition that \(p\) is not just a fact that a certain thing is in a certain state,
but a scientific fact that a certain thing has an \textit{explicable} attribute which has to be revealed by
further investigations. For Aristotle, scientific inquiries are possible by the very power of the

\(^{76}\) Charles gives a cautious appraisal of the semantic depth of nominal definitions: “the enquirer (at Stage I) need
only have a comparatively shallow grasp of the nature in question.” D. Charles, \textit{Aristotle on Meaning and Essence},
55.


\(^{78}\) J. Ackrill, Ibid. 378.
inquirer’s pre-supposing. Also it is because of the presupposition that the demonstrative inquirer’s signification of essences remains and is continuous in the whole process of coming to the essences. Then, is this the Aristotelian way to resolve the paradox of inquiry? That is still an open question to pursue later, but at least in the text we are dealing with, Aristotle does not seem to answer the question. As Ackrill puts it, he does not say “what leads us to suppose or recognize that there is a middle term, why and with what justice we go from $p$ to explicable-$p$.”

However, we can see now a most significant point that we could not realize when we were dealing with the principles of Aristotelian demonstrative knowledge, hypothesis, definition, and axiom. In our first chapter, we attained the main thesis that the hypothesis as a principle in Aristotle’s theory of demonstrative knowledge is the semantic identification of a particular object in the syntactic form of ‘$x$ being $F$’ on the proof-theoretic condition that it serves as a starting point for a demonstrative inquiry. That is, the hypothesis as a principle is all about the facts to be established in the demonstrative inquiry. Why does Aristotle call one of the principles, ‘hypothesis’ (ὑπόθεσις)? It is because a demonstrative inquirer supposes there to be an unrevealed middle in the facts. With this supposition, i.e., hypothesis, a demonstrative inquirer begins his journey of investigation to the reason, the essence of an underlying subject kind. The journey of investigation might be unsuccessful, sometimes not reaching to the maximal universal cause, while at another time ending up with a total disposal of the initial fact as inexplicable. But without the supposition and hypothesis, the journey itself cannot begin.

So far we have examined in Aristotle’s demonstrative inquiry (a) what the non-incidental grasp of facts is, (b) how nominal definitions are used to establish the non-incidental facts, (c)

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whether the nominal definitions can be not unique but various, (d) if there are the ways other than nominal definitions to establish the non-incidental facts, (e) why it is so important and difficult to establish the non-incidental facts. In the rest of this section, we will deliberate on (f) how the factual (hoti) knowledge as established before the second stage is connected with the reasoned (dioti) knowledge as it stands through demonstration.

Let us consider the following passage from PoAn II.10:80

[II.10b] One definition of definition is the one we have just stated. Another definition is an account which shows why something exists. Hence the former type means something but does not prove it, whereas the latter will clearly be like a demonstration of what something is, differing in arrangement from a demonstration. For there is a difference between saying why it thunders and what thunder is. In the one case you will say: Because the fire is extinguished in the clouds. But: What is thunder?—A noise of fire being extinguished in the clouds. Hence the same account is given in different ways: in one way it is a continuous demonstration, in the other a definition. Again, a definition of thunder is noise in the clouds; and this is a conclusion of the demonstration of what it is.

The definition of an immediate item is an indemonstrable positing of what it is.

This passage describes the finished state of the second stage of demonstrative inquiry, the stage of revealing the cause. Here follow some points that we have already made but need to summarize. There are others that we should think over and supplement for clarification.

We can see evidently from the passage that there are four types of definition in the two stages of demonstrative inquiry: [df₁] one type of definition at the stage of establishing facts, which “signifies something but does not prove it,” and the three types of definition as the results of the stage of revealing the cause, that is, [df₂] the definition differing in arrangement from a demonstration, while manifesting the cause, [df₃] the definition as a conclusion and [df₄] the definition as an indemonstrable positing of what it is. We have argued that [df₂] can be read off from the demonstration why or that something is the case, not from the demonstration what.

80 PoAn. II. 8, 93b38-94a10.
something is, e.g. “thunder is a noise of fire being extinguished in the clouds.” Likewise, [df3] can be read off or is contained in the conclusion of the demonstration, e.g. the definition of thunder from the conclusion ‘a noise occurs in the clouds’. And [df4] can be either the minor premise or the major premise of a demonstration depending on whether the subject kind is either substantial entities or attributes of subjects like ‘thunder’.

However, the passage does not tell us the actual procedure of how a demonstrative inquirer comes up with the middle, the cause of the fact that is manifested through the demonstration. Distinguishing the last three types of definition must be the outcome of Aristotle’s reflection on the finished state of the whole demonstrative inquiry. It is not hard to think, though, that the way to the middle will start with the fact as established, i.e., the hypothesis that a certain thing (subject) has an explicable attribute (predicate). That is, the established facts are the platform from which to proceed to any plausible causes that will explain the necessary connection between subjects and attributes. Since the ‘what-it-is’ device is, as we have shown in the previous chapter, the decisive tool for demonstrative inquiry, the search for the middle must find the connecting point among the items of what-the subject-is and the items of what-the attribute-is.81 It is understandable in this context that “it is by interpolating a term internally and not by assuming an additional term, that what is demonstrated is demonstrated.”82

Clearly then, the movement of reasoning in Aristotle’s demonstration follows from the subjects

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81 Chapter 13 of the book II confirms that the ‘what it is’ question is the main tool for finding the middle: “We have shown above that whatever is predicated in what something is is necessary (and what is universal is necessary), and the case of triplets –and of anything else for which we take terms in this way—whatever we take is in what the item is: thus triplets will have these features from necessity.” PoAn. II. 13, 96b3-6.

82 PoAn. I. 22, 84a36-37.
and predicates of facts to the plausible reasons, which in turn are expressed as premises. Therefore, Aristotle’s demonstration is not deduction from premises to conclusions.\(^8\)

In an ideal case in which the cause of a fact is successfully identified, for example, when the efficient cause of the noise in the clouds is identified with quenching of fire in the cloud, the initial fact undergoes a modification: it is not just a likely scientific fact, i.e., a hypothesis, but a conclusive fact that something is necessarily the case because of the revealed reason. The perceptible fact that a loud noise resides in the clouds is a necessary consequence of the reason that a quenching of fire occurs in the clouds. The conclusions of demonstration are not any longer hypotheses: They are not just factual (\textit{hotti}) knowledge but reasoned (\textit{dioti}) knowledge. See here the multiple transformation that the final conclusion of a successful demonstrative inquiry has gone through: That ‘thunder’ is a certain noise in the clouds is a nominal definition, and that a (rumbling) noise occurs in the clouds is an established fact and at the same time a hypothesis for a demonstrative inquiry, and now the conclusion that a noise occurs in the clouds is a reasoned knowledge and at the same time a ground for a type of definition, i.e., definition as conclusion.

Through demonstration, the factual knowledge \textit{before} demonstration and the reasoned knowledge \textit{after} demonstration are interconnected: the factual knowledge points to the way in which the \textit{per se} cause could be found, and the middle as the \textit{per se} cause gives the reason why the fact is necessary, thus making it reasoned knowledge. Aristotle’s remarks on the types of

\(^8\) In the middle of his intensive study on the relationship between definition and demonstration, Charles rightly confirms this point: “Aristotle does not attempt to show that every science must contain a set of basic propositions which are undervivable from the remainder, and then argue that these propositions must be definitions which can satisfactorily answer the ‘What is F?’ question. That is, he does not impose a structural constraint on demonstration, and argue that only a subclass of knowable propositions can meet it. Rather, he begins with the substantial claim that demonstrations must begin with statements concerning essences, which (if they are to answer satisfactorily the ‘What is F?’ question) must be knowable by us. If so, the practice of demonstration is once again constrained by considerations drawn from our practice as definers.” D. Charles, \textit{Aristotle on Meaning and Essence}, 216.
definition in the stages of inquiry lay emphasis not on how many types (3 or 4) of definition are classified, as commentators all along have thought in their debate, but rather on the intrinsic connection between the defining task and the demonstrating task. The way in which a bit of factual knowledge is connected with an instance of reasoned knowledge is the way in which definitions and demonstrations are woven together so as to be interdependent. 84 For the text II.1-10 ultimately tells us not only that the quest for ‘what X is’ is only accomplished by the quest for ‘why X is’, but also that the question ‘why X is’ can be answered only when, in the course of answering it, the ‘what X is’ is disclosed. Hence, Aristotle says at 93b18-19, “without a demonstration you cannot get to know what something is.”

Finally, a few remarks need to be made concerning the relationship between essences and the definition as indemonstrable positing. At the end of the thunder demonstration (93b12-14), Aristotle adds that “if there is another middle term for this, it will be from among the remaining accounts.” This passage implies that the definition as indemonstrable positing is literally a positing (θέσις) of what it is (τοῦ τί ἐστιν) as ( provisionally) indemonstrable (ἀναπόδεικτος). It remains open for the positing to be revised later, but not it is not infinitely revisable, since “the middle term will always be thickened until they become indivisible and single.” 85 Essences are there as the limit and end in Aristotle’s demonstrative inquiry in as much as definitional quest always demands one and unity. Nonetheless, there is a room for revision and fallibility in the course of greater determination of essences.

84 Thus Aristotle is committed to the following claims, as Charles recapitulates: “Aristotle, I have argued, is committed to the following three basic claims:
(D) Our practices of definition and of explanation are incomplete without the assistance of one another.
(E) Essences and per se causes are co-determined.
(F) The interdependency of our practices rests on the co-determination of essences and per se causes.” D. Charles, Ibid. 349.
85 PoAn. I. 23, 84b35-36.
§3.3 The Fallibility of Demonstrative Inquiry and the Role of imperfect Demonstration.

According to the axiomatic interpretation, fallibility, one of the main characteristics of modern science, cannot figure in Aristotelian demonstrative science, because Aristotelian demonstrative sciences are conceived to be linear deductive processes from axioms and definitions that are true and necessary to lower theorems. Thus, axiomatic interpreters could not accommodate in their exegesis this candid statement by Aristotle.⁸⁶

It is difficult to know whether you know something or not. For it is difficult to know whether our knowledge of something proceeds from its principles—and this is what it is to know something.

From our examination of Aristotelian demonstrative knowledge up to this point, we can say, the fundamental reason why demonstrative inquiry or explanation is difficult is that one cannot be so sure whether the explanatory middle ‘hunted out’ (ἐθηρσθην) is a maximal universal cause.

When we dealt with ‘primitive-universal’ demonstration in the previous chapter, we saw that for Aristotle, any demonstrative proof that does not fulfill the strict requirements of the primitive-universal demonstration is regarded as an error. While it is true that the Posterior Analytics comes ultimately down to articulating the primitive-universal demonstration as the ideal case of knowledge simpliciter, the treatise abounds with non-ideal or imperfect forms of demonstrations. Besides PoAn I.5, where Aristotle discusses the three ways of error in which “we may delude ourselves into thinking we have a universal-primitive demonstration,”⁸⁷ PoAn. I.16-17 deal with ‘ignorance’ as an error coming about through deduction, and I. 24-26 compare different forms of demonstration—universal vs. particular demonstration, and positive vs. privative demonstration—and weigh in the pros and cons of each demonstration. Aristotle in the

Posterior Analytics is keenly attentive to various possible errors into which a demonstrative inquirer may fall.\(^8^8\)

Now considering both the difficulty of finding out maximal universal causes and the various forms of imperfect demonstration, we are in a position to consider the question of fallibility and also the issue of the dynamism of Aristotelian demonstrative inquiry. In this regard, this section reviews the recent studies by Lennox, Kosman, and De Groot, all of whom give scholarly attention to specific forms of imperfect demonstrations from somewhat different perspectives.

First, Lennox, in an article that clearly has in mind the still debatable question of the discrepancy between the theory and practice of Aristotelian science,\(^8^9\) argues strongly against Barnes’ conception of Aristotelian demonstration as philosophical pedagogy. Lennox concludes his study:\(^9^0\)

I have been unwilling to adopt the expedient that APo. is primarily a treatise in pedagogy. At the very least it is an exploration of those themes central to the Theaetetus: what is scientific understanding, how do we distinguish the person possessing it from the person with opinions, what sorts of facts can we hope to have understanding of, what place do sense perception, causal explanation, definition and division have in our account of understanding? . . .

The argument of this paper leads me to think that we need to reassess the evidence that has been used to claim that Aristotle would have pictured a science of zoology as an axiomatic system \textit{à la} Euclid’s Elements, had he based it on the APo.

Lennox’s conclusion above is based on his careful observation of the conformity of the methodological recommendations of Posterior Analytics II.14 to the evidences of Historia Animalium and Parts of Animals that he understands to follow the recommendations. Crucial to

\(^8^8\) We may add I.7, which warns us not to prove by crossing from another kind.


our interest, though, is the distinction that he ingeniously makes and uses\textsuperscript{91} to support his argument for the conformity, that is, A-type demonstration vs. B-type demonstration. An instance of the A-type demonstration is:

2\textit{R} belongs to every triangle.

\textit{Being triangle} belongs to every isosceles figure.

2\textit{R} belong to every isosceles figure.

Then, Lennox appraises the characteristics of this demonstration:\textsuperscript{92}

1. The predication to be explained is the predication of a feature which belongs to its subject necessarily, but to other subjects as well.

2. The predication is explained by showing that the subject is an instance of the kind to which the predicate belongs primitively and as such...

3. Thus, were one to syllogize the explanation, the middle term would identify the proximate kind of the subject, with respect to the predicate in question.

We learned already that in I.5, Aristotle demarcated A-type demonstration strictly from the primitive-universal demonstration, and depreciated its value in his overall articulation of knowledge \textit{simpliciter}. Lennox, however, reconsiders the value of A-type demonstration, considering carefully Aristotle’s ambivalence towards it. In historical terms or in terms of

\textsuperscript{91} The ingenuity of the distinction, we should rather say, seems to reside in his appraisal and use of the distinction for supporting his main argument, since the two types of demonstration have long been recognized traditionally as the two types of propter quid demonstration: “In the most perfect type of propter quid demonstration, all of the terms of the syllogism, S, M, and P, are commensurately universal. However, as long as the middle term and the attribute or predicate are convertible, there is a propter quid demonstration, even though the subject of the given demonstration has a more limited extension than the proper subject of the attribute. For example, every isosceles or equilateral triangle has three internal angles equal to two right angles…” W. Wallace, \textit{The Modeling of Nature} (Washington, D.C.: The Catholic University Press, 1996), 294.

\textsuperscript{92} Lennox, Ibid. 93.
cognitive development, he claims, the A-type demonstration is a kind of “intermediate stage” in the following sense:\textsuperscript{93}

We may occasionally learn that a feature belongs to every $A$, then that it belongs to every $B$, and $C$. . . , and not yet notice that $A$, $B$, and $C$ share a common nature ($K$) in virtue of which they all have that feature. In fact, I learned that chimpanzees, great apes, humans and orangutans were each tailless before I realized there were all members of a group, the hominoids, of which this is a peculiar feature. I learned this, in turn, before I learned that the hominoids share a common ancestor in the late Miocene era.

Knowing that each—chimpanzees, great apes, humans—are tailless in virtue of their being hominoids is clearly an intermediate stage in the way to knowing why all hominoids are tailless. But even before the intermediate stage, there should be a stage in which an inquirer has only the partial knowledge that humans and etc. are tailless. This partial knowledge is an inevitable prerequisite to the intermediate stage of demonstrative inquiry, i.e., A-type demonstration. Lennox presents another example in the biological works for the clarification of this partial knowledge: “if one knows, for example, that lion and ox were each covered with body hair, but hadn’t yet recognized that each of these kinds had a common nature, both being viviparous quadruped, one would lack a true understanding… In fact, a researcher would consistently describe in partial terms (\textit{kata meros}) what belongs universally (639a23).”\textsuperscript{95}

The value of A-type demonstration, which at one point in \textit{PoAn} I.5 was depreciated as an erroneous demonstration, lies in the fact that it accomplishes recognition or naming of the common genus so that “one refers to their nature at the correct level of generality with respect to the problem to be solved.”\textsuperscript{96} The common genus,\textsuperscript{97} ‘hominoids’ and ‘being viviparous

\begin{itemize}
\item \textsuperscript{93} Ibid. 95
\item \textsuperscript{94} Ibid. 94.
\item \textsuperscript{95} Ibid. 114-115.
\item \textsuperscript{96} Ibid. 115.
\end{itemize}
quadruped’ in the above examples, connects the partial knowledge with B-type demonstration.

All three stages of demonstration, that is, the preliminary stage of partial knowledge, the intermediate stage as A-type demonstration, and the final stage as B-type demonstration occur evidently in II. 16-17 of the *Posterior Analytics* as Lennox says:98

…the middle term is an account of the first extreme: that is why all understanding comes about through definition. E.g. shedding leaves follows together with the vine [kind] and extends beyond it; and with the fig [kind] and extends beyond it—but it does not extend beyond all, but is equal in extent to them. Thus if you were to take the primitive middle term, it is an account of shedding leaves. For there will be a middle term in the other direction (that all are such and such); and then a middle for this (that the sap solidifies or something else of this sort). What is shedding leaves? The solidifying of the sap at the connection of the seed.

The knowledge that all vines shed leaves is an instance of partial knowledge, but the knowledge that all broad-leaved plants shed leaves is a major premise among the A-type of demonstration, and then the demonstrative knowledge that:

1. Shedding leaves belongs to everything which undergoes solidification of sap at the seed connection.
   - **Solidification of sap** at the seed of connection belongs to every broad-leaved plant.
2. Shedding leaves belong to every broad-leaved plant.

This syllogism is a B-type of demonstration, i.e., primitive-universal demonstration. What Lennox argued consequently in his study is that a non-ideal case of demonstration can become an invaluable bridge or means to proceed to the ideal case of demonstration.


98 *PoAn*. II. 17, 99a21-29.
Kosman’s investigation of necessity in the hybrid syllogism of *Prior Analytics* I.9 seems to be in line with what Lennox conceives to be an imperfect but invaluable demonstration. There Aristotle writes:\(^9^9\)

…assume that \(A\) belongs or does not belong to \(B\) of necessity, and that \(B\) belongs simply to \(C\). If we make this assumption, then \(A\) will also belong or not belong to \(C\) of necessity. For since \(A\) belongs or does not belong of necessity to every \(B\), and \(C\) is one of these \(B\)s, it is clear that \(A\) will also of necessity either belong or not belong to \(C\). But if the \(AB\) premise is not necessary whereas the \(BC\) premise is necessary, the conclusion will not be necessary. For if it were, it would follow that \(A\) belong to some \(B\) of necessity, by the first and third figure. But this is not true.

Kosman observes that “in the case of these two hybrid Barbaras, the inheritance of the necessity trait follows the modality of the dominant major premise rather than that of the recessive minor premise. *Necessarily* \(AaB\) and \(BaC\) yields necessarily \(AaC\), whereas \(AaB\) and necessarily \(BaC\) yields merely \(AaC\).”\(^1^0^0^\) He considers one of the forms of hybrid Barbara: \((x)[Mx \rightarrow \text{Nec} Px]\) and \((x)[Sx \rightarrow Mx]\), therefore \((x)[Sx \rightarrow \text{Nec} Px]\), and illuminates its implication from his own understanding of Aristotelian demonstration.

For Kosman, demonstration as explanation is first and foremost an *act of revealing*: Explanation is “one of *revealing* why this—a certain *pragma* consisting of one sort of thing being another—has to be so.”\(^1^0^1^\) At the same time, demonstration is a sort of semantic re-description of an entity:\(^1^0^2^\)

An explanation attempts to show why an entity that may be identified under one description may, just because it can be identified under that description, also be identified under another description…. it is not simply an accident that some entity which is \(F\) is \(G\),

\(^9^9\) *PrAn*. I. 9, 30a15-27
\(^1^0^2^\) Ibid.
since the description by which the entity is specified as being F is connected by some sort of necessary connection to the description by which the entity is specified as being G. This explanatory office, as we know, is accomplished by the middle.

Therefore, in the paradigm case of scientific understanding, the initial description of an entity (subject of conclusion: minor extreme), the additional description of the entity (predicate of conclusion: major extreme), and the more general mediating description (the middle) have to be necessarily connected with each other.

The above form of hybrid Barbaras in I.9 of the Prior Analytics, however, has a necessary major, a merely assertoric minor premise, and a troublesome necessary conclusion. Considering Aristotle’s claim in I.6 of the Posterior Analytics that any demonstrations whose premises are not necessary are not capable of generating knowledge in the full sense, Kosman acknowledges that the modally hybrid syllogism, even though logically valid, is a sort of imperfect demonstration. An example of the hybrid demonstration is given by Kosman:

Having two right angles belongs necessarily to triangle

Triangle belongs contingently to this figure

Having two right angles belongs necessarily to this figure qua triangle.

What has been revealed in this imperfect demonstration is the fact that the figure’s having two right angles can only be understood insofar it is apprehended as this triangle, and not merely as this figure.

Notice here the difference between this hybrid syllogism and A-type demonstration given by Lennox, that is, the minor term, the small difference of which reflects the significantly

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103 Kosman himself accepts the similarity of this hybrid demonstration with that as an imperfect demonstration, saying “the entire discussion which I’ve here devoted to explanations of the particular qua individual is more appropriate with respect to explanations of the particular qua what is kata meros in the sense Lennox explains.” Ibid. 359, no. 17.
different ways in which Aristotelian demonstrative science is understood. Aristotelian science, Kosman claims, has “its source and telos in the particularity of experience.”104 Thus, the first indispensable task of scientific explanation will be the “noetic task of correctly describing particulars, of finding the right universal to characterize those beings which have been picked out by the mere thises and thats of our initial discourse.”105 As a consequence, the hybrid mode of reasoning, though it does not in itself constitute scientific understanding in the strict sense, serves to apprehend particulars in terms of general natures which explain their being, revealing it most fundamentally in terms of what it is.

Both Lennox and Kosman in their studies highlight the value of a specific kind of imperfect demonstrations in the progress toward knowledge in the strict sense, but they did not develop from it any interpretive idea aimed at understanding the fallibility of Aristotelian sciences. De Groot in her recent study106 that responds to two Aquinas lecturers on Aristotle’s Posterior Analytics, those of MacIntyre and McMullin,107 makes strong arguments for the fallibility of Aristotelian sciences.

De Groot takes her interpretive route from the analysis of II.7-10 of the Posterior Analytics to the assessment of I.2-3, where her respondents conceive an a priori deductivism and perfectionism to belong to Aristotle’s theory of demonstration. The first most important insight we can gain in II.7-10, she says, is the distinction between knowing the existence of a cause and

104 Ibid. 358.
105 Ibid. 361. We can see that the perspective from which Kosman describes Aristotelian demonstration is very close to ‘demonstrative knowledge in actuality’ or ‘demonstrating by setting forth (ekthesis)’ that we tried to make evident in the previous chapters. But he seems to fall short of recognizing the fact that knowledge in the full sense, i.e., primitive-universal demonstration as well should be performed on the level of arbitrary individuals, that is, demonstrating by setting forth.
knowing the exact *nature* of it in a demonstrative investigation, and the former, knowing the existence of the cause, grounds the entire process of demonstrative reasoning. In a scientific investigation, knowledge of the existence of a cause depends on an *observable trait* of something, since the observed trait becomes consequently the major term, i.e., the predicate of the conclusion in the later constructed syllogism. In all probability, De Groot already implicates the fallibility of a scientific investigation even in this initial stage, because she says of the observed trait that it is something “known or *suspected* to belong to a subject in nonincidental way.”

In criticizing *a priori* deductivism from the concept of an observable trait, De Groot says, “Aristotelian sciences do not start with first principles but with significant observable traits of things or states of affairs.” These are platform from which demonstrative reasoning starts:

This means that observable traits figuring in conclusions are sifted and analyzed in a context of necessary connections. It is assumed that a trait is situated within some set of necessary connections that includes a proximate cause. The purpose of investigation is to narrow the relevant set of connections that support the trait, so as to settle upon a demonstrative structure. This is accomplished by eliminating conditions that are incidental, or else causal but too broad or too narrow. There will be a back and forth process of reasoning pivoting on the trait special enough to command an assessment of its being necessary.

The crucial point is that demonstrative reasoning lies in trawling for the necessary connection between subjects having observable traits and any plausible proximate cause in relation to empirical and theoretical considerations. In this reasoning, there are enough rooms to allow various forms of imperfect demonstration. Thus, De Groot maintains:

… there is no impediment to considering other sorts of demonstration besides the kind involving the proximate cause as middle term. This is a point Aristotle makes in discussing ὅτι demonstrations. Many demonstrations “of the fact” will have διότι, or *propter quid*, form, but will lack the component of commensurate universality (ἴα ἄυτό ὅ

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108 J. De Groot, Ibid. 468. This may correspond to hypothesis as a principle, as we argued in the previous section.
109 Ibid. 469.
110 Ibid. 471.
1.4). There are also demonstrations of διότι form at the level of proximate cause that have not yet defined the proximate cause with precision, as he says in AP 2.13-17. Comparing these “imperfect” sorts of demonstrations is how we learn to judge when we have come to rest with genuine causes in an investigation.

What is remarkable in De Groot’s treatment of imperfect demonstration is her attention to the ὁτι demonstrations in I.13 of our treatise, besides the imperfect forms of propter quid—A type demonstration in Lennox and the modally hybrid form of demonstration in Kosman. Here, she tries to grasp anew the value of the ‘demonstrative regressus,’ of which there is a rich on-going discussion in the Medieval and Renaissance commentaries.¹¹¹ This form of reasoning makes sense, she argues: “If there are necessary connections of the sort Aristotle envisions between subjects and observable traits—and in propositions, between subjects and signifying predicates—then these connections are, for the investigator, a ladder traversable in either directions.”¹¹² Moreover, with her assessment of the six conditions of knowledge simpliciter in their relation with necessary and causal structure of demonstration—“Necessity and priority, even more than firstness or commensurate universality, are the salient features of premises of ἐπιστήμη ἀπλῶς”—De Groot comes to the conclusion:¹¹³

More could be said, by drawing upon examples of different kinds of ὁτι demonstrations… These passages from the first six chapters of AP 1 provide at least the framework for understanding how one might have a grasp of necessary connections imperfectly but still be demonstrating, as long as the investigator is on the trail of genuine connections. Nominal definitions of things that have a τί ἐστι provide the empirical data that sustains this process. It is by seeking the τί ἐστι that causal priority is established within the demonstrative structure.

¹¹² Ibid. 476.
¹¹³ Ibid.
For De Groot’s construal of fallibility, her views on nous are as important as her insight on the distinction between knowing the existence vs. knowing the exact nature of a cause, and on the significance of observable traits.\textsuperscript{114}

\textit{Nōûs}, however, is involved even in the initial grasp of whatness—the \textit{tī τοῦ τί ἐστι}—because as Aristotle explicitly say, one does not know enough to seek a cause of a thing without having grasped something of the whatness of the thing. \textit{Nōûs} gets an investigation started by its partial grasp of whatness in terms of a trait that may turn out to be either part of essence or a proper accident…. Accordingly, \textit{νοûs} is involved throughout the investigative process.

At this point, one could recognize an overlapping of De Groot’s view on nous—“\textit{νοûs} is involved throughout the investigative process.”—with the ‘epistemic continuity’ of the first section of this chapter—the demonstrative inquirer’s signification of essences \textit{continues} in the whole process of coming to know the essences. If we apply the latter to the former thesis, then we can draw the conclusion that the cognitive power that makes the epistemic continuity possible is \textit{nous}. This might be an embarrassment to anyone who has the traditional conception of Aristotelian \textit{nous}, namely, \textit{nous} as non-inferential intuition that grasps first principles of demonstrative science.\textsuperscript{115}

We are now left with the final task of illuminating Aristotle’s epistemological ground to support both the fallibility and dynamism of demonstrative knowledge. This task will make us defend Aristotle’s epistemological optimism that, despite all the fallibility, demonstrative knowledge makes things in the world intelligible.

\textsuperscript{114} Ibid. 470.

\textsuperscript{115} Irwin gives us a crystal clear presentation of the traditional understanding of \textit{nous} as intuition: “Intuition is needed, then to secure the epistemic priority that Aristotle demands. This priority implies that our knowledge of the lower principles depends on our knowledge of the higher, but our knowledge of the higher is independent of our knowledge of the lower. If we reject intuition, we cannot guarantee the appropriate asymmetry in knowledge, and can no longer claim that the highest principles are prior in knowledge. If we deprive Aristotle of any belief in intuition, we deprive him of his grounds for claiming that his principles satisfy his demand for epistemic asymmetry, and therefore leave him to face his own objections to coherence as a source of justification.” T. Irwin, \textit{Aristotle’s First Principles} (Oxford: Clarendon Press, 1988), 134.
Chapter 4

Epistemic Continuity:

The Ground for Demonstrative Knowledge

Introduction

This chapter aims to elucidate the opening and closing chapters of the *Posterior Analytics*, I.1 and II.19, from the viewpoint of the demonstrative knowledge revealed in our previous studies.

The demonstrative knowledge that we brought to light up till now is considerably different from demonstration as axiomatic interpreters conceive it. First, two principles of Aristotelian sciences are closely related to establishing scientifically explicable facts. Definition as a principle turns out to be *nominal* definition that guides the establishment of facts in the initial stage of inquiry, rather than ultimate propositional premises of axiomatic deductive sciences. Hypothesis as a principle turns out to be a particular fact that should be ultimately proved by maximally universal causes, rather than existential presuppositions of basic terms in deductive sciences. Second, demonstrations for Aristotle are dynamic fallible processes that search for the necessary connections between scientifically established facts—subjects *cum* credible attributes of them, i.e., the conclusion of later constructed demonstration—and plausible proximate causes, rather than linear deductive processes from axioms and definitions to lower derivative theorems. Third, what demonstrative knowledge deals with includes not only particulars that are to be illuminated by universals but also universals that are to be instantiated in particulars, rather than just universal propositions.
As to the third point, we made several supporting arguments in the following different venues; in §1.2-3, we emphasized the significance of particulars in the case of proof by *ekthesis*; in §2.2, we showed the domain of demonstration in which particulars and lower level of universals and higher level of universals are continuously conjoined by the relation of parts and wholes; also in §2.2, we related the activity of demonstration with Aristotle’s concept of ‘knowledge in actuality’; in §3.1, we introduced and explicated the concept of ‘epistemic continuity’ by which we meant that signification of essences *via* terms continues throughout the whole process of demonstrative inquires, that is, from the initial (non-incidental) grasp of *particular facts* up to the recognition of the true nature of essences.

In the opening and closing chapters of our treatise, we see that Aristotle confronts two central proposals of Plato’s theory of knowledge, the paradox of inquiry in I.1 and the theory of recollection II.19, both of which find their home in Plato’s *Meno*. Indeed, these proposals of the *Meno* are the epistemic platforms for Plato’s full-blown doctrine of forms in the middle dialogues, that is, the real separation of universal forms from particulars, and as a consequence of the separation, the unbridgeable gap between perceptual knowledge of the latter and *noetic* knowledge of the former.¹ This consequence, however, is obviously untenable in the framework of Aristotelian demonstrative knowledge, especially according the third characteristic of the demonstrative knowledge as we specified above. The primary goal of this chapter is to

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¹ It is true that the *Meno* has not yet overtly suggested the real separation between particulars and universals and the gap between perceptual and *noetic* knowledge. But the dialogue paves the way to the developed middle-period Theory of Forms, as Sharples notes: “Plato there [*Phaedo, Symposium, and Republic*] holds that there are two levels of reality. The ordinary world of perception is a reflection of an ideal world of Forms, accessible only to the intellect….Our knowledge of the Forms is the result of our recollection of our souls’ experience of them before our souls entered their earthly bodies; a sharp distinction is drawn between knowledge, concerned with the Forms, and opinion or belief (*doxa*), concerned with the perceptible world…. Admittedly, the early part of the *Meno* is in any case closer to the early dialogues, and it is in its later parts that anticipations of the middle period Theory of Forms are more naturally to be sought.” R. Sharples, *Plato: Meno* (Warminster: Aris & Phillips Ltd., 1991), 12.
substantiate Aristotle’s view on the epistemic relationship of perceptual knowledge with noetic knowledge, by examining his critical treatment of Meno’s paradox in I.1 and theory of recollection in II.19.

It should be preliminarily noted that I.1 and II.19 occupy unique places in the Posterior Analytics. The first chapter (I.1), as a preface to the subsequent development of demonstrative knowledge, describes pre-existing knowledge, whereas the last chapter (II.19), as an appendix to the treatment of demonstrative knowledge, deals with how we recognize principles or starting points of demonstrative knowledge. These chapters, not directly addressing what demonstrative knowledge is, share an epistemic problem of demonstrative knowledge. We will argue here that Aristotle’s discussions in both places bear on the initial (non-incidental) grasp of particulars in a demonstrative investigation, in contrast to the common and historically dominant understanding that they have to do with the preexisting knowledge or the starting point (archê) of demonstrative deduction. In other words, these two chapters are where we can seek Aristotle’s answer to how perceptual knowledge is mediated with noetic knowledge.

This suggests further that we can read in both chapters Aristotle’s responses to the Meno paradox, since we alleged in our previous chapter that a kind of paradox of inquiry resides in the plausibility of a non-incidental grasp of particulars. It seems that the intricate distinction between ‘knowing universally’ and ‘knowing simpliciter’ (ἀπλωσ ἐπίσταται) of particular facts specified in I.1 is Aristotle’s only and apparent response to the paradox. But the epistemology in II.19, which is a sort of phenomenological description of human cognition, can be interpreted as his ultimate rejoinder to the puzzle that the Meno paradox raises. Underlying in this epistemology is what we may call ‘epistemic continuity of human cognitions’.
Of this chapter, the first section looks into the meaning of the two kinds of ‘pre-existing knowledge’ in I.1. It will be shown that the ancient and medieval commentators see them as the foreknowledge of a subject and a predicate of a demonstrative conclusion—that is a knowledge of them before demonstrating, which is in stark contrast to the view of modern axiomatic readers. We will argue that the two kinds of pre-existing knowledge (that is and what it means) correspond to the two principles (starting-points) of demonstrative knowledge, i.e., hypothesis and definition.

The second section carefully analyzes the so-called the argument of ‘simultaneous learning’ in I.1 together with II.21 of the Prior Analytics. By investigating the meanings of the terms, ‘induction’ and ‘knowing simpliciter’ contained in the argument, we will argue that the ‘simultaneous learning’ precisely notices in advance the general feature of demonstrative knowledge that mediates perceptual knowledge of particulars with noetic knowledge of universals.

The third section delves into the meaning of Aristotle’s mention of the Meno paradox that occurs at the end of the argument about ‘simultaneous learning’. It will be shown that Aristotle’s understanding of Meno paradox is correct and that his response to the paradox is Aristotelian induction that sees universals among particulars in their what-they-are.

The fourth section explores the much-debated II.19, the closing chapter of the Posterior Analytics from the perspective of the previous sections. We will argue that there is a strong plausibility to reading this chapter as Aristotle’s critique of Platonic recollection. Aristotle describes the inductive process of human cognition as concerning not definitional first premises of demonstrative deduction but a non-incidental grasp of particular things, which is the epistemic ground of demonstrative investigations. Our conclusion is that Aristotle’s fundamental stance on
the feasibility of demonstration can be found in his view of the human capacity of perception that is continuously connected up to nous.

§4.1 Pre-existing Knowledge of Demonstration

(P1) All teaching and all learning of an intellectual kind proceed from pre-existing knowledge (πᾶσα διδασκαλία καὶ πᾶσα μάθησις διανοητικὴ ἐκ προϋπαρχούσης γίνεται γνώσεως).²

The Posterior Analytics begins with one of the famous lines of Aristotle’s corpus. It would be hard for us to suppose that Aristotle could have started the treatise with any other statement than the above, since the line captures in the most distinctive way what he wants to convey throughout the rest of the treatise, namely, that

(P2) demonstrative knowledge proceeds from pre-existing knowledge.³

At the same time, the first line already contains within itself what seems to be a perennial problem of the Posterior Analytics. Given that the object of “all teaching and learning of an intellectual kind” is ‘knowledge’, we can formulate a broader thesis than (P2):

(P3) all knowledge proceeds from pre-existing knowledge.

However, this thesis (P3) seems to be refuted two chapters later by Aristotle in terms of the question whether all knowledge is demonstrative: supposing that demonstrative knowledge is knowledge that proceeds from something else, “we assert that not all knowledge (epistêmê) is demonstrative; rather in the case of immediate items knowledge is indemonstrable.”⁴ This implies that

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² PoAn. I. 1, 71a1-2.
³ The context of the first two paragraphs in I.1 does not cause any problem to apply the requirement of pre-existing knowledge (P1) to demonstrative knowledge, even though Aristotle does not explicitly state (P2).
(P4) some knowledge does not proceed from pre-existing knowledge.

Regarding this apparent contradiction of (P3) with (P4), nearly every commentator advises that we have to wait for the solution until the end of our treatise, II.19, where awaits again “numerous problems, of general and of detailed interpretation.”

Some might object to our formulations from (P1) to (P4), since our treatment above ignores the intricate differences of connotation of the epistemic word, ‘to know’. For, in contrast with the term, gnōsis, used in (P1) which is a general introduction of I.1, Aristotle preserves a more esteemed term, epistêmê, for demonstrative knowledge in I.2. Accepting the objection, then, we are to revise (P2) as follows:

(P2a) demonstrative knowledge* (epistêmê) proceeds from pre-existing knowledge (gnōsis), or

(P2b) demonstrative knowledge* (epistêmê) proceeds from pre-existing knowledge*

(epistêmê).

In addition to the statement in I.3 cited above, Aristotle’s cryptic sentence in I.2—“whether there is also another type of knowledge (epistêmê) [other than demonstrative knowledge] we shall say later,”—supports the formulation (P2b). Whereas, his use of the term, gnōsis, when it applies to ‘principles’ in II.19—“as for the principles, how they become familiar (γνώσιμοι) and what is the state which get to know (γνώσις) them”—and his view on perceptual knowledge and induction in II.19 seem to uphold the formulation (P2a). This indeterminacy as to the meaning

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6 A study by Burnyeat concerns this issue; M. Burnyeat, “Aristotle on Understanding,” in Aristotle on Science: The Posterior Analytics edit. E. Berti (Padua, 1981), 99-139. Barnes adopts “understanding” as the translation of epistêmê by the influence of Burnyeat’s argument; Barnes, Aristotle: Posterior Analytics, 82.
8 PoAn. II. 19, 99b17-18. See also 99b22.
of the epistemic word in (P2) makes it also difficult to identify the epistemic word in (P4), so that despite the objection the apparent contradiction lives on. It is most likely that unless we clearly illuminate the ‘pre-existing knowledge’ from which demonstrative knowledge proceeds, we will be left with this exegetical impediment from the first line of the *Posterior Analytics*.

Then, what is the pre-existing knowledge of demonstrative knowledge? The opening chapter does not appear to speak directly about demonstration. After proving inductively the statement of the first line (71a1-11), Aristotle states generally two kinds of pre-existing knowledge (71a12-16), and then, he spends much of the chapter elaborating what seems a rather too specific kind of pre-existing knowledge (71a17-29), at the end of which he abruptly mentions ‘the puzzle in the *Meno*’, followed by his criticism of an erroneous solution of the puzzle in the rest of the chapter (71a30-71b9). Hence, there is no way for us to proceed but to focus on Aristotle’s statements about the two kinds of pre-existing knowledge:

There are two ways in which we must already have knowledge: of some things we must believe (προϋπολογίζονται) that they are (ὅτι ἐστὶ), or others we must grasp (ξυνίζονται) what the items spoken about are (τί τὸ λέγομενόν ἐστι) (and of some things both). E.g. of the fact that everything is either asserted or denied truly, we must believe that it is the case; of the triangle, that it means this; and of the unit both what it means (τί ἔστι) and that it is (ὅτι ἐστὶ). For these items are not all equally plain to us.

We can draw a simple scheme of pre-existing knowledge as follows:

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9. Our formulation of (P1) - (P4) is a simplified presentation of the problem-setting in which I.1 and II.19 are interwoven. Most commentators suppose a foundationalist solution to the problem, as we will see later.


Modes\textsuperscript{12} of Knowing\hspace{1cm} Aspects\textsuperscript{13} of Knowing\hspace{1cm} Examples of objects

Grasping (\xi\nu\iota\nu\iota\nu\iota\nu\iota) \hspace{1cm} what it means (t\iota \sigma\mu\alpha\iota\nu\iota\iota) \hspace{1cm} unit / triangle
Assuming (\pi\rho\o\u\o\u\u\pi\o\o\l\a\m\i\m\b\a\\nu\iota\iota\iota) \hspace{1cm} that it is (\o\o\iota \iota\o\o\iota\nu) \hspace{1cm} unit / the fact that...

Before we survey the rich tradition of commentaries on this passage, let us look at a minor exegetical point that could help illuminate the two aspects of pre-existing knowledge. Right after the distinction of the two aspects of pre-existing knowledge, Aristotle mentions as an example of ‘that it is’- knowledge, “the fact that everything is either asserted or denied truly.” This seems to be an axiom, that is, a formulation of the Law of Excluded Middle. McKirahan presents one of the difficulties of the passage: “The law of the excluded middle and the unit are logically different types, yet we are said to know in advance that both of them are.” But to the interpretive eye of Barnes, no axiom is witnessed in the passage: “The knowledge presupposed by a teacher is of two sorts; it consists of (a) knowledge of propositions and (b) knowledge of terms…. (Should Aristotle have added (c) knowledge of rules of inference?)\textsuperscript{14} Whereas, in the commentary by Ross, there is nothing problematic:\textsuperscript{15}

Aristotle has before his mind three kinds of proposition which he thinks to be known without proof, and to be required as starting-points for proof: (1) nominal definitions of meanings of certain words…; (2) statements that certain things exist…; (3) general statements such as ‘Any proposition may either be truly affirmed or truly denied’. Of these (1) are properly called ὀρισμοί (72a21), (2) ὑποθέσεις (ib. 20), (3) ἀξιώματα (ib. 17). But here he groups (2) and (3) together under the general name of statements ὀτι ἐστιν…

\textsuperscript{12} We can see here that our modes of knowing objects can differ by reference to the aspects of a same object.
\textsuperscript{13} One might think that ‘what it means’ and ‘that it is’ are objects of pre-existing knowledge, but these are the ways (aspects) in which a same object, e.g. ‘unit’ can be known differently.
\textsuperscript{14} Barnes, Aristotle: Posterior Analytics, 83-84.
\textsuperscript{15} W. Ross, Aristotle’s Prior and Posterior Analytics: A revised text with introduction and commentary (Oxford: Clarendon, 1949), 504-505
It is clear that when these commentators read the pre-existing knowledge in I.1 they have in mind the three principles of demonstrative knowledge in I.2. This implies that their understanding of the pre-existing knowledge is affected by their interpretation of the three principles of demonstrative knowledge. We may cite another recent commentator who has such a view on the character of the pre-existing knowledge: “But the learner, one might say, must understand everything that the teacher teaches, and this includes the premises or axioms which signify facts.”

Is it a correct view that anyone who has pre-existing knowledge is the one who knows beforehand the premises of demonstrative deduction charged with existential import and axioms as well? The views of ancient and medieval commentators seem to be different. Let us survey them selectively. Aquinas describes the backdrop against which the above passage should be understood:

[Aq1] Note first that what we seek to know by demonstration is a conclusion in which a proper attribute is predicated of a subject. This conclusion is inferred from principles. Because the knowledge of simple things precedes the knowledge of composite things, we must know the subject and the attribute in some way before we know the conclusion. Similarly, we must foreknow the principle from which the conclusion is inferred. For a conclusion becomes known through its principle.

Notice that Aquinas’ conception of foreknowledge is based on his understanding of what demonstrative knowledge ideally is; “what we seek to know by demonstration is a conclusion in which a proper attribute is predicated of a subject.” For him, demonstration is not the business of inferring (deducing) one proposition from other propositions: it is seeking to know why an

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17 Needless to say, this is the view of the axiomatic deductive interpreters, which we criticized all along. For example, see; M. Ferejohn, “Meno Paradox and De Re Knowledge in Aristotle’s Theory of Demonstration,” in Essays in Ancient Greek Philosophy V: Aristotle’s Ontology, edit. A. Preus and J. Anton (Albany: State University of New York Press, 1992), 111-130.
18 St. Thomas Aquinas, Commentary on Aristotle’s Posterior Analytics, 7.
attribute is properly (appropriately) predicated by a subject. Thus, we have to have the
foreknowledge of the subject and the attribute “in some way” before undertaking the business of
seeking the why.19

Aquinas proceeds to illuminate the two ways of foreknowledge based on such an
understanding of demonstration:20

[Aq2] There are two ways in which each of these three things—i.e., the principle,
the subject and the attribute—might be foreknown: that it is and what it is…. Since
the principle is a kind of proposition, therefore, we cannot foreknow what it is but only that it
is so. But of the attribute we can know what it is, because, as Aristotle shows in the same
book, accidents do have definitions, in a sense. However, the being of the attribute, as of
any accident, is to be in a subject. This is what is concluded in a demonstration.
Therefore, prior to the demonstration, we do not know that the attribute exists, but only
what it is. The subject is also definable. But its being does not depend on the attribute;
rather, its being must be understood as prior to the being of the attribute which exists in it.
Therefore, with respect to the subject, we must foreknow both what it is and that it is.
These points are especially important, because middle terms in demonstrations are taken
from the definitions of the subjects and attributes.

Plain and clear as they are, some of Aquinas’ comments need more elaboration in the languages
of our study. With respect to the ‘being’ or ‘that it is’ of a subject, Aquinas says, “its being does
not depend on the attribute; rather, its being must be understood as prior to the being of the
attribute which exists in it.” We formulated this in our chapter 1 as ‘x being F’, which reads as ‘a
substratum (x)’s being identified and instantiated by a universal kind’. Preceding this
formulation, we criticized its existential construal. As to the ‘being’ or ‘that it is’ of an attribute,
St. Thomas says, “the being of the attribute…, is to be in a subject. This is what is concluded in a
demonstration. Therefore, prior to the demonstration, we do not know that the attribute exists,
but only what it is.” His statements mean in our languages of chapter 3 that before

19 Chapter 3 of this study claimed that this foreknowledge belongs to the stage of establishing facts in a
demonstrative inquiry.
20 St. Thomas Aquinas, Commentary on Aristotle’s Posterior Analytics, 7
demonstration, an attribute’s being in a subject is just a knowledge of fact, but after demonstration, its being in a subject is an instance of reasoned knowledge. Regarding the ‘that it is’ of principles, Aquinas’ conception of it is by no means close to the notion of premises of demonstration charged with existential import. He means by ‘principles’ the axioms, i.e., rules of inference, from (by) which demonstration proceeds. And finally, concerning the ‘what it is’ of a subject and an attribute, Aquinas adds explanation, distinguishing the strict sense of ‘what it is’ from ‘what the items spoken about are’:  

[Aq3] With respect to other things, i.e., the attributes, we must foreknow “what the thing spoken about is,” that is, what the name signifies. Note that Aristotle does not say “what the thing is.” This is because, properly speaking, we cannot know what a thing is before we know that it exists; for there are no definitions of non-beings. Hence, the question of whether or not a thing exists precedes the question of what it is. But we cannot show that something exists unless we first know what its name means.

We see that one import of II.8-10 of the *Posterior Analytics* is conspicuously reflected in this passage. In our previous chapter, we argued that as a starting point of demonstrative inquiry, a nominal definitions, that is, a *logos* of ‘what the item spoken about is’ guides the investigator to identify and so establish a scientifically explicable fact, i.e., ‘that it is’.

What is more luminous in Aquinas’ construal of the ‘what it is’ of an attribute is the *relativity* of the attribute with respect to its place in a demonstration:  

[Aq4] The demonstration of these things are said to be *operative*, as it were. For example, we demonstrate the construction of an equilateral triangle on a given straight line. Once we have constructed the equilateral triangle, we prove that other attributes, like the equality of its angles, belong to it. In the first way of demonstrating, the triangle is clearly an attribute; in the second, clearly, a subject. Therefore, when he says that we must foreknow what “triangle” means, Aristotle is using the triangle as an example of an attribute, not of a subject.

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21 Ibid.
22 Ibid. 8.
Without further ado, the above exposition is a decisive counterpoint to the interpretation that there are two epistemic entities in Aristotle’s theory of demonstration.\textsuperscript{23} According to the interpretation, only to the ‘epistemic substances’—e.g. ‘unit’—can the ‘that it is’ and ‘what it means’ be applied. However, as the example of the exposition shows, ‘triangle’ can be either a subject or an attribute so that both ways of foreknowledge are needed when it occupies the place of subject—\emph{that} this is a triangle,\textsuperscript{24} and \emph{what} a triangle means.

Now let us see how pre-existing knowledge is understood in the ancient tradition of commentaries, using the commentary of John Philoponus. According to him, demonstration is an inquisitive movement of reasoning:\textsuperscript{25}

\begin{quote}
[Ph1] I state that the following two things are observed in every demonstration: the problem proposed for demonstration, and the premises through which the problem is established. Again, in every problem the following two things are observed: the \textit{given} and the \textit{sought}. For example in the problem whether the soul is immortal, the subject term, namely, soul, is given, and the predicate [term], whether it is immortal is sought. And it is not only in problems that investigate per se attributes of things that we find the given and sought, but the same division is also observed in those [problems] that go on to investigate whether it is at all. For example, in the problem that investigates whether a goat-stag is an animal, animal is the given and goat-stag is the sought.
\end{quote}

This passage reads as if Philoponus commented on II.1-2 of the \textit{Posterior Analytics} rather than I.1. Remember that the first word with which the second book starts is ‘the things we inquire \emph{into’}. Among the four inquiries or questions immediately followed, the first level questions, ‘whether it is?’ and ‘if it is?’ are here put forward in the form of ‘demonstrative problems’. Then,

\begin{quote}
\textsuperscript{23} On this interpretation, see our §I.3. Besides Goldin, Deslauriers recently presents a similar argument: M. Deslauriers, \textit{Aristotle on Definition} (Leiden: Brill, 2007), chap. 2.
\textsuperscript{24} The construction of this sentence was a key point of our arguments §I.3. See the comment by Heath: “On a given finite straight line. The Greek usage differs from ours in that the definite article is employed in such a phrase as this where we have the indefinite. \textit{ἐπὶ τὴς δοθείης πεπερασμένη}, ‘on the given finite straight line,’ i.e., the finite straight line which we choose to take.” Euclid, \textit{The Thirteen Books of The Elements}, translated with introduction and commentary by Sir. T. Heath, \textit{2\textsuperscript{nd} ed.} (New York: Dover, 1956), 242.
\end{quote}
these demonstrative problems are analyzed into ‘the given’ and ‘the sought’ which correspond respectively to ‘subject’ and ‘attribute’ in St. Thomas’ commentary. It is interesting to see how Philoponus deals with the question, ‘if it is (ei esti)’: the question “if a goat-stag is?” is transformed into the question “whether a goat-stag is an animal?” Here, the predicate “animal” is the given, while the subject “goat-stag” is the sought. Anyhow, the given and the sought are to be assumed in advance along with the axiom, Philoponus asserts.

[Ph2] The way in which we have previous knowledge, he says, are two: what it is or what it signifies, and that it is. And, he says, in the case of the given it is necessary to have previous knowledge both that it is and what it signifies or what it is, but in the case of the sought [it is necessary to have previous knowledge] not that it is but what it signifies or what it is. For example, if a finite straight line is given, it is necessary to have previous knowledge both that the straight line is finite and what the term signifies, but in the case of the sought, i.e., the equilateral triangle, only what it signifies. For in this case it is not necessary to have previous knowledge that it is, since otherwise it would not be the sought.

For Philoponus, a demonstration is not just a proving, but constructing a new (geometrical) object from a given object. Thus, the given object is conceived not just in the aspect of ‘what it is’ (a straight line means xxx), but also in the aspect of ‘that it is’ (this is a finite straight line). But the sought object is previously known only in the aspect of ‘what it is’ (an equilateral triangle means yyy), since the ‘that it is’ aspect of it (this is an equilateral triangle constructed from the given line) is able to be shown after demonstration.

Brief and selective as our reviews of the ancient and medieval commentaries on the pre-existing knowledge are, what is obvious is that pre-existing knowledge was long understood to concern the subject and the predicate of a conclusion before demonstrating the conclusion. This

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26 Philoponus’s understanding of ‘the given’ and ‘the sought’ in demonstration seems to lean on his keen attention to the Greek geometrical problems, which are to construct a new geometrical object from a given geometrical object. See the abundance of geometrical examples in his exposition.
27 Ibid. 22-23.
is in stark contrast with the interpretation that “the possibility of demonstrative knowledge requires that prior to the demonstration, one had already possessed knowledge of first principles (archai) that serve as ultimate premises of the demonstration.”²⁹  In this interpretation, it is a difficult task to explain how the ultimate definitional premises are charged with existential import,³⁰ let alone the harder task of elucidating how the principles are previously grasped. The ‘pre-existing knowledge’ in I.1 is intimately connected with the first principles in I.2 and the mode of knowing the principles in II.19 of the Posterior Analytics. Overall, an understanding of ‘pre-existing knowledge’ hinges on an appreciation of what demonstrative knowledge is. Let us reconsider it, then, from our appreciation of demonstrative knowledge.

The locutions, ‘that it is’ and ‘what it means’ were the key terms respectively in our chapter 1 and chapter 3. We argued that the former have a direct bearing on the initial grasp of particular facts in the form of $x$-being-$F$, while the latter guides a demonstrative inquirer to identify and establish the facts. Thus, the ancient and medieval understandings of pre-existing knowledge seem correct in that it is the knowledge about the subject and the predicate of a demonstrative conclusion before demonstrating the conclusion. But what is missing in the traditional understandings is that the two aspects of pre-existing knowledge about the subject and the predicate are reduced into one particular proposition, for example, that this triangle has interior angles equal to two right angles. In this proposition, what triangle means, what 2R means, and that this is a triangle are all condensed. As we will corroborate once again in our examination of the rest of PoAn. I.1, a conclusion of demonstration is a particular proposition.

This point might already be implied in Aristotle’s description of the two ways of pre-existing knowledge, if we read the clause itself—“that everything is either asserted or denied truly”—not as an object of ‘that it is’ knowledge. This is related to McKirahan’s complaint that two logically different types are said to be the objects of ‘that it is’. Recall, then, Aristotle’s description of the hypothesis as a principle at 72a19-21.: “A posit which assumes either of the parts of a contradictory pair—what I mean is that something is or something is not—I call a hypothesis.” Recall also why Aristotle denies that definitions are propositions at 76b35-36:

Definitions are not hypotheses—they are not said to be or not to be anything. Rather, hypotheses are found among propositions.

By ‘proposition’, we argued before, Aristotle means that something, which can be denoted by a demonstrative pronoun, is asserted or denied by a universal predicate. Then the ‘that clause’ might be not an expression of the Law of Excluded Middle as the object of ‘that it is’ knowledge, but a full description of the ‘that it is’ itself.31

§4.2. Simultaneous Knowledge and the Problem of Induction

It is clear now that the two locutions, ‘that it is’ and ‘what it is’ or ‘what it means’ are at the top of the list of terms for us to figure out for the illumination of Aristotelian demonstration. Their frequency in the Posterior Analytics has already been shown in our study: hypothesis ‘that something is or is not’ vs. definition of ‘what something is’ in I.2 and I.10; the four scientific questions in II.1-2; the epistemic priority of ‘that it is’ to ‘what it is’ in II.7; the relationship of ‘what it is’ and ‘what it means’ in II.8-10. The tension between ‘that it is’ and ‘what it is’ has also been explored in our study. Aristotle said that when we know that there is a middle term,

31 A merit of this interpretation is that it can easily allow a negative proposition as a conclusion of demonstration, like the incommensurability of a diagonal to sides.
we ask what the middle is. As can we know ‘that it is’ without knowing ‘what it is’? At the same time, how can we know ‘what it is’ without knowing ‘that it is’?

As a matter of fact, Aristotle mentions Meno’s paradox in the opening chapter of the Posterior Analytics, which is the only place Aristotle mentions it in his entire works. His presentation of and solution to it, however, do not apparently meet our expectation to figure in a prominent and helpful way the puzzle potential in his theory of demonstration; how can we know ‘that there is a middle’ without knowing ‘what the middle is’? Above all, the way he introduces it is abrupt.

[A] 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 (προήδει) that every triangle has angles equal to two right angles; but you got to know (ἐγνώρισεν) that this figure in the semicircle is a triangle at the same time (Άμω) as you were being led to the conclusion (ἐπαγόμενος). In some cases learning occurs in this way, and the last term does not become known through the middle term—this occurs when the items are in fact particulars (καθ’ ἐκαστα) and are not said of any underlying subject.

[B] Before you are led to the conclusion (πρὶν δ’ ἐπαχθηναι), i.e., before you are given a deduction (λαβέειν συλλογισμού), you should perhaps be said to understand (ἐπίστασθαι) it in one way—but in another way not. If you did not know (ηδει) whether there was such-and-such a thing simpliciter (εἰ ἐστὶν ὀπλῶς), how could you have known (ηδει…ὀπλῶς) that it had two right angles simpliciter? Yet it is plain that you do understand (ἐπίσταται) it in this sense; you understand it universally (καθ’ ὀλο)—but you do not understand it simpliciter (ὀπλῶς). (Otherwise the puzzle in the Meno will arise: you will learn either nothing or what you already know.)

Part [A] sets the stage for the ‘simultaneous knowledge’ and then displays an epistemic syllogism in order to explain the case of ‘simultaneous knowledge’. Part [B] is Aristotle’s own

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32 PoAn I. 2, 90a5-9: “Thus it results that in all our searches we seek either if there is a middle term or what the middle term is. For the middle term is the explanation, and in all cases it is the explanation which is being sought… After that, having come to know that there is one, we seek what it is.”

33 This formulation concerns an identification of something.

34 This formulation concerns an existence of something.

35 PoAn. I.1, 71a17-31.
interpretation of the syllogism with his distinction between ‘knowing universally’ and ‘knowing unqualifiedly’, and then it is said abruptly that without the distinction, “the puzzle in the Meno arises: you will learn either nothing or what you already know.” Even if Aristotle didn’t mention “the puzzle in the Meno” at the end of the part [B], this whole continuous passage would pose some serious interpretive issues. (1) What is the import of the ‘simultaneous knowledge’ to the theme of the chapter, i.e., pre-existing knowledge? (2) What is the connection of the exemplary syllogism of the simultaneous knowledge to the theme of the treatise, i.e., demonstrative syllogism? (3) Is there any relationship between ‘knowing simpliciter’ here and ‘knowledge simpliciter’ (epistêmê haplês) in I.2? Combined with Aristotle’s mention of the puzzle, the above passage yields further complicated issues. (4) What is exactly Aristotle’s own understanding of the puzzle in the Meno? (5) How does the distinction between ‘knowing universally’ and ‘knowing unqualifiedly’ solve the puzzle?

The above passage has received notable scholarly attention in recent years, after a long period of neglect among modern readers.³⁶ The scholars address more or less the issues raised above, and their debates on these issues considerably improved our understanding. Nonetheless, their interpretations seem to be still misguided by a rigid view of demonstrative knowledge as we

will see in a while. In what follows and in the next section, we will critically examine their views on the issues (1) – (5).

For explication of the ‘simultaneous knowledge’ that might be in contrast with the pre-existing knowledge, Aristotle presents, in Part [A], a simple syllogism:

Every triangle has two right angles (2R).
This figure in the semicircle is a triangle.
Therefore, this figure in the semicircle has 2R.

Prima facie, this syllogism should not cause any problem at all, since it is valid and sound as well. The complication in understanding this syllogism follows from the addition of epistemic terms: someone (a) who knows beforehand (προὶ δεῖ) the major premise comes to grasp (ἐγνώρισεν) the minor premise and the conclusion at the same time, i.e., simultaneously (αὐτῷ). More specifically, the complication lies in between the two epistemic states of an agent, one before constructing the syllogism (λαβὲ ἔτι συλλογισμόν), and the other after or at the moment of the construction. Part [A] describes the epistemic state of the moment at which the agent constructs the syllogism, while Part [B] discloses and clarifies the epistemic state before constructing the syllogism. Before constructing the syllogism, the agent a does not know unqualifiedly (ἡ δεῖ ὁ πλοῦς) that this figure in the semicircle is a triangle, and accordingly, he does not know unqualifiedly (ἡ δεῖ ὁ πλοῦς) that this figure in the semicircle has 2R. But, at this

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37 The overall context of the passage and the rest part of I.1 gives the impression that Aristotle now leaves the topic of the 'pre-existing' knowledge.
38 It is another thing to ask whether this syllogism is a demonstration in the proper sense. We will examine this point shortly.
39 There is a tricky but important exegetical problem whether the object of simultaneous knowledge is the minor premise or the conclusion, or something else. We will get back to this one soon.
stage, the agent \textit{a already knows} (προηδει) that every triangle has 2\(R\). Hence, here lurks what is called ‘Paradox of Knowing Universals’:\textsuperscript{40}

1. \textit{a} knows that every \(S\) is \(F\).
2. \(x\) is \(S\).
3. \textit{a} does not know that there is such a thing as \(x\).
4. Therefore, from 3, \textit{a} does not know that \(x\) is \(F\).
5. But, from 1 and 2 \textit{a} knows that \(x\) is \(F\).\textsuperscript{41}
6. Therefore, \textit{a} both knows and does not know at the same time that \(x\) is \(F\).

Aristotle’s solution to this paradox consists in meticulously disambiguating the epistemic word ‘\textit{to know}’ in 4 and 5. The knowledge involved in 4 is explicit knowledge of particulars; ἐπίσταται ἀπλῶς, while the knowledge engaged in 5 is potential knowledge of the particulars; ἐπίσταται καθόλου.\textsuperscript{42} Without distinguishing the two sorts of knowing, Aristotle asserts, the puzzle in \textit{Meno}—instead of the above paradox, i.e., Paradox of Knowing Universals—arises. It does so probably because “without the distinction, our knowledge of a universal entails explicit knowledge of all relevant particulars, and so we do not extend our knowledge by discovering new particulars.”\textsuperscript{43} The result would be: you will learn either nothing or learn what you already know.

The typical understanding of this passage such as we just displayed above has been recently challenged by Gifford, who argues that this understanding is seriously mistaken on two accounts. First, Gifford claims that the term, ‘ἐπαγόμενος’ in Part [A] and ‘ἐπισχήματι’ in Part [B] should be translated as its technical meaning, i.e., as “being led to perform the induction,”


\textsuperscript{41} Gifford claims that in the inference of 5, there is a “Principle of Universal Instantiation in Knowledge-Contexts,” which means that \(S\) knows that every \(B\) is \(A\); \(c\) is in fact a \(B\); therefore \(S\) knows that \(c\) is \(A\). According to him, one major aim of \textit{Pr.An.} II.21 is to show the invalidity of this inference rule. M. Gifford, “Aristotle on Platonic Recollection and the Paradox of Knowing Universals: \textit{Prior Analytics} B. 21, 67a8-30,” 3.

\textsuperscript{42} See Barnes’ detailed argument for the disambiguation: J. Barnes, \textit{Aristotle: Posterior Analytics}, 88.

\textsuperscript{43} S. LaBarge, “Aristotle on ‘Simultaneous Learning’ in \textit{Posterior Analytics} 1.1 and \textit{Prior Analytics} 2. 21,” 188.
contra Ross⁴⁴ and Barnes⁴⁵ who translate it as “being led to conclusion.” The re-rendering of the term, Gifford argues, invites us to interpret differently Aristotle’s ideas about the simultaneous knowledge. Second, he strongly criticizes the reticence of the typical understanding that stretches all the way to the ancient commentators on the anomalous use of the term, ἐπίσταται ἀπλῶς’ of in I.1. The most important and technical term of the Posterior Analytics is employed confusedly and carelessly in the first chapter of the treatise, so he judges on this ground that there must have been an editorial error in the text we have inherited.

The first criticism by Gifford focuses on the purported doublet of the passage in I.1, that is, a passage in II.21 of the Prior Analytics:⁴⁶

[C] (a) For this sort of error is similar to the way we are deceived in the case of particular premises…. But nothing prevents him being ignorant that C exists, as, for example, if A is two right angles, B stands for triangle, and C stands for a perceptible triangle: for someone could believe C not to exist, while knowing that every triangle has two right angles, and consequently, he will at the same time know and be ignorant of the same thing. (b) For to know of every triangle that it has angles equal to two right angles is not a simple matter, but rather one <way of knowing it> is in virtue of having universal knowledge, and another way is in virtue of having the particular knowledge. In this way, i.e. by means of the universal knowledge (τὴν καθόλου), he knows C, that it has two right angles; but he does not know it as by means of the particular knowledge (τὴν καθ’ ἐκαστοῦ); consequently, he will not possess contrary states of knowledge.

[D] (a) And the argument in the Meno that learning is being reminded (ἡ μαθήσις ἀνύψωμης) is also similar: for it never results that people know the particular in advance

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⁴⁴ W. Ross, Aristotle’s Prior and Posterior Analytics, 506: “In a note prefixed to An Pr.ii.23 I have examined the usage of ἐπάγων in A., and have argued that ὁμα ἐπαγωμένος here means ‘at the very moment one is led on to the conclusion’, and that this is the main usage underlying the technical sense of ἐπαγωγή = ‘induction’. Yet the process referred to here is not inductive. The fact referred to is the fact that if one already knows a major premiss of the form All M is P, knowledge of the minor premiss S is M may come simultaneously with the drawing of the conclusion S is P; the reasoning referred to is an ordinary syllogism. In a25 has the same meaning; ἐπιχειρεῖται and λαβεῖν σφηλογισμῶν are different ways of referring the same thing.”

⁴⁵ J. Barnes, Aristotle: Posterior Analytics, 85: “Aristotle does not say that we may learn one of the premises at the same time as we learn the conclusion: he says that we learn one of the premises at the same time as we are being led to the conclusion.”

⁴⁶ PrAn. II. 21, 67a5-30. This passage is one of the fascinating examples in Aristotle’s writing where a same material content serves to a different purpose: here, the same example of simultaneous knowledge is employed for showing what kinds of syllogistic errors we can make. See also: PoAn II.19 and Meta I.1.
(προεπίστασθαι τὸ καθ᾽ ἐκαστον), but rather that they get the knowledge of the particular (τῇν τῶν κατὰ μέρος ἐπιστήμην) at the same time (αἷμα), by means of the induction (τῇ ἐπαγωγῇ), like those who recognize something (ὡσπερ ἀναγινωσκόντας). (b) For there are some things which we know right away (εὐθὺς ′ς) (for example, we know that something <has angles equal> to two right angles, if we see (ἰδὼμεν) that it is a triangle, and similarly also in the other cases). (c) In virtue of the universal knowledge (καθόλου), then, we contemplate the particulars (θεωροῦμεν τὰ ἐν μέρει), but we do not know them in virtue of their peculiar knowledge (τῇ ὁικείᾳ).

Consequently, it is also possible to be in error concerning these, but not contrarily: instead it is possible to have the universal knowledge and be in error about the particular (κατὰ μέρος).

We notice in this passage that despite some terminological twists—instead of ἐπιστήμη ὀπλῶς, ἐπιστήμη κατὰ μέρος or καθ’ ἐκαστον—and the direction of extended discussion to the theory of recollection in the Meno, instead of Meno’s paradox, the same example of simultaneous knowledge is displayed. What is more noticeable is Aristotle’s straightforward mention of “induction,” by virtue of which an agent gets the knowledge of the particular (τῇν τῶν κατὰ μέρος ἐπιστήμην). A key critical point that Gifford advances against the typical—“received”—understanding is that “on that account, Aristotle is supposed to be describing… a process of knowledge-acquisition that occurs by means of a syllogistic inference. Yet the term he uses to refer to the inferential process he has in mind… is not συλλογισμός, but ἐπαγωγή.”47 He rightly points out further through his examination of various texts48 in which empiricism and innatism are raised:49

when the idea of innatism is broached in the corpus, Aristotle’s almost reflexive response is: “No, induction.” And so when he explicitly refers to the theory of Recollection in Prior Analytics B.21, and then immediately tosses the term ἐπαγωγή into the bargain, there is a powerful presumption that Aristotle is referring to his own empiricist account of knowledge-acquisition through induction—the inferential process by which we apprehend universal statements from the information of perception.

48 Meta. I. 9, 992b34-993a2; Meta. XIII. 4, 1078b17-31; PoAn. II. 19.
49 M. Gifford, Ibid. 15.
Thus, it is an implausible reading at the best that an agent \(a\) never knows a conclusion—this figures in the semicircle having \(2R\)—beforehand, i.e., before he performs the corresponding syllogistic inference, or putting conversely, the agent comes to know the conclusion at the same time he performs the syllogistic inference (\(\alpha\mu\alpha\ \tau\iota\iota\iota\ \varepsilon\pi\alpha\gamma\omega\gamma\iota\)).

This connects directly to another doubtful reading of the relevance of ‘recollection’ to this knowledge acquisition: “this syllogistic process of drawing out the logical consequences of acquired knowledge was mistaken by Plato for a process of recovering innate knowledge (\(\omega\sigma\pi\epsilon\rho\ \alpha\nu\alpha\gamma\nu\omega\rho\iota\zeta\omega\nu\tau\alpha\varsigma\): it’s as though we were coming to know <these singular truths> for a second time.”\(^{50}\)

In other words, the received understanding makes Aristotle’s treatment of Recollection “a sort of mini-digression—a digressiuncia as Pacius called it—with Aristotle turning aside from the matter at hand to take a quick poke at Plato.”\(^{51}\)

To intensify the criticism of the received view, Gifford parses the major premise that occurs in the paradox of knowing universals, i.e., ‘an agent \(a\) knows that every \(S\) is \(F\)” as follows: (a) the agent \(a\) has explicit\(^{52}\) knowledge of universals (\(S\) is \(F\)); (b) \(a\) has enumerative knowledge of universals (\(S_1, S_2, S_3\ldots\) and \(S_n\) is \(F\)); (c) \(a\) has universal (potential) knowledge of particulars (either \(S_1, S_2, S_3\ldots\) or \(S_n\) is \(F\)).\(^{53}\)

These three types of knowledge are contradistinguished from: (d) \(a\) has explicit knowledge of a particular (\(S_x\) is \(F\)), where \(x\) is, e.g. ‘this figure in the semicircle’.


\(^{51}\) M. Gifford, Ibid. 17.

\(^{52}\) Ibid. 13, no.11: “By “explicit knowledge” I mean knowledge whose object is actually represented in the mind. Explicit knowledge in this sense can be distinguished from what we might call “conscious knowledge,” . . . Given these rough definitions, we can characterize innate knowledge in Plato, on Aristotle’s view, as knowledge that is explicit but not conscious.”

\(^{53}\) So, knowing a particular universally means knowing it potentially. *PoAn*. I. 24, 86a25-27: “If you know that every triangle has two right angles, you know in a sense of the isosceles too that is has two right angles—you know it potentially (\(\delta\nu\nu\sigma\mu\epsilon\iota\)—, even if you do not know of the isosceles that it is a triangle.”
Then, the overall argument of the passage in *PrAn*. II.21 is that: (a) does not entail (d); but (a) entails (c). In Gifford coinage, the former is Aristotle’s denial of the ‘principle of universal instantiation’, and the latter is Aristotle’s idiosyncratic formation of a ‘principle of potential knowledge’. According to Gifford, if ἐπαγωγή is understood as a sort of syllogistic process of drawing out a conclusion, then Aristotle should be taken in his argument as just *assuming* (a) human being’s having explicit knowledge of universals, and as *not defending* how the principle of potential knowledge is viable. In view of that, Gifford argues that this construal makes Aristotle’s overall argument vulnerable to criticism by an extreme empiricist who does not believe universal truths whatsoever, or at best believes universal truths only understood as (b) *enumerative* knowledge of universals (S₁, S₂,…and Sn is F).

Gifford’s own reading of the passage, needless to say, hinges on his appreciation of ἐπαγωγή and then its role in the argument of simultaneous knowledge:54 Induction, for Gifford, is the inference from plural statements about particulars (S₁, S₂, S₃…and Sn is F) to explicit knowledge of universal properties (S is F), and the explicit knowledge of universals (S is F) entails the potential knowledge (S₁, S₂,…or Sn is F). Thus, the first two sentences in Part [Da], allegedly Aristotle’s explication of the principle of potential knowledge, read like: at the same time we perform induction (ἂμα τῆ ἐπαγωγή), it results that we have potential knowledge of particulars (τῆν τῶν κατὰ μέρος ἐπιστήμην), like those who recognize something (ὡσπερ ἀναγνωρίζοντας). That is, the epistemic power of induction is supposed to

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54 “An inductive inference, which furnishes explicit knowledge of a universal truth, could provide us with knowledge of a plurality of particulars or singular statements”; “an induction yields explicit knowledge of a universal truth, and Aristotle is saying…that we acquire potential knowledge of the singular statements falling under a universal truth at the very moment (ἂμα) we draw the inductive inference—in other words, universal knowledge entails potential knowledge.” M. Gifford, Ibid. 18, 19.
be analogous (ὁμοίως) with recollection. On how we acquire universal knowledge, Plato and Aristotle disagree—recollection; no, induction!—but on whether or not we possess universal knowledge, they totally agree. In review of their agreement, Aristotle “invokes Plato in the discussion...to serve less as a philosophical foe than as a dialectical ally.”

Gifford’s persistent indication that ἐπαγωγή should be interpreted in its technical meaning is adequate enough to reclaim the non-syllogistic process involved in simultaneous knowledge, and his reading of ‘recollection’ in this knowledge acquisition is more persuasive than the typical interpretation. However, his conception of ἐπαγωγή itself seems to be clouded with the modern view of induction, which leads him to misidentify the object of ἐπαγωγή and consequently the object of simultaneous knowledge.

LaBarge, in his critical review of Gifford, finds fault with the misidentification. According to LaBarge, the first exegetical misstep is taken by Gifford in his construing ‘at the same time’ (ὁμοίως) in [Da] and ‘right away’ (εὔθυς) in [Db] as representing two different epistemic events: the former describes the epistemic event of performing induction to explicit knowledge of universals, while the latter refers to the epistemic event of applying potential knowledge of particulars to a particular thing. That is, the two pieces of knowledge that occur simultaneously in [Da] are explicit knowledge of universals and potential knowledge of particulars. By contrast, those that occur right away in [Db] are two explicit instances of knowledge of a particular thing, respectively the minor premise and the conclusion of the

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55 Ibid. 23: “Our knowledge of a universal truth thus provides an epistemic surplus far exceeding the comparatively meager information of experience. So where did this surplus come from? Again, not from without, for experience gave us only a radically finite string of singular statements. The epistemic surplus over and above empeiría must then, at least in a sense, have come from within. It’s as though these super-experiential, universal truths were lurking in our minds somewhere and we merely retrieved them from storage.”
56 Ibid. 24.
syllogism at issue. Obviously, “this argument falls short,” since [Db] is prefixed by conjunction ‘for’ (γάρ) to introduce the reason for [Da]. Plainly, there is no room here to interpret ἀμα differently from εὐθύς. The second mistake is related to the first one that supposes the two distinct epistemic events. Gifford takes ἐπιστήμη τὸ καθ’ ἐκαστὸν and τῶν κατὰ μέρος ἐπιστήμη in [Da] differently from ἐπιστήμη καθ’ ἐκαστὸν and ἐπιστήμη κατὰ μέρος in [Cb and Dc]: the addition of the definite article (τό or τῶν) in the former shows that Aristotle has potential knowledge of the particulars in mind, in contrast to the latter that clearly indicates explicit awareness of a particular thing. LaBarge criticizes on this point:

Gifford would have us believe that, even though Aristotle has made a distinction just three sentences ago between ἐπιστήμη καθόλου and ἐπιστήμη καθ’ ἐκαστὸν where the latter clearly indicates explicit awareness of the existence of some particular or particulars..., Aristotle has here suddenly and without explanation introduced the terms ἐπιστήμη τὸ καθ’ ἐκαστὸν and τῶν κατὰ μέρος ἐπιστήμη to stand for a new concept, meaning something entirely different from ἐπιστήμη καθ’ ἐκαστὸν.

If Gifford’s distinction of the two technical terms is right, “it must be admitted that Aristotle took shockingly little care that very similar phrases should not be confused in a way that would destroy the argument Gifford claims to find here.”

Overall, Gifford is misled in his interpretation by his supposition that Aristotle is concerned in the passage with an epistemological challenge from an extreme empiricist, which is obviously the modern context of epistemology. So, his view of induction also is laden with the modern conception of it rather than reflecting an Aristotelian one. In contrast, LaBarge proposes

58 Ibid. 196.
59 [Da]…at the same time by means of the induction (ἀμα τῇ ἐπαγωγῇ), like those who recognize something (ὦσπερ ἀναγνωρίζοντας). (Db) For (γάρ) there are some things which we know right away (εὐθύς) (for example, we know that something <has angles equal> to two right angles, if we see (ἰδοµεν) that it is a triangle
60 Ibid. 197
61 Ibid. 198
62 Ibid. 200: “Indeed, it would be surprising if a philosopher who is generally as little interested in skepticism as Aristotle is should go out his way to haul in the sceptic in a passage like Pr. An. 2.21 that is so narrowly focused on the technical problem of what sorts of epistemic errors are compatible with explicit knowledge of a universal.”
A revised interpretation of the typical understanding of the passages, employing the view of Aristotelian ἐπαγωγή offered recently by McKirahan, that is, ἐπαγωγή involves the process of seeing a particular as representative of a universal. So, in his explanation of the induction in the passages at issue, he says, “from contemplation of particular triangles, he [an agent] is coming to see an individual as representative of a universal, and thereby holding both kinds of object in mind at the same time.”

It follows, then, that the ἐπαγωγή in the passage in PrAn. II.21 takes place at the moment at which “we see (ιδωμεν) that it is a triangle,” and likewise in the passage PoAn. I.1 at the moment of coming to know (εγνώρισεν) that this figure in the semicircle is a triangle, simultaneously performing induction (όμα ἐπαγόμενος). In these cases, the “seeing” and “coming to know” that ‘x is F’ should be distinguished from the simple acquaintance of ‘x being such and such’. Aristotelian ἐπαγωγή is not just seeing particulars as representative of any

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64 Ibid. 206.

65 McKirahan suggests a slightly different view on the object of ἐγνώρισεν: “Aristotle’s point is very simple. As soon as the person recognized that this figure is a triangle, he came to know without qualification that it has 2R. And this is the sense to be found in the sentence, “that this figure in the semicircle is a triangle, ομα ἐπαγόμενος ἐγνώρισεν.” Thus ἐπαγόμενος will refer to realization that it is a triangle, and ἐγνώρισεν to realizing it has 2R.” R. McKirahan, “Aristotelian Epagôgê in Prior Analytics 2.21 and Posterior Analytics 1.1,” 5. Engberg-Pedersen gives another alternative reading that the object of ἐπαγόμενος is ‘this figure in the semicircle has 2R,’ i.e., the conclusion of the syllogism. So the proposition can be both the result (conclusion) of ἐπαγωγή and the constructed syllogism. T. Engberg-Pedersen, “More on Aristotelian Epagoge,” Phronesis 24 (1979), 303.

66 McKirahan precisely indicates: “We certainly can and frequently do have acquaintance with individual cases before realizing that they are individuals falling under a certain kind. Aristotle is not saying that as soon as we catch sight of a triangle we know that it has 2R; he is saying that we know it to have 2R as soon as we spot it as a triangle.” R. McKirahan, Ibid. 7. See also his comment: “Recognizing an individual as falling under a universal therefore involves more than simply perceiving it; it is a matter of perceiving it in a certain way, a way for which prior acquaintance with the universal in question is not a sufficient condition, as I.1 shows: even if we are acquainted with the universal, we may fail to realize, for example, that the figure in the semicircle is a triangle:” Ibid. 8
universals, but seeing or spotting particulars falling under a certain universal in their ‘what they are’.

Why does Aristotle say ‘seeing’ instead of ‘inferring’ since induction as well as deduction is arguments? Why does Aristotle say ‘seeing’ instead of ‘inferring’ since induction as well as deduction is arguments? What kind of ‘seeing’ would this be? Barnes identifies it as ‘a quasi-perceptual thought’ (noësis), giving us further references to it: 

…practical wisdom is concerned with the ultimate particular, which is the object not of knowledge but of perception—not the perception of qualities peculiar to one sense but a perception akin to that by which we perceive (αἰσθάνομεθα) that the particular figure before us is a triangle.

But when we come to the concrete thing, e.g. this circle, i.e. one of the individual circles…, of these there is no definition, but they are known by the aid of thought or perception (μετὰ νοησεως ἢ αἰσθήσεως γνωρίζονται); and when they go out of our actual consciousness it is not clear whether they exist or not; but they are always stated and cognized by means of the universal formula (τῷ καθόλου λόγῳ).

The ‘seeing’ is a kind of perception, but not the perception that depends on a certain sense, e.g. the sight of eyes. It is a perception (αἰσθήσεως) that is accompanied by thought (νοησίας), being cognizable always by means of universal formula. This point about Aristotelian ἐπαγωγή is the most distinctive feature distinguishable from the modern concept of inductive inference so that there is no worry in Aristotelian induction about justifying the inference from finite strings of particular statements to a universal statement as Gifford conceives there is.

The above references provide also a clue to decipher the idiosyncratic statements in the part [A] of the passage in I.1:

In some cases learning occurs in this way, and the last term does not become known through the middle term—this occurs when the items are in fact particulars (καθ’ ἐκαστα) and are not said of any underlying subject (καθ’ ὑποκειμένου).

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67 PoAn. I. 1, 71a5-8.
68 Barnes, Aristotle: Posterior Analytic, 86.
69 Nichomachean Ethics, VI. 8, 1142a26-29.
70 Metaphysics, VII. 10, 1036a2-6.
These statements follow right upon the mention of ‘ἐπαγωγή’ so that the ‘learning that occurs in this way’ must refer to the process of Aristotelian induction, i.e., the noetic *perception* of something. Then, all of ‘the last term’, ‘particular’, and ‘underlying subject’ must signify ‘the figure in the circle’. Obviously these are not an underlying subject in the sense of individual substance in the *Categories*. Rather, it is a subject (*substratum*) that is put forward before us (*to prokeimenon*), who are in the middle of inquiring. In the language of *PoAn*. I.31, it is also “this so-and-so” (τόδε τι).71 Aristotle says above, the subject (*substratum*) is directly known—perceived—by us without being mediated by anything else, the import of which bears not only on his idea about the epistemic power of induction,72 but also on Aristotle’s analogous mention of ‘recollection’ in *PrAn*. II.21—an agent knows the *substratum* directly “like those who re-recognize something” (ὡσπερ ἀναγνωρίζοντας).

Let us return to LaBarge’s argument to see whether such a view on Aristotelian ἐπαγωγή as he starts from maintains his further explication of the simultaneous knowledge in I.1 and II.21. Probably due to the burden of explaining how the pre-existing knowledge of universal truths is possible, LaBarge quickly extends his discussion of Aristotelian induction to the controversial issue of *nous* in II.19, asserting:73

> Particularly in the case of definition, the successful conclusion of an ἐπαγωγή must be understood as the achievement of νοῦς, i.e. a state in which we explicitly cognize the essential universal carried by the φαντασία of a perceived individual. Once the agent makes the inductive leap to νοῦς, a whole new world of cognitive activity opens up. Now she can achieve ἐπιστήμη when she makes syllogistic inferences on the bases of the first principles she grasps via νοῦς.

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71 *PoAn*, I.31, 87b28-30: “Even if perception is of what is such-and-such, not of what is a this so-and-so, nevertheless what you perceive must be a this so-and-so at a place and at a time.” See also *PoAn*. II.19, 100a17-100b1: “although you perceive particulars, perception of universals,—e.g. of man, not of Callias the man.”

72 On this point, we will continue our discussion in the final section which will examine the role of perception in *PoAn*. II.19.

73 S. LaBarge, Ibid. 204.
A serious problem in an interpretation such as the one above is to make so clear-cut a division between Aristotelian ἐπαγωγή as a way to universal truths and definitional principles on the one hand, and Aristotelian ἐπιστήμη achieved by a demonstration that has the definition as a premise, on the other hand. Moreover, even though LaBarge tries to keep the particularity of the φαντασία in his talk about the achievement of νοῦς, it is not clear how it is possible to arrive at definitional principles from the φαντασία of a perceived individual. It is very likely that LaBarge here switches his interpretative stance from the conception of Aristotelian ἐπαγωγή to the modern conception of inductive inference.

These indicated problems are clearly in evidence in LaBarge’s account of the troubling phrase at PoAn. I.1, 71a24-25—πρὶν δ’ ἐπαχθήνω τῇ λοιμογίσμων—that Ross and Barnes construe as “before you are led to the conclusion, i.e., before you are given a deduction. LaBarge asserts that the τῇ should be taken not epexegetically but as a quotidian disjunctive: 74

When we scientifically grasp a universal truth, we do so either through induction or deduction, but in either case an instance of simultaneous learning is possible if the learner explicitly cognizes the particular while he cognizes the universal through νοῦς or ἐπιστήμη. And this has the further happy result that the syllogism one grasps at 71a25 need not be the one that Ross and Barnes gave us long ago:

Every triangle has 2R
This figure in the semicircle is a triangle.
Therefore, this figure in the semicircle has 2R.

Indeed, the syllogism we grasp may be whatever geometrical syllogism it is that proves the universal truth that all triangles have 2R.

If we read carefully these statements, we can notice that LaBarge is talking about the universal truth that every triangle has 2R as the object of both induction and deduction, and consequently

74 Ibid. 209-210.
as the object of ἐπακθηναί or (quotidian disjunctive) λαβέιν συλλογισμόν. Definitely, this statements departs from the view of Aristotelian ἐπαγωγή by which he promised initially to interpret the passages in PoAn. I.1 and PrAn. II.21. If he had maintained the view of Aristotelian induction in his reading of the phrase, he should have read it like: being led to see (noëtic perception) by induction that this figure in the semicircle is a triangle, and to construct a syllogism as the above. The phrase implies that a construction of a demonstrative syllogism presupposes or needs in advance a perception-like (inductive) seeing of a particular subject as representative of a universal, i.e., seeing this figure in a semicircle as a triangle. This does not mean that induction is one thing, constructing a syllogism is another. For Aristotelian demonstration basically involves inductive seeing of a particular thing as its requisite starting-point. This point cannot be revealed in the formal presentation of a syllogism like ‘given two premises (major and minor), a conclusion follows,’ since it could easily be misunderstood such as the minor premise should be attained as a result of induction. As a matter of fact, for an agent who constructs the syllogism, the epistemic content of the minor premise comes—is actualized in the mind—first before the universal major and the particular conclusion.

For further explanation of this point, we need to reconsider the exemplary syllogism, which is the first case of a syllogism in the Posterior Analytics, beyond its immediate problem setting of the simultaneous knowledge, that is, in the setting of the chapter’s theme, pre-existing knowledge, and furthermore in the wider setting of demonstrative knowledge, the theme of the treatise.

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75 See the comment by Charles: “Although induction does not itself directly involve demonstration, it is permeated by our explanatory concern. This is why induction can give us a route to grasp the structures relevant for explanation, even though induction itself does not involve the formulation of demonstrations;” D. Charles, Aristotle on Meaning and Essence (Oxford: Clarendon Press, 200), 271.
Let us start with the second criticism by Gifford against the typical and traditional understanding of the ἐπίσταται ἀπλῶς of in I.1. He expresses his initial uneasiness with the passage about simultaneous knowledge in I.1 as follows: “Why the elementary case of syllogistic knowledge acquisition supposedly examined in A [part] should seem to Aristotle to merit any particular attention at this point in the chapter is not immediately obvious.” The initial depreciation of the exemplary syllogism deepens when Gifford illuminates the syllogism from his understanding of Aristotelian demonstrative knowledge that is officially exhibited in the very next chapter (PoAn. I.2), where Aristotle identifies it with ἐπιστῆμη ἀπλῶς, two conditions of which are necessity and explanation. Gifford comments extensively on the locution that occurs eight times in the first book of the Posterior Analytics, with the result that he finds a unitary, determinate, and context-independent sense such as any technical coinage should fulfill, except for the one in I.1. He pays a special attention to the minor term of the alleged syllogism, ‘this triangle here in the semicircle’ (τὸ δὲ τὸ ἐν τῷ ἡμικυκλίῳ τρίγωνῳ) which would be the subject of the proposition that could form the epistemic content designated by ἐπιστῆμη ἀπλῶς. Gifford claims: “the exemplary triangle T in A2 is going to have to be an individual and material entity with a non-renewable lease on existence (say, a triangle drawn on papyrus or on a wax tablet), and hence an entity that lacks the ontological constitution and metaphysical stamina needed to support the universal, omnitemporal, and necessary truths of Aristotelian science.” Considering Aristotle’s explicit denial that there is demonstration of perishable things (75b24), and his general requirement that the objects of scientific cognition be universal truths (87b28-39,

77 Ibid. 202.
88b30-33, and *NE* 1140b31-32), the exemplary syllogism cannot be a case of demonstrative knowledge at all. Hence, Gifford concludes:78

Thus, in the light of these considerations, were we to accept the received view, this is what we would find ourselves looking at: in I.1 Aristotle is wheeling out his technical innovation ἐπίστοσθαι ἀπλῶς, the linguistic vehicle which, as we saw in 2.1, he carefully manufactured in book I of the *Posterior Analytics* for the precise purpose of conveying the most fundamental concept of knowledge in his epistemological system, and he is using this weighty and uncommon expression to refer there, not to the state of scientific understanding which it is designed and defined to pick out, but instead to what is for him the non-scientific grasp of a singular and ephemeral truth—a cognitive state that signally fails to satisfy the official and all-important definition that he explicitly lays down for this key expression less than fifteen lines later at the start of I.2, in the passage around which the rest of the treatise revolves. This would be an odd spectacle, surely.

First of all, disregarding for a moment the idea that Aristotelian demonstration deals with only categorical statements, we should point out that Gifford and other scholars do not take into account the link that connects the passage on the simultaneous knowledge (71a17-30) to the previous passage on the kinds of pre-existing knowledge (71a11-16). Specifically speaking, they take in the pre-existing knowledge at 71a19-20—“you already knew (προὴδει) that every triangle has angles equal to two right angles”—simply as the explicit knowledge of the major premise, without pondering what kind of pre-existing knowledge it is. However, according to the two kinds (aspects) of pre-existing knowledge as we observed, it is a foreknowledge of ‘what it is’ of a triangle. Another foreknowledge given in the passage is, obviously, *that* ‘the figure in

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78 Ibid. 203. LaBarge accepts the argument against ἐπιστήμη ἀπλῶς in I.1: “Through most of the *Posterior Analytics*, however, the kind of cognitive object which concerns Aristotle most is the universal, so in most contexts ἐπιστήμη ἀπλῶς refers to the kind of ἐπιστήμη appropriate to universals. Admittedly, it is still decidedly uncomfortable that Aristotle should use ἐπιστήμη ἀπλῶς in an unusual way just a moment before he introduces the use of ἐπιστήμη ἀπλῶς that will dominate the rest of the *Posterior Analytics*.” S. LaBarge, Ibid. 212. Bronstein, who subsequently examines the passage at issue to seek Aristotle’s response to the *Meno* paradox, tries to alleviate the harsh criticism of Gifford against ἐπιστήμη ἀπλῶς in I.1. D. Bronstein, “Meno’s Paradox in *Posterior Analytic*,” 123-124.
a semicircle is', that is, a case of ‘that it is’ foreknowledge. Now, what is the most significant but easily unnoticed point in the distinction is that only the ‘that it is’ foreknowledge is actually given, while the ‘what it is’ foreknowledge is potentially given. Thus, before an agent constructs a syllogism (\(\lambda\alpha\beta\epsilon\iota\nu\varsigma\nu\lambda\lambda\lambda\omicron\sigma\iota\mu\omicron\nu\)), he actually has the explicit (fore)knowledge that the figure in the semicircle is, but at the moment when the agent sees (\(\iota\delta\omega\mu\nu\)) inductively that this figure in the semicircle is a triangle, the potential foreknowledge that every triangle has 2R is brought in to be actualized in the mind of the agent, and right away (\(\epsilon\upsilon\theta\upsilon\varsigma\)) the conclusion that this figure in the semicircle has 2R follows. Therefore, the demonstrative reasoning involved in and so resulting in the construction of the syllogism is unlike the formal presentation of the syllogism: the ‘that it is’ foreknowledge of this figure in the semicircle comes first, and then the crucial moment of seeing it as a triangle comes next, and simultaneously the ‘that it is’ knowledge of this figure having 2R follows. The potential knowledge of ‘what it is’ of a triangle, i.e., every triangle has 2R has been, figuratively speaking, absorbed in between the second and third procedure of the demonstrative reasoning.

Second, these scholars are hampered by their presuppositions so that they cannot get to the real meaning of the passage of the simultaneous knowledge. In the passage, there is a big delusion: it looks as if Aristotle was here talking about the movement of a (syllogistic) reasoning

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79 A more accurate expression would be that this (\(x\)) is a figure in a semicircle.

80 Aristotle identifies ‘knowing universally’ with ‘knowing potentially’ at PoAn. I.24, 86a25-27: “If you know that every triangle has two right angles, you know in a sense of the isosceles too that is has two right angles—you know it potentially (\(\delta\upsilon\sigma\omicron\mu\epsilon\iota\))—, even if you do not know of the isosceles that it is a triangle.” See also Aristotle’s distinction of the two kinds of potentiality at De Anima, II.5, 417a21-417b1. It is natural to interpret that the foreknowledge of ‘what it is’ is potentially given in the second sense of the potentiality in De Anima. But if it would not be implausible to interpret it in the first sense of the potentiality, then it implies that a human agent has a potentiality (capacity) to know the 2R theorem, which is a more Platonic version of the potentiality.

81 Notice here the structure of demonstrative reasoning that Aquinas presented by virtue of ‘that it is’ and ‘what it is’: “the being of the attribute, as of any accident, is to be in a subject. This is what is concluded in a demonstration. Therefore, prior to the demonstration, we do not know that the attribute exists, but only what it is.”
from a universal truth (every triangles has 2R) to a particular truth (this figure as a triangle has 2R). But, when we interpret the pre-existing knowledge of universal truths as pre-existing knowledge of ‘what it is’, not actually but potentially given to an agent, we can view the process of the simultaneity of knowledge acquisition entirely differently. It is the movement of reasoning from a particular fact actually given (that this figure in the semicircle is) to a particular fact previously unknown but simultaneously cognized (that this figure has 2R) at the same time as seeing the subject as representative of a universal (triangle), which brings into service the foreknowledge of ‘what a triangle is’. Here is a kind of inquiry from the initial fact that this (x) is a figure in the semicircle to what it really is (it is a triangle and so has 2R). The success of the inquiry critically depends on a new noetic-perception of the subject, in other words, a correct re-description of the initial fact, in which the agent refers to its nature at the correct level of generality. This is the fine structure of demonstrative inquiry that Aristotle elaborates later in II.1-2 (inquiry from that it is to what it is) and II.17-18 (referring to common nature in the correct level of generality) of the *Posterior Analytics*.\(^{82}\) Contrary to the depreciation by the scholars of the exemplary syllogism, what Aristotle describes through the simultaneous knowledge acquisition deserves to be taken as a good introduction to the theme of the *Posterior Analytics*, demonstration itself.

Third, as to the rigid idea of most scholars that demonstrative knowledge comprises only categorical statements, we have already made several counter-arguments against it:\(^{83}\) what demonstrative knowledge deals with includes particulars that are to be illuminated by universals but also universals that are to be instantiated by particulars. Rather, we should say that the

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\(^{82}\) See the details in our §1.4 and §3.3.

\(^{83}\) See the details in our §2.2 and §3.2
ultimate *telos* of demonstrations is to reveal or comprehend particulars by means of their universalities. For an Aristotelian *Weltanschauung* is to understand *this* or *that*, regarding why it is so, in terms of what it is. The terminology in the *PrAn*. II.21 reflects at least the territory where demonstrative knowledge prevails: where a particular (καθ’ ἐκαστον) and a universal (καθόλου) are connected by the relationship of part (μέρος) and whole (ὅλος) so that a particular is understood in respect of its wholeness (καθόλου: κατά ὅλου) and a universal is confirmed in respect of its part or each-ness (κατὰ μέρος, καθ’ ἐκαστον). It is no small worry with respect to Aristotelian demonstration to understand how it is addressed to particulars as far as the particulars are conceived as representative of universals. So, when Aristotle states in *PoAn*. I.1 that we have ἐπιστήμη ἀπλῶς of this particular figure having 2R, he has no reluctance in using the locution, even though he has not yet elaborated the two conditions to which ἐπιστήμη ἀπλῶς must comply, i.e., explanation and necessity.

§4.3 The *Meno* Paradox and Aristotle’s Response to it

Having examined the three issues, (1) the import of the simultaneous knowledge to the theme of the chapter, i.e., pre-existing knowledge, (2) the implication of the simultaneous knowledge acquisition to the theme of the treatise, i.e., demonstrative knowledge, (3) the applicability of the locution, ἐπιστήμη ἀπλῶς to a particular thing, we have two more issues left for a full range explanation of I.1, (4) Aristotle’s understanding of the paradox in the *Meno*, and (5) his response to it.
Insofar as simultaneous knowledge deals with demonstrative inquiry as we claim, it is the right place for Aristotle to mention the paradox of the *Meno*:\(^{84}\)

**MENO.** And how are you going to search for this, Socrates, when you don’t know at all what it is? Which of the things that you don’t know will you set before yourself, when you are searching for it? And even if you do come across it, how are you going to know that this is the thing you didn’t know?

**SOC.** I see what you’re getting at, Meno. Do you see what a contentious argument you’re conjuring up, that it isn’t possible for a man to search either for what he knows or for what he doesn’t know? For he wouldn’t search for what he knows – for he knows it, and there is no need to search for something like that; nor for what he doesn’t know, for he doesn’t even know what he’s going to search for.

*Meno*’s paradox is the paradox of inquiry cast in the form of a dilemma:\(^{85}\)

1. For any \(x\), one either knows, or does not know, \(x\).
2. If one knows \(x\), one cannot inquire into \(x\).
3. If one does not know \(x\), one cannot inquire into \(x\).
4. Therefore, whether or not one knows \(x\), one cannot inquire into \(x\).

This paradox presupposes that it is an *all or nothing* matter when it comes to knowing \(x\).\(^{86}\) This is a recurrence of or reference to the *epistemological monism* of the Eleatics.\(^{87}\) Plato’s epistemology—knowledge’ (*epistêmê*) vs. ‘belief’ (*doxa*), and the theory of recollection (*amamnèsis*)—grows out of this presupposition. For the presupposition is already put in Plato’s early dialogues with the form of Socrates’ disavowal of knowledge, and the *Meno* expresses it in the following: “I reproach myself not knowing anything at all (\(τό \ παράπαν\)) about virtue. And if I do not know what a thing is (\(ο\ δὲ \ μὴ \ οἶδα \ τί \ ἔστιν\)), how should I know what sort of thing

\(^{84}\) Plato, *Meno*, 80d4-e5.


\(^{86}\) See Fine’s argument that [2] and [3] presuppose ‘complete knowledge vs. total ignorance’: “if I know *everything* there is to know about Meno, or physics, *then* there is no need—or possibility—of inquiring about them. But surely not all knowledge of a thing is tantamount to complete or total knowledge of it; generally, one has only partial knowledge”; “if I know \(x\) in the sense that my mind is a complete blank about it, if I am totally ignorant about it, have no ideas whatsoever about it, then I cannot inquire into it. But being totally ignorant about \(x\) does not seem to be the only way to lack knowledge about it.” G. Fine, Ibid. 206.

\(^{87}\) M. Ferejohn, “Empiricism and the First Principles of Aristotelian Science,” 68.
it is? (πῶς ἀν ὀποῖον γέ τι εἰδείην;)"88 Socrates’ disavowal of knowledge here, on the one hand, up to the limit of total denial of having knowledge, on the other hand, shows the priority of the knowledge of ‘what it is’ to other types of knowledge. Thus, Socratic disavowal of knowledge basically blocks the possibility of inquiry from ‘knowing what sort of thing x is’ into ‘knowing what x itself is’. 89 It is evident that Aristotle’s demonstrative inquiry from that it is to what it is would not be possible within the Platonic frame of knowledge. To Aristotle, who is most likely to be acquainted with the eristic argument within the Academy, the Meno paradox must have been a stumbling block to surmount.

Recently, Bronstein, who focuses on the relevance of the paradox in the Meno to the paradox referred in the context of simultaneous knowledge, finds similarities and differences between these two paradoxes. As to a key difference, he says, “the Meno deals with the sort of learning that occurs on the way to first principles, Post.An. I.1. deals with the sort of learning that occurs on the way from them,”90 since the latter presupposes that a learner already knows a universal truth, while the former concerns how to know the universal itself. In Bronstein’s view, it is important that the paradox in I.1 has nothing to do with what is involved in an inquiry: rather, it arises in the specific context of applying universal truths to a particular case.91

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88 Plato, Meno, 71b3-4.
89 Typically, Socratic dialogues ends with revealing the ignorance of the interlocutors who believed that they knew what x is, but Platonic dialogues suggest methods that make it possible to inquire into what x is, notably, the method of hypothesis in Phaedo and Republic. Among the numerous studies, refer on this method: I. Mueller, “Mathematical method and philosophical truth,” in The Cambridge Companion to Plato, edit. R. Kraut (Cambridge: Cambridge University Press, 1992), 170-199.
90 D. Bronstein, Ibid. 123.
91 Ibid. 129: “the Meno puzzle is concerned primarily with enquiry (ζήτησις)…, whereas Aristotle’s puzzle is concerned with learning (mathēsis)… The gap seems especially wide given that in Aristotle’s example, as I have interpreted it, the geometer’s learning is not preceded by a deliberate search for the thing he learns (‘the figure has 2R) but occurs spontaneously in the course of his investigation of a different geometrical problem.”
Despite the difference, Bronstein finds the same logical structure in both paradoxes. First, the paradoxical conclusions are similarly presented: in Plato’s, ‘it is impossible for a person to search either for what he knows or for what he does not know’ (οὐ̂τε ὁ ὁδὲ ὁοὐ̂τε ὁ μὴ ὁδὲ), and in Aristotle’s, ‘one will learn either nothing or what one [already] knows’ (η...οὐ̂δὲν...η ὁ ὁδὲν). That is, the same construction of ‘either . . . or’ suggests that Aristotle has in mind the very same dilemma as he read in the *Meno*. Second, Bronstein shows that the paradox in I.1 has the structurally same two-horned dilemma as the paradox in the *Meno*, contra LaBarge who argues before him that “there really is no way to find two distinct problems in Aristotle’s treatment of the paradox to correspond to the two problems that Plato’s version of the dilemma produced.”

Aristotle’s point is regarded such that if someone denies the distinction between knowing universally and knowing unqualifiedly of particular facts, he will face the following dilemma:

1. Either the geometer knows without qualification the conclusion or he does not at all know it.
2. If the geometer knows without qualification the conclusion, he cannot learn it (he learns what he already knows).
3. If the geometer does not at all know the conclusion, he cannot learn it (learns nothing).
4. Therefore, the geometer cannot learn the conclusion—he learns either nothing or what he already knows.

The assumption (1) presupposes, like the one in the paradox in *Meno*, the ‘all-or-nothing’ conception of knowledge, because it does not allow any intermediate cognitive state between the

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92 S. LaBarge, Ibid. 200. LaBarge’s point is that in the paradox in I. 1, there is no dilemma, because it concerns only the one horn of the dilemma that there is no learning since a person already knows it. See also: “the question is then what Aristotle means when he says that without the distinction a person would learn nothing. I suggest that we should take the phrase to mean basically what the other phrase (μαθήσεται ὁ ὁδὲν) means—that is, if we have ἐπιστήμη κοθδου we cannot learn anything about the instances falling under the universal which we do not already know. We can learn *nothing new*, and if we learn nothing new, then we do not really learn at all. In this case, the statement of the paradox would be only apparent dilemma.” Ibid. 200-201. Therefore, LaBarge judges that Aristotle takes Meno’s paradox out of context and ignores the serious threat that the paradox causes for Plato’s pursuit of universals.
93 D. Bronstein, Ibid.132.
unqualified knowledge and total ignorance. The first horn of the dilemma is that (2) he knows unqualifiedly the conclusion before learning, because we do not suppose the distinction between knowing universally and knowing unqualifiedly. In this case, after learning, he will learn what he already knows (µοθήσεται ἀ οἶδεν).

The next horn of the dilemma is a little bit tricky, according Bronstein: “In the case (3) [that the geometer lacks the unqualified knowledge of the conclusion], learning is possible only if the geometer has some other type of knowledge . . . : the geometer’s prior knowledge must consist in (some sort of) knowledge of the conclusion—i.e., of the very thing he is about to learn.” On this point Bronstein explains further: “the explanandum for which Aristotle’s concept of knowing universally is the explanans is not merely the fact that the geometer learns that the figure has 2R…; rather, the explanandum is the fact that he learns this immediately after recognizing that the figure is a triangle.” Considering this statement, then, the former statement falls short to illuminate a significant point of the paradox in I.1: Bronstein should have stated that even if the geometer lacks the unqualified knowledge of the conclusion, there is a possibility to know it on the base of the prior knowledge of the subject of the conclusion, instead of the conclusion itself. We argued previously that this prior knowledge of the subject of the conclusion is the result of induction, a new noetic-perception of the subject, i.e., a right re-description of the initial fact. Anyhow, in Bronstein’s view, this possibility is blocked by the assumption (1): “prior to learning the geometer will not have any gnōsis at all of the

94 Ibid. 130-131.
95 Ibid. 131.
conclusion—he will be in a cognitive blank with respect to it.” 

Consequently, there is no possibility left for learning, i.e., he will learn nothing (μαθητέσαι οὐδέν).

After the construction of the dilemma caused by the denial of the distinction between knowing universally and knowing unqualifiedly in accordance with the dilemma of the paradox in the *Meno,* Bronstein gives his final assessment:

Aristotle begins with the interesting phenomenon of simultaneous learning, and he wonders: how is it that the geometer can reach the conclusion so quickly? The answer is: in a way, the geometer already knew it. He did not know it in the very same way in which he learns it—that would be absurd (71b7-8); but he did know it in a different way: he knew it universally (or potentially). And *all it takes for the geometer’s potential knowledge to be actualized is his seeing that there is a triangle in front of him* [italics mine]. Hence, prior to learning, in one way the geometer does not already know the conclusion, which makes genuine learning possible; but in another way he does already know it, which makes simultaneous learning possible.

Despite the virtue of finding out the second horn of the dilemma, Bronstein’s final understanding of the paradox in I.1 does not fully reflect the implication of the second horn of the dilemma. It is obvious that the first horn of the dilemma breaks down when we apply the distinction between universal knowledge and unqualified knowledge. That is, the consequence of the first horn—he will learn what he already knows—does not follow, because before learning he did not know it in the same way—unqualifiedly—he (genuinely) learns it. Then, what would be the case of the second horn? Bronstein thinks this way: because before learning he already knew it universally (or potentially), he learns the conclusion, i.e., it is not the case that he learns nothing. As Bronstein admits, though, there is one more element for this inference to be necessary: “*all it takes for the geometer’s potential knowledge to be actualized is his seeing that there is a triangle in front of him.*”

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96 Ibid.
97 Ibid. 133.
Bronstein comes close but not so far as to realize that the situation in the second horn of the dilemma is the initial stage of an inquiry: a geometer lacks the unqualified knowledge of the conclusion, having known only that this \((x)\) is a figure in a semicircle. How could the inquiry proceed from the initial stage? It can proceed to the next stage when he sees that there is a triangle in front of him, immediately actualizing the geometer’s potential knowledge that every triangle has \(2R\). It is a crucial point that the next stage of the inquiry is possible not because he has the universal (potential) knowledge but because he can see that the figure is a triangle. If he could not see that it is, even when he has the potential knowledge, the consequence of the second horn follows, i.e., “he will learn nothing.” Therefore, what breaks down the second horn of the dilemma in the paradox is the possibility of the seeing.

We argued before that the seeing is an Aristotelian epagōgê, a perceptual-noiēsis which refers to the nature of a particular subject at the correct level of its generality. Through the epagōgê, we can get a re-described fact which will bring out (actualize) the potential knowledge that we previously possessed. What is clear now is that the paradox in I.1 conceals a significant idea of Aristotle that demonstrative inquiry requires Aristotelian epagōgê. The reason why many commentators could not realize this point in the passage of the simultaneous knowledge should be attributed to their misunderstanding of pre-existing knowledge—“you already knew that every triangle has angles equal to two right angles.” The reason why Bronstein could not realize it is also the same: “the context of the Meno puzzle is the problem of searching for and learning universal truths, whereas the context of the Post. An. I.1 puzzle is the problem of learning particular truths (in the light of the relevant universals).” Because of this initial fixation about the difference between kinds of pre-existing knowledge, he could not appreciate the real message
of the fact of simultaneous knowledge and Aristotle’s intention in mentioning the paradox in the

*Meno* as well:98

“although Plato and Aristotle disagree about the origin of our knowledge of universal truths, it may very well be the case that they agree about how we make inferences from such known universals to unknown particulars…. In other words, while Plato and Aristotle may disagree about how to solve the *Meno* version of the puzzle, they may be well agree about how to solve the *Post. An.* I.1 version.”

There are two different versions of paradox, one in the *Meno* and the other in *PoAn.* I.1, even though they are isomorphic in their logical structure. Aristotle’s mention in I.1 of the paradox in the *Meno* is, in Bronstein’s interpretation, nothing but the indication of the formal identity. If Bronstein’s argument is correct, either Aristotle seriously misreads the significance (urgent threat) of the *Meno* paradox for Plato’s pursuit of what *X* is,99 or he finds a wrong place to mention it (he should have mention it in *PoAn.* II.19).100

Let us refresh our viewpoint on the paradox in the *Meno* and the paradox in I.1. The paradox in the *Meno* is Socrates’ dilemma recapitulation of Meno’s questions how one can set off an inquiry when he is completely ignorant of what he is inquiring—“how are you going to search for this, Socrates, when you don’t know at all what it is?... And even if you do come across it, how are you going to know that this is the thing you didn’t know?” So, in Socrates’ construction of the dilemma, the first horn—if one knows *x*, one cannot inquire into *x*—is not a real issue; it is rather redundant. The real issue is the second horn of the dilemma: if one does not know *x*, one cannot inquire into *x*. Right after having made exhibition (*ἐπίδειξις*) of an

98 Ibid. 137.
99 See the previous note on LaBarge’s interpretation of this issue.
100 Socrates introduces the theory of Recollection as a solution to the paradox of inquiry, saying: “enquiring and learning are as a whole recollection” (*τὸ γράφ ζητεῖν ἀρα καὶ τὸ μανθάνειν ἀνάμμησις ὑλὸν ἐστίν: 81d4-5). Unarguably, Aristotle denies the theory, notably in II.19 of the *Posterior Analytics.*
exemplary case of recollection, Socrates eloquently confirms this point once again: “we will be better and more manly and less idle if we think one should search for what one does not know (δεῖν ζετεῖν ἃ μὴ τις οἶδεν)...—this is something that I would certainly fight for to the end, if I could, both in word and in deed.” What makes Socrates so confident that he can and should search for what he does not know? Recollection! Specifically speaking, it is a concrete (ἐν τοῦτῳ) and actual proving of a case (ἐπιδείκνυμι) of recollection by the slave-boy of a geometrical truth. How could it be possible for that slave-boy? He already knew it. Here, we return to the first horn of the dilemma with which Socrates responded to Meno’s desperate questions. The Meno paradox does not look like just an eristic argument that Plato has to overcome. The implicit structure of the paradox seems to suggest that a Platonic human being is in between the two epistemic states, one in which he searches for what he does not know, and the other in which he knew already (the eternal truths).

Then, how does Aristotle understand the paradox in the Meno? Since PoAn. I.1 is the only place where he mentions it in his entire works, whatever he states just before his mentioning should be the direct source for his understanding of it. In addition, in the light of the remaining part of I.1 (71a30-71b8) where another solution to the puzzle by someone else is displayed, we suppose the paradox in the Meno to be a very familiar topic to the members of the Academy and Aristotle. Hence, we should try to find an interpretation that gives Aristotle full credit of his understanding of it not only with respect to the logical structure but also with respect to the

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101 Plato, Meno, 82b1-2: “Call here for me one of your many attendants here, whichever you like, so that I can perform the demonstration on him for you (ἰνα ἐν τούτῳ σοι ἐπιδείκνυμι).”
102 Plato, Meno, 86b7-c3
103 Ibid. 81c5-7: “So, since the soul is immortal and has been born many times, and has seen both the things here on earth and those in the underworld and all things, there is nothing that it has not learned (οὐκ ἔστιν ὅτι οὐ μεμαθηκέν).”
signification. For this purpose, let us bracket the sentence, [you already knew that every triangle has angles equal to two right angles], and leave it aside for a while for our fresh look at the passage concerning simultaneous knowledge. Then, we are left with the initial fact that this particular figure \((x)\) in the semicircle is. From this state, Aristotle tries to make an actual proving of a case \(\varepsilonπιδείξωμαι\) on ‘you’: you do not know what \(x\) is or what sort of thing \(x\) is, that is, what property \(x\) has. How can you inquire into what you do not know from the fact that \(x\) is?

You are just in the same situation of the second horn of the dilemma of Meno’s paradox. But you can see what \(x\) is, that is, that this figure in the semicircle is a triangle. In other words, by virtue of induction, you are able to see the subject \((x)\) at the correct level of its universality. Now, you confront a re-described fact that this figure in the semicircle is a triangle, immediately knowing that this figure \((x)\) has 2R. How could you come to know that \(x\) has 2R? You already knew it. Then, you are in the same situation of the first horn of the dilemma. However, you knew it not unqualifiedly but universally (potentially).

The above speculation shows that Aristotle fully understands the logical structure and the signification of the paradox in the Meno. The gap of signification between the paradox in the Meno and the paradox in I.1 is not as wide as Bronstein thinks. Nevertheless, we observe two critical points. First, in view of the fact that Aristotle’s distinction between knowing unqualifiedly and knowing universally is useful only for the resolution of the first horn of the dilemma, the distinction must be Aristotle’s first response to Plato’s theory of recollection: we already knew it not unqualifiedly but universally. Second, with regard to the second horn of the dilemma, an inquiry for what one does not know is possible for both Plato and Aristotle, but with
different cognitive powers: recollection for Plato, and induction for Aristotle. Thus, induction is the second response to Plato’s theory of recollection.

We should add some notes to the first point, since it relates to the sentence we bracketed, [you already knew that every triangle has angles equal to two right angles]. We indicated that universal knowledge is a pre-existing knowledge of what a triangle means, which is potentially given in contrast to the actual knowledge of this figure in the semicircle. If so, we suppose, right after we see that the figure \( x \) is a triangle, there should be in mind a searching for—actualizing of—the what-ness of the triangle, despite the words of ‘simultaneously’ and ‘right away’. \( PoAn. \) I.1 does not engage the issue of how the universal knowledge came to be known beforehand. Contrary to the common view, we are not so sure whether the issue is dealt with even in \( PoAn. \) II.19. What is obvious through our examination, though, is that universal knowledge serves to disclose the what-ness of a particular thing. There is no unbridgeable gap between universal knowledge as \( noēsis \) and particular knowledge as perception, since they are mediated by the power of Aristotelian induction.

Having explored (4) Aristotle’s understanding of the paradox in the \( Meno \), and (5) his response to it, we have one final task that we postponed up to now in our previous study of Aristotle’s demonstrative knowledge. In contrast to Plato’s claim that the knowledge of ‘what \( X \) is’ is prior to the knowledge of ‘what sort of thing \( Xs \) are’, we showed that Aristotle’s project of demonstrative inquiry proceeds from the grasp of the non-incidental—what sort of thing \( x \) is—features of \( x \) to the knowledge of the true nature of it, i.e., ‘what \( x \) is’. We can assert that Book II of the \( Posterior Analytics \) is devoted to exposing the one point that inquiry proceeds from \( that \ it is \) to \( what \ it is \). We also indicated that a paradox lurks in the demonstrative inquiry: how could one grasp a non-incidental feature of \( x \) without knowing what \( x \) really is? What guarantees or
justifies the initial grasp of $x$ to be non-incidental knowledge of $x$? From this question, we were only able to get a clue for the reason why Aristotle names one of the principles of demonstration as “hypothesis”: it is because a demonstrative inquirer supposes there to be an unrevealed middle in the initial grasp of a fact. Now, it is reasonable for us to expect to find in PoAn. I.1 Aristotle’s answer to the problem we raised, since the Meno paradox presupposes that we cannot know what sort of thing $X$s are without grasping what $X$ is. From our investigation of I.1, we can find without further ado Aristotle’s answer to this question: it is because of the power of induction that we are able to grasp non-incidental features of a particular $x$: we human beings are born with the natural ability to see particulars in their what-ness. Obviously, this answer is not a sort of logical justification that we expected for the non-incidental grasp of particular facts in a demonstrative inquiry. Rather, the answer seems to be deeply embedded in Aristotle’s view of human cognitive powers. This is the reason why we need to extend our discussion of the current

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104 Two Aristotelian scholars recently indicate the significance of the paradox potential in Aristotelian demonstrative inquiry. Lennox states: “The Meno paradox assumes that an inquiry about virtue could not get off the ground unless one knew from the outset what virtue was in the strongest sense, i.e., knew the nature of virtue itself. This assumption, moreover, would seem to rest on another—that there is no weaker knowledge of virtue, sufficient to ground further inquiry. In the Analytics Aristotle rejects these assumptions. Prior to inquiring what something is there needs to be a preliminary inquiry to establish that it is…. This, however, is at best a provisional solution. The fundamental problem behind the Meno Paradox is still present—how will you know you have succeeded in grasping that something is, in fact, an S, if you don’t have a reliable way of identifying Ss?” Lennox asserts that the identification problem is dealt nowhere in the Analytics, but it is directly faced by Aristotle in the biological works, especially De Partibus Animalium I. J. Lennox, “Getting a Science Going: Aristotle on Entry Level Kinds,” in Homo Sapiens und Homo Faber: Festschrift Mittelstrass, ed. G. Wolters (Berlin: Walter De Gruyter, 2004), 87-100; 88-89. D. Charles also recognizes the identification problem in the initial stage of demonstrative inquiry: “However, there remains Meno’s original question: If one does not have an account of what ‘virtue’ signifies, how can one proceed to find what virtue is?...For Meno’s question can be phrased as follows: If we can engage in an enquiry only if we possess an account which notes a general feature present whenever virtue is found, how can we begin an enquiry when we lack such an account? His question arose in a context in which neither he nor Socrates had succeeded in producing such an account. It is best seen as asking : How are we to obtain the minimum initial conditions of enquiry (whatever they are)?” D. Charles, “The Paradox in the Meno and Aristotle’s Attempts to Resolve It,” in Definition in Ancient Philosophy, ed. D. Charles (Oxford: Oxford University Press, 2010), 115-150:142-143. In Contrast to Lennox, Charles argues that the clue for the identification problem can be found in Aristotle’s notion of empeira in PoAn. II.19.
issue to Aristotle’s epistemic description of human cognitions in II.19, the closing chapter of the
Posterior Analytics.

§4.4 Epistemic Continuity of Human Cognition: Perception, Experience, and Noûs

The closing chapter of our treatise has notorious difficulties to decipher, of general and of
detailed interpretation. We do not here dare or need to attempt the full exegesis of the chapter. What we expect to expose from reviewing crucial parts of II.19 is Aristotle’s view on the human
cognition that grounds Aristotelian demonstration as an investigation of particulars in their what-
ness. More specifically, we want to explicate further than in the previous sections Aristotle’s
idea on induction, which is deliberately expressed in the most anti-Platonic tone at 100a16-17
and 100b5: “although you perceive particulars, perception is of universals (γὰρ αἰσθανόμενα μὲν
tὸ καθ’ ἔκαστον, ἢ δ’ αἰσθησίς τοῦ καθόλου ἐστίν); “we must get to know the primitives by
induction, for this is the way in which perception instills universals (δήλον δὴ ὦτι ἢμῖν
tὸ πρῶτα ἐπαγωγὴ γνωρίζειν ἀναγκαῖον. καὶ γὰρ ἢ αἰσθησίς οὔτω τὸ καθόλου
ἐμποιεῖ).”

These two statements are the dual crux of what we may call the ‘recasting account’
(100a15-100b5) that follows the long ‘genetic account’ (99b35-100a9) and the short ‘simile
account’ (100a10-14) in PoAn II.19. Our main concern will be how we should understand these
statements in relation to the other accounts. If we can construct a reasonable understanding of
the statements, what will be Aristotle’s basic presupposition regarding the human cognition on
which demonstrative knowledge is grounded.

105 For a recent trial of such an attempt, see: P. Biondi, Aristotle: Posterior Analytics II.19: Introduction, Greek Text,
Translation and Commentary Accompanied by a Critical Analysis, (Saint-Nicolas: Les Presses de L’Université
Laval, 2004).
As a preliminary step, we need to think about the subject matter and the general structure of II.19. The subject matters are apparently stated by Aristotle in the beginning: (1) how principles of demonstrative knowledge become known, and (2) what the state which gets to know them is:\textsuperscript{106}

[II.19a] As for deductions and demonstrations, it is clear both what each of them is and also how they come about—and so too (which is the same thing) for demonstrative understanding (ἐπιστήμης ἀποδεικτικῆς). As for the principles (περὶ τῶν ἀρχῶν)—how they become familiar (γίνονται γνώριμοι) and what is the state (ἐξίς) which get to know them—, this will be plain from what follows, when we have first set out the puzzles.

The process of knowing is dealt with in the three accounts which comprise a fair amount (99b35-100b5) of the chapter, while the state is identified as noús in the relatively brief passage (100b6-17) at the end. Before these two parts, Aristotle presents two aporiai in the early part (99b20-26), one of which clearly gives rise to Plato’s theory of recollection: “whether the state, not being present in us, come about in us or rather are present in us without being noticed.” Then he argues (99b26-34) that each horn of the aporia is respectively impossible (ἀδύνατον) and absurd—out of place (ἀτομπον) —on the basis of his ideas of ‘pre-existing knowledge’ (γνώσις προϊσχούσης) and ‘exactness’ (ἀκριβεία).

Regarding the subject matters, what has been most puzzled to the readers of II.19 was that it is extremely hard to identify the contents of the ‘principles’ or the object of noús within II.19. Aristotle refers to the principles by terms like, ‘the primitive immediate principles’ (τὰς πρῶτας ἀρχὰς τὰς ἀμεσὰς), ‘the immediates’, ‘the primitives’, or ‘primitive universal’ (πρῶτος καθόλου) in the chapter. Do these terms signify the first propositional premises of deductive sciences as axiomatic readers of Aristotelian demonstration expect? Unfortunately,\textsuperscript{106}

\textsuperscript{106} PoAn. II. 19, 99b15-19.
they are shortly disappointed by the absence of reference to these premises in this closing chapter.

Barnes states a classic problem of II.19:

Most commentators have found a deep-seated ambiguity in B19: its ‘principles’ vacillate between primitive propositions and primitive terms. On the one hand, if Aristotle means to talk about the principles of demonstrations, he should be speaking of propositions; on the other hand, much of the language of B19 suggests that he is speaking of concept-acquisition. Was Aristotle guilty of a gross confusion? Or is there some way out?

This exegetical problem was so seriously regarded by many commentators that even recent scholars seem to be obliged to mention it and find a solution in one way or another. Contra Barnes, though, there is no genuine vacillation between propositions and terms in II.19, since we cannot find a single sentence where Aristotle refers any propositions by the term, ‘principles’.

In our second chapter, we maintained that Aristotelian demonstration should be understood as the part and whole relations of the sequence, particulars - lower level universals - higher level universals, and also showed how the ‘immediates’ and ‘primitives’ are to be interpreted in conceptual language rather than in the propositional one. Following the line of our interpretation, we suppose then that the ‘principles’ of II.19 could mean the highest level of universals—what we called before ‘maximally universal causes’—that are proximately or ultimately explanatory of certain subjects having certain attributes.

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As a matter of fact, the ‘deep-seated ambiguity in B19’ was disambiguated in Lesher’s seminal paper about forty years ago. Even though he does not directly tackle the problem, still using “universal principles” several times in the sense of universal propositions, he provides a right perspective in which to view II.19.

One reason for thinking that what is going on here is not a matter of concept formation, in the sense of coming to understand the meaning of words like ‘man’, ‘animal’, is that καθόλου is not understood as ‘concept’ in the Posterior Analytics. As a bare minimum, it is understood as “an attribute which belongs to every instance of its subject” and on occasion, as also an attribute which belongs in every instance, essentially and as such. Thus ‘to grasp the universal’ in the sense of καθόλου which is evident in the Posterior Analytics, is to grasp a universal principle…. If this is concept formation, it is exemplified not by a man who is learning the meaning of the word ‘man’, but by the scientist who is developing a scientific definition of the nature of man by demonstrating certain attributes to inhere essentially, necessarily and universally in men.

Besides our claim that universals and their instances are the core materials of demonstration, Lesher highlights here the point that Aristotle’s description of how the principles become known in II.19 should be read in the context of demonstrative investigation for the higher and finally proximate universal cause. This point is highly important since it is related to the main thesis of his paper that νοῦς in the Posterior Analytics could not be understood as ‘intellectual intuition’ of universal or self-evident truths, which operates independently from perception. Rather, he argues, νοῦς as a cognitive state is another aspect of induction which operates initially from perception in the context of demonstrative inquiry:

If we were able to see passages in the burning glass, and the light passing through them, we would be able to see the reason for burning in this case and νοησία that it must be so in all cases, this would be an instance of ‘extracting the universal from perception’ (88a14). This is an important passage because it puts the act of νοησία in the ongoing activity of scientific inquiry, progressing towards first principles (not reserved for the final grasp of them), and it establishes an important link between νοησία on the one hand

110 Ibid. 61.
111 Ibid. 57-58.
and the extraction of the universal’, i.e. induction, on the other…. This account of νοûς and ἐπαγωγή coincides with Aristotle’s view that experience provides us with principles which we then endeavor to structure within syllogistic form.

The prevailing view of noûs as Platonic ‘intellectual intuition’ represented by Ross and others at the time, with its consequent alleged ‘rationalistic switch’ in the end of II.19 no longer gains scholarly support. Another virtue of Lesher’s argument is that he opens the possibility for assessing the scope of noûs in the broader framework of demonstrative inquiry i.e., not just in the final grasp of principles. He states in the above: “it puts the act of νόησις in the ongoing activity of scientific inquiry, progressing towards first principles (not reserved for the final grasp of them).” In other words, according to him, noûs engages in the every level of grasping universals in demonstrative inquiry, which is “a paradigm of scientific discovery; seeing the extremes, and uncovering the middle which connects them: πάντα γὰρ τὰ αἰτία τὰ μέσα ἵδων τὸ ἀκρα ἐγνώρισεν, 89b14-15.”

Let us sum up the invaluable perspectives for reading II.19 that we can draw from Lesher’s work: we should read Aristotle’s accounts of the two subject matters on (1) the process of knowing the principles and (2) the state of knowing them (a) in the domain of demonstration, i.e., particulars and universals, (b) in the context of demonstrative inquiry rather than just concept-formation and (c) in the ongoing demonstrative activities of approaching the final

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112 On this point, see Barnes’ testimony: “B19 is Janus-faced, looking in one direction towards empiricism, and in the other towards rationalism. The principles are apprehended by ‘induction’ (ἐπαγωγή) in an honest empiricist way; but they are also grasped by nous, or ‘intuition’ as it is normally translated, in the easy rationalist fashion. It is a classic problem in Aristotelian scholarship to explain or reconcile these two apparently opposing aspects of Aristotle’s thought.” J. Barnes, Aristotle: Posterior Analytics, 259.

113 The earlier view on noûs as intuition is based on the distinction between induction as a preceding step and noûs as a final step of insight or validation of the result of the induction as principles. We find still such a distinction in a recent scholarship: “Some commentators…usually distinguish between (i) knowing those things that are principles and (ii) knowing principles as principles (i.e., having nous of principle)…. In light of the distinction drawn above, what we would like to know is whether, in Salmieri’s view, concept-formation is identical to our acquisition knowledge of principles as principles (i.e., nous), or whether it falls short of that.”; D. Bronstein, “Comments on Gregory Salmieri,” in From Inquiry to Demonstrative Knowledge, 187-188.

114 J. Lesher, Ibid. 56.
universal. The third point is especially illuminating for us, since we gain an exegetical support for extending our issue of the previous section—the plausibility of non-incidental grasp of initial facts in demonstrative inquiry—to II.19.\textsuperscript{115}

Now, we look at the crucial parts of the text, firstly the genetic account, secondly the simile account and then thirdly the recasting account. The genetic account follows:\textsuperscript{116}

[II.19b– Genetic Account] And this is clearly true of all animals: they have a connate discriminatory capacity (δύναμιν συμφύτων κριτικήν), which is called perception (αἰσθήσιν). Given that perception is present in them, in some animals the percepts are retained (μονή τοῦ αἰσθήματος) and in others they are not. If they are not, then, the animal has no knowledge (γνώσις) when it is not perceiving (either in general or with regard to items which are not retained). But some can still hold the percepts in their soul after perceiving them. When this occurs often, there is then a further difference (διαφορά): some animals come to have an account (λόγον) based on the retention of these items, and others do not.

Thus from perception there comes memory (μνήμη), as we call it, and from memory (when it occurs often in connection with the same item) experience (ἐμπειρία); for memories which are many in number form a single experience (ἐμπειρία μία). And from experience (ἐκ ἐμπειρίας) or (ἡ) from all the universal (ἐκ πάντων καθόλου) which has come to rest (ἡρεμήσαντος) in the soul (the one apart from the many (ἐνος παρὰ τὸ πολλὰ), i.e. whatever is one and the same in all these items), there comes a principle (ἀρχή) of skill (τέχνη) or of understanding (ἐπιστήμη) — of skill if it deals with how things come about, of understanding if it deals with how things are.

First of all, it should be pointed out that Aristotle provides a crucial clue for us to follow in understanding the genetic account. Right before this account, he states at 99b32-34 that “we must therefore possess some sort of capacity (δύναμιν)—but not one which will be more valuable than these states in respect of exactness (κατ’ ἀκρίβειαν).” Since the ‘states’ refer clearly to the state of knowing the principles, that is, noûs, the various capacities described in the genetic account must be inferior to noûs in respect of exactness. Then, it is natural for us to ask:

\textsuperscript{115} The introduction of the aporia in the early part of the chapter that evocates evidently Plato’s theory of recollection seems to be relevant to this issue. For the objects of recollection are not confined only to the highest Idea, that is, the Idea of Good.

\textsuperscript{116} PoAn. II. 19, 99b35-100a9
exactness of what? Without answering this question i.e., realizing the genuine context of the genetic account, the account itself will read like a psychological or epistemological description of concept-formation. However, if we view the genetic account from the perspective of demonstrative inquiry, then we will appreciate that the degree of exactness is an exactness in grasping universals that are primitively explanatory of certain facts. Granting that we human beings have already an ability to come up with such universals,\footnote{Touminen’s statement about II.19 is relevant to our point: “We wanted him [Aristotle] to justify the truth of intellectual cognition, preferable by reference to some characteristic qualities that distinguish true intellectual apprehension or understanding from all other forms of cognition. However, this is not Aristotle’s approach in \textit{APo} II 19. To the extent that we can understand his account in terms of justification, the justification he gives is descriptive rather than normative.” M. Touminen, “Back to \textit{Posterior Analytics} II 19: Aristotle on the Knowledge of Principles.” 118.} Aristotle traces back the origin of the ability in human cognitions. This implies that even though he mentions some capacities of animals in the account, his focus is primarily on human cognitions that give rise to the level of exactness of \textit{noûs}.

The regress of exactness ultimately stops in perception. In other words, the capacity of perception has the entry level exactness for grasping universals. For this assertion, we have to pay attention to Aristotle’s statement that perception is a discriminative (\textit{kritikos}) power. Commenting on this line, Barnes states: “if \textit{kritikos} is taken here mean “judgemental”, and if a capacity to judge presupposes some conceptual mastery, then Stage (A) will already involve the possession of concept, and the four-stage account cannot coherently function as an account of concept-acquisition.”\footnote{Barnes, \textit{Aristotle:} Posterior Analytics, 263.} Surely, the field of perception does not involve concepts, however we understand the term ‘concept’. The only thing the statement implies is that perception \textit{makes a}
distinction, separating one thing from others, and thus making an elementary difference (diaphora).¹¹⁹

This minimal point concerning perception can be confirmed by the fact that the next level capacity of exactness, that is, memory, makes a further (ἡ δὴ) difference. Aristotle says that when perception is retained in the soul, memory arises on the base of the retention. Then, Aristotle’s report about memory is somewhat striking that some animals who have memory have a kind of knowledge (γνώσεως), and come to have an account (λόγος). It is unclear whether the ‘animals’ refer to only human beings or any other general animals with memories, and whether the capacity having (using) logos is memory itself or the next level capacity, i.e., empeiria.¹²⁰

‘Logos’ is the term that has weighty significance later in the account of noûs: “the principles of demonstration are more familiar, and all understanding involves an account (ἐπιστήμη δ’ ἀπασά μετὰ λογοῦ ἐστι 100b10). Also in the account, Aristotle expresses the states which always grasp truth, i.e., epistemē and noûs as the ‘disposition in regard to dianoia’ (ἡ περὶ τῆν διάνοιαν ἔξις 100b5-6). Furthermore, Metaphysics I.1 says that only the human race lives also by skill (τέχνη) and reasoning (λογισμῶν). Accordingly, it would be prudent and a safe

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¹¹⁹ Biondi makes an interesting comment on this line: “The fact that κριτική can refer to both sensitive powers and the intellect in their respective acts of discriminations suggests to us that, regardless which reading is followed, the meaning of αἰσθήσεως has to be broad enough to include the perception of both the faculties of sense and intellect. In other words, it must admit the perceptive discrimination of all three kinds of sensible object admitted by Aristotle (see DA II.6) – proper, common, and accidental, the last of which requires the intervention of the intellect for it to be perceived since it is not at all perceptible to the external senses…. That is why I translate this term by (sense-) perception, the parentheses indicating that the perception, in the case of humans at least, is already from the start intellectual or intelligible, or at least potentially so. By admitting a (sense-) perception of all three sensible objects and recognizing that the senses and intellect operate together in the act of perception with each having their own mode of discrimination, one is able to avoid creating an unbridgeable chasm between the senses and the intellect and the knowledge provided by each.” P. Biondi, Aristotle: Posterior Analytics II.19, 35.

¹²⁰ Biodi relates the capability with logos to empeiria rather than memory. See also his observation of the various translations of the ‘logos’. Ibid. 38.
interpretation to understand ‘knowledge’ and ‘account’ here strictly in terms of the distinctions of which memory is capable in comparison to perception.

Some scholars often interpret the capacity of memory in line with *De Anima*’s imagination (φαντασία). For example, Salmieri argues:¹²¹

Aristotle does think that episodes of perception leave as a trace in the soul states that can (at least sometimes) be actualized at will, and that these states have contents that can be put to various uses. In the *De Anima* and *Parva Naturalia*, such states are called ‘φαντασία’ and their contents ‘φαντάσια’. Neither of these words appears in the *Posterior Analytics*, but II 19 speaks of a ‘retention’ (μνήμη) of perceptibles in the soul and of the perception’s ‘inhering’ (ἐνείμι) (99b36, 39). Compare this with *De Anima* III 3’s characterization of ‘φαντασία’ as aftereffects of αἴσθησις that ‘are retained (ἐμμένειν) and are like αἴσθησις (429a4-5).

This line of interpretation to consult the biological works of Aristotle in reference to II.19 is useful and productive for clarifying the capacities themselves. Likewise, *Metaphysics* I.1 980b26 testifies that animals other than man live by imaginations (φαντασίας) and memories. If we study further the animal’s cognitive power of imagination, we might be able to limit the meaning of the ‘knowledge’ and ‘account’ that some animals enjoy. For it is at least true that cats and dogs recognize their owners, and they chase birds and mice with distinctive intentions.¹²² However fruitful such interpretations are, they do not seem to be on the right path for assessing the genetic account of II.19, since Aristotle’s theory of human cognition in the *De Anima* is separated from the context of II.19, which is knowing the principles of demonstration.

¹²² See for example a very interesting paper of Osborne. She concludes her study: I have tried to suggest that φαντάσια is not an extra pseudo-faculty that kind-of thinks, and thereby somehow makes up for a lack of concepts in animals, but rather that it is not a faculty of judgement or interpretation at all, but the source of the intentional object to which we attend. Why is it important, then? Because by avoiding a dualism of the intentional objects of the two faculties of sense and thought, and by ensuring that the objects of both are actually is the objects we encounter in experience of the real world, Aristotle is cutting away any possibility of the move that we started this paper with, the claim that because animals do not have access to the world of thoughts they cannot have anything in mind when they act.” C. Osborne, “Aristotle on the Fantastic Abilities of Animals in *De Anima* 3.3,” in *Oxford Studies in Ancient Philosophy* XIX (Oxford: Oxford University Press, 2000), 253-285, 285.
When we recapitulate the basic image that the transition from perception to memory evokes, it is like some large scale differences becoming articulated in some detail. This is the exactly same image as Aristotle describes the method of natural philosophy in terms of the distinction between undifferentiated ‘whole’ vs. detailed ‘parts’, additionally illustrating the story that children call at first every man ‘father’ and every woman ‘mother’, but later on distinguishes them:  

[Phy. I.1] The natural way of doing this to start from things which are more knowable and clear to us and proceed towards those which are clearer and more knowable by nature…. So we must follow this method and advance from what is more obscure by nature, but clearer to us, towards what is more clear and more knowable by nature.

Now what is to us plain and clear at first is rather confused masses (συγκεχωμένα), the elements and principles of which become known to us later by analysis. Thus we must advance from universals (καθόλου) to particulars (καθ’ ἐκαστά); for it is a whole (ὅλου) that is more knowable to sense-perception, and a universal is a kind of whole, comprehending many things within it, like parts (μέρη). Much the same thing happens in the relation of the name to the formula. A name, e.g. ‘circle’, means vaguely a sort of whole; its definition analyses this into particulars. Similarly a child begins by calling all men father, and all women mother, but later on distinguishes each of them.

Except one terminological puzzle that the terms ‘universals’ and ‘particulars’ are oppositely applied to items, i.e., ‘what is more knowable to us’ (perceptibles), and ‘what is more knowable by nature’ (universals in Analytics’ sense), it is well attested that the two descriptions of the method of inquiry in the Physics I.1 and PoAn. II.19 correspond to each other.  

What are ‘confused masses’, a ‘whole’, or a ‘universal’ is the first differences having the lowest level of exactness that perception instills in the mind of an inquirer. Then, demonstrative inquiry moves to the more articulated differences or ‘parts’ that the initial grasp could not differentiate or

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123 Physics, I, 1, 184a17-184b14.
reveal.\(^\text{125}\) As Aristotle proclaims in the simile account (100a14), “our soul is such as to be capable of undergoing this.”

The progression of exactness should be once more made in experience (*empeiria*). However, we could not find any words in Aristotle’s description about experience that evoke the image of exactness or deepening of differentiation. Instead, we observe the image of one from many: ‘memories which are *many* in number form a *single* experience’, ‘from *all* the universal which has come to rest in the soul’, ‘the *one* apart from the *many*’ (ἐνος παρὰ τὰ πολλά). In what sense does the image of ‘one from the many’ contribute to the progression of exactness that takes place in the capacity of experience? The genetic account tells very little about the experience itself, only leaving a very controversial phrase in the description of the transition from experiences to a principle of understanding (*aorh e0pisth/mhj*): “from experience (ἐκ ἐμπειρίας) or (ἡ) from all the universal (ἐκ παντὸς καθόλου) which has come to rest (ἡμεμησαντος) in the soul (the one apart from the many, i.e., whatever is one and the same in all these items).”

The focus of debates among scholars is how to explain the conjunction ‘or’ (ἡ): “Is it (a) disjunctive (the principle of science comes *either* from experience *or* from the universal in the soul), (b) explicative (it comes from experience, *that is to say*, from the universal in the soul, or (c) progressive (it comes from experience, *or rather* from the universal in the soul, which is the

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\(^{125}\) See Scott’s rendering of the passage: “The epistemological journey consists in the articulation of something already grasped. We start with what is compounded and proceed by disentangling it and analyzing it into first principles. So in this chapter Aristotle is not saying that the path of discovery is from universal to particular, or from genus to species, but from a concept which embraces a number of elements in an unarticulated way to a more articulated level of understanding—for instance, from the hazy notion of circle to its definition.” D. Scott, *Recollection and Experience: Plato’s theory of learning and its successors* (Cambridge: Cambridge University Press, 1995), 124.
The disjunctive reading is, according to McKirahan, implausible because it would not only place ‘the universal in the soul’ outside the sequence of perception-memory-experience but also commit Aristotle to admit Platonic forms in the soul. He prefers the progressive reading in which the grasp of the universal is the intermediate stage between experience and *noûs* (the state of knowing principles). The textual ground for rejecting the explicative reading lies in the corresponding passage in *Metaphysics* I.1 that gives much more information about Aristotle’s thoughts on experience.

[Met. 1.1] And from memory experience (ἐπειριξα) is produced in men; for many memories of the same thing produce finally the capacity for a single experience. Experience seems to be very similar to science (ἐπίστημη) and art (τέχνη), but really science and art come to men through experience; for ‘experience made art’, as Polus says, ‘but inexperience luck’. And art arises, when from many notions (ἐννομαστοι) gained by experience one universal judgment (καθόλου ὑπόληψις) about similar objects is produced. For 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 individual 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 ill of this disease, e.g. to phlegmatic or bilious people when burning with fever—this is a matter of art.

With a view to action experience seems in no respect inferior to art, and we even see men of experience succeeding more than those who have theory (λογον) without experience. The reason is that experience is knowledge of individuals (καθ’ ἐκαστον), art of universals (καθόλου), and actions and productions are all concerned with the individuals; for the physician does not cure a man, except in an incidental way, but Callias or Socrates or some other called by some such individual name, who happens to be a man…. For men of experience (ἐπειροι) know that the thing is so (ὅτι), but do not know why (διότι), while the others know the ‘why’ and the cause. Hence we think the master-workers in each craft are more honorable and know in a truer sense and are wiser than the manual workers, because they know the causes of the things that are done…. And in general it is a sign of the man who knows, that he can teach, and therefore we think art more truly knowledge than experience is; for artists can teach, and men of mere experience cannot.

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128 *Metaphysics*, I. 1, 980b29-981b10.
Among the many characteristics of experience in these passages, we note first the reason that McKirahan rejects the explicative reading. Aristotle states explicitly in the second passage that experience is knowledge of individuals (καθ’ ἐκαστον) and art of universals (καθόλου). The person with experience (empeiros) knows—rather has information—that when Callias was ill of a certain disease and similarly in the case of Socrates, and of many other cases, such and such a treatment did good. Thus, the past memories of the practical success will make it possible to apply the treatment to a new case that the empeiros confront presently and in the future. But he does not reach the level of judging (καθόλου ὑπόληψις) that it has done good to all persons of a certain constitution, marked off in one class. Because of affinity of experience to particulars and memories rather than to universals, Ross claims that experience is a ‘coagulation of memories’: “(a) as embodying the data of unconsciously selected awareness it foreshadows a universal; but (b) as not conscious of what in the past is relevant, and why, it is not aware of it as universal.” 129 According to Salmieri’s figurative explanation, the experienced person has “no mental file for biliousness, though he has a bunch of associated material that belongs in such a file.…The experienced person’s frequent ἐννοήματα may, of course, prompt him to organize the pile into a file—to form a concept for the biliousness that Socrates and Callias have in common.” 130 In spite of the affinity of experience to memory, what distinguished it form memory and thus make further differences in respect of exactness of grasping universals is the ἐννοήματα of experience. It is tempting to consider ἐννοήματα as some mental contents that approximate to something like concepts.

The second and third characteristics of experience in the *Metaphysics* passages will help us to deepen our understanding of the term. At the end of the second passage, Aristotle says, “artists can *teach*, and men of mere experience cannot, because it is a sign of a man who knows that he can teach.” This negative characteristic of experience relates to the lack of *logos* in the case of experience: “we even see men of experience succeeding more than those who have theory (*λογόν*) without experience.” Does the *logos* mean, for example, a verbal expression of such and such an illness, ‘biliousness’? Or is it related to the ability to give a reason why this medicine is effective to this *type* of illness? At least, the third characteristic of experience seems to approve the verbal ability of experience: “men of experience (*ἐπείροι*) know that the thing is so (*ὅτι*), but do not know why (*διότι*), while the others know the ‘why’ and the cause.” That experience involves knowledge of facts (*ὅτι*) can be found elsewhere in another work.\(^{131}\)

Consequently, it is the task of experience (*ἐμπείρος*) to give the principles which belong to each subject. I mean for example that astronomical experience supplies the principles of astronomical science; for once the phenomena (*φαινόμενων*) were adequately apprehended, the demonstrations of astronomy were discovered. Similarly with any other art or science. Consequently, if the attributes (*ὑπάρχοντα*) of the thing are apprehended, our business will then be to exhibit readily the demonstrations. For none of the true attributes of things had been omitted in the survey (*ἱστορίαν*), we should be able to discover the proof and demonstrate every which admitted of proof, and to make that clear, whose nature does not admit of proof.

According to this passage, the range of experience based on phenomena is large enough to involve knowledge of common features and attributes of a subject on the level of generalization. And this passage gives us the impression that experience is powerful enough to involve non-incidental knowledge of facts.\(^{132}\) Besides, we see Aristotle’s exceedingly optimistic expectation

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\(^{131}\) *PrAn.* I. 30, 6a17-27.

\(^{132}\) Modrak evaluates experience very positively: “…experience consists in many notions (*ἐννοήματα*). The external world through sense perception acts on the mind, producing not only perceptions and memories, but also particular conceptualizations of observed phenomena. The experienced person is in a position to articulate these
that the complete knowledge or survey of attributes will readily (ἐτοιμωσύ) produce
demonstration. These points make us cautious to identify the experience in the genetic account
II.19 directly with knowledge of to hoti.¹³³

Nevertheless, the connection of experience to knowledge of facts is vital for
understanding experience—the transitional capacity between memory and noûs—in the context
of demonstrative inquiry. Let us recall again the important statement of Aristotle in PoAn. II.2:
“When we seek the fact or if something is simpliciter, we are seeking whether or not there is a
middle for it; and when, having come to know either the fact or if it is—either partially or
simpliciter—, we seek the reason why or what it is, we are then seeking what the middle term is.”
As we elaborated in our §1.4 and §3.3, knowledge of facts (to hoti) is a prerequisite for
knowledge of the ‘reason-why’ (to dioti). Crucial to appreciating the thesis is that knowing the
facts in the network of demonstrative inquiry involves awareness of existence of a middle.¹³⁴ By
that awareness, an inquirer can suppose in advance that there is a necessary or non-incidental
connection between a subject and its attributes. In other words, for Aristotle, knowledge of facts
extends considerably beyond the knowing of plain facts in the normal sense. What would this
point about knowledge of facts imply to the relation between experience and knowledge of facts?
LaBarge who traces the relation between the two from the same line concludes suitably as
follows:¹³⁵

¹³³ See LaBarge’s comment on this point: “I do not claim that empeiria and knowledge of to hoti are strictly
identical….Though I will not argue for the claim here, it seems probable to me that the content of knowledge of to
hoti must be explicitly verbalized by the knower, while I take the content of empeiria to be often left unverbalized.”
¹³⁴ This point was discussed in our §3.3 when we review De Groot’s interpretation of the Posterior Analytics.
¹³⁵ S. LaBarge, “Aristotle on Empeiria,” 36.
But his linkage of *empeiria* with knowledge of *to hoti* in *Metaphysics* i 1 seems to amount at least to this: just as knowledge of *to hoti* always involves awareness of some sort of important connection between things, but can also constitute the awareness of a puzzle that spurs the scientifically minded on to ask and, hopefully, answer the scientific questions, similarly *empeiria* may involve only the (often unverbalized) awareness of a connection but *can* provide a scientific spur to an agent with the cognitive capacities to receive it. This second role for knowledge of *to hoti* and *empeiria* provides the crucial and necessary bridge between the cognitive world of particulars and plain facts to that of universals and scientific explanations.

Let us explicate the idea presented here by the mixed languages of 96b8-9 and 99a23-29. A person has memory that all vines shed leaves [“shedding leaves both follows vine and exceeds it”], and also memory that all figs shed leaves [“it follows fig and exceeds it”], and then he wonders why these are so. Soon from these many memories, he comes to have a single experience (ἐμπειρία μία) that [“it does not exceed all of them: rather, it is equal to them.”] That is, he has one notion (ἐννοήμα) about [“a sort of kind (ὁ οἶον γένος ττ), whether named or nameless (ἡ ὄνομασμένον ἡ ἄνωμομον).”] The one notion spurs him on to ask, and when he eventually [“take the first middle” (πρῶτον μέσων), it is an explanation (λόγος) of shedding leaves. For there will be first a middle (that all are such-and-and).”]

This explication shows that *empeiria* does have a role of grasping universals in a type of *propter quid* demonstration (A-type of demonstration in Lennox’ coinage), even though it may not at first articulate the universal in a verbal form. Moreover, if we can say that this type of demonstration is a way of establishing (knowing) facts for further explanation (B-type of demonstration), we will be able to claim that *empeiria* provides genuine starting points of demonstrative inquiry, that is, a non-incidental grasp of initial facts. In this respect, the

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136 The two types of *propter quid* demonstration was discussed in our §3.3.
137 Half of the general argument that Tuominen makes is agreeable: “If we ask which of these two kinds of starting points, those of inquiry or premises of proofs, are at stake in *Apo* II 19, I would say: both…. When explaining how the starting points become known in *Apo* II 19, Aristotle describes both how our reason is developed from...
genetic account can be read as a defense against the eristic argument of the *Meno* paradox that threatens the possibility of initiation of an inquiry.\(^{138}\) This defense is a kind of descriptive justification: Aristotle would say, ‘See how human cognition from perception actually gives rise to non-incidental grasp of the particular facts.’ Notwithstanding the seeming affinity of *empeiria* to individuals or particulars, it turns out that experience is very close to grasping universals. From these considerations, it is rather plausible than not to read the controversial phrase, “from experience or from all the universal which has come to rest in the soul” epexegetically.\(^{139}\)

We may add a significant point to LaBarge’s suggestion that knowledge of *to hoti* and *empeiria* as well may contain in itself a ‘scientific spur’ to the next level of capacity. As long as the genetic account concerns the advent of universals as principles in demonstrative inquiry, as we claimed before, it cannot be viewed as a developmental story of human cognitions from animal cognitions. It is chiefly about the human cognitions that presupposes underneath the questions like ‘what is \(x\)?’ or ‘why is \(x\) \(Y\)?’ that appear in *PoAn* II.1. Then, it may well be the case that the ‘scientific spur’ is not only contained in experience, but also already in the level of memory and perception. It seems evident that we presuppose these questions even at the level of perception. For instance, when we hear an unfamiliar sound, we would ask ‘what is it?’ Then, the continuity of human cognitions, perception-memory-experience-*noûs*, must be triggered and maintained by the enquiring mind of the human being. Aristotle’s genetic account does not seem to be far from his first statement in the *Metaphysics*, “All men by nature desire to know.”

\(^{138}\) For a similar argument, see: D. Charles, “The Paradox in the *Meno* and Aristotle’s Attempts to Resolve It,” in *Definition in Ancient Philosophy*, ed. D. Charles (Oxford: Oxford University Press, 2010), 142-149.

\(^{139}\) For a more detailed argument for epexegetic reading, see: LaBarge, Ibid. 37-43.
There is a further point that we need to exploit from the continuity of human cognitions. It would be a demanding question to ask the objective ground of the continuity of cognitions, if the subjective ground of it is the enquiring mind of human beings. Most commentators think that each of the objects of consecutive cognitions is a discreet item, though transforming themselves to the next level of items: to put it roughly, what is perceived is in whatever manners distinguished from universals. Nevertheless, although the degree of exactness or articulated differences in grasping universals will progress from perception to noûs, the intention or signification via various differences is of the same universals throughout the progress. We are reconfirming the thesis in our §3.1, ‘epistemic continuity’ that the signification of essences via terms continues in the whole process of our coming to know essences. This ‘epistemic continuity’ reinforces the continuity of human cognitions that we find in the genetic account of II.19. That is, man’s cognitive faculties from perception up to noûs are continuously conjoined such that not only each of the lower levels cognition is articulated and deepened by the upper level, but also that each of the upper levels cognitions is confirmed by the lower ones.

Next to consider is the simile account, another murky part of II.19:

[II.19c–Simile Account] Thus the states in question neither inhere in us in a determinate form nor come about from other states which are more cognitive; rather, they come about from perception—as in a battle, when a rout has occurred, first one man makes a stand (ἐνός στάντος), then another does, and then another, until a position of strength is

\[140\] A few scholars mention the continuity of human cognitions, for example: “The sensory apprehension of particulars is then a feature of experience as well as memory and perception, and the continuity of the progression from perception to experience is assured.” D. Modrak, *Aristotle: The Power of Perception* (Chicago: The University of Chicago Press, 1987), 167. But the idea of continuity in human cognitions for Aristotle is not thermalized by any scholars except Scott. His reading of the genetic account in II.19 is quite different from ours: “In An. Po. II19, Aristotle does not really explain in what way each stage is relevant to its successor and ultimately to knowledge of first principles, nous. He seems keener to point out the differences between the stages than to explain what it is about each that paves the way for the next.” D. Scott, *Recollection and Experience: Plato’s theory of learning and its successors*, 120.

\[141\] PoAn. II. 19, 100a10-14.
reached [until it arrives at a starting point] (ἐὼς ἐπὶ ἀρχήν ἦλθεν). And the soul (ἡ ψυχή) is such as to be capable of undergoing this.

From the genetic account, it seems fair for Aristotle to say that “thus the states at stake do not inhere in us in a determinate form,” even though he did not mention anything about the states (noûs) itself in his genetic account. The first observation to make concerns Aristotle’s statement that the states come about from perception. Does it mean that noûs comes about ultimately from perception, the last term of the regress of exactness? Isn’t it more natural, if Aristotle has to choose just one capacity, to make reference to the direct origin of the states, i.e., experience? Otherwise, does he here employ the term, ‘perception’ in a different or broader sense, preparing the sense of perception in the recasting account that follows later? If he does, is the battle simile used to describe some other aspect of perception than the one in the genetic account?

These questions complicate further the battle simile, which is in itself a conundrum.

Normally, a simile user try to explain clearly what he wants to conveys by the simile. However familiar the battle simile was to the readers of Aristotle’s time, it is a mystery to contemporary readers.\textsuperscript{142} Nevertheless, the picture of the simile that gains the most supports from ancient commentators up to contemporary ones is such that the phalanx as a unit for battle is destroyed, and one hoplites stands (ἐνὸς σταύρωτος) from defeat and another one stands, and another stands, until the original formation of phalanx is reformulated:\textsuperscript{143}

\textsuperscript{142} Biondi indicates adequately an exegetical danger of the simile: “Whatever may be the exact significance of the simile of a fleeing army, the limitation and danger inherent in the poetic image consist in the fact that one will more than likely understand it in the same way that one understands the cognitive process itself…. Apostle provides an excellent example of this limitation as he explains the metaphor with reference to the cognitive process rather than the other way round.” P. Biondi, \textit{Aristotle: Posterior Analytics II 19}, 47-48. Various speculations are made about the real picture of the battle simile. For instances, see Biondi, Ibid, 48-49; J. Lesher, “A note on the Simile of the Rout in the \textit{Posterior Analytics} ii 19,” \textit{Ancient Philosophy} 31 (2001): 1-5.

So just as in the case of the battle that was being finished off, it happened that this [battle] once again came together as a result of the assemblage of a unity out of those taking flight, things happened this way in the case of the soul too. For when the irrational powers of the soul (I mean *thumos* and desire) rule over the rational soul, it turns out that the knowledge within it of the universal is destroyed. Then from a perception of a single percept imprinted in the imagination and again from another such thing and accordingly from many assembled percepts many memories come to be. And from memories [comes] a single experience. And again from experience there emerges in the soul the knowledge of the universal.

As we can see in the above comment by Pseudo-Philoponus, the philosophical moral that is drawn from the picture of battle simile has a serious drawback: original knowledge of universals in the soul—being destroyed by *thumos* and desire—then being restored with the aid of perception and other capacities. Such cannot be the signification of the simile, considering Aristotle’s obviously antagonistic attitude in II.19 toward Plato’s theory of recollection. The focus of the trouble is how we understand the phase, “until it arrives at a starting point (ἐκ ἐκάθεν ἐπὶ ἀρχήν ἑλθεν),” which Barnes translates with his emendation of the verb (ἀλκήν) as “until a position of strength is reached.” According to Lesher, “we have no record of any ancient author speaking of anyone or anything in a battle coming or going to an *archē*.”

Then what is the “it” that arrives at the starting point? Even though it is abnormal to read the phrase as not being a part of the simile, at least it will give us a plausible candidate of the subject, that is, “the soul”—‘until the soul arrives at a principle— which is the subject of the next sentence. Let us pause and see the basic image of the battle simile: ‘one by one making a stand (στάντος) / until...’ The same image can be observed in the recasting account:

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145 Ibid. 148: “Is this one of the soldiers, or perhaps the group of soldiers, or perhaps just the last soldier? Or is it the battle that returns to the original location? Or is it the process of regrouping?”

146 *PoAn*. II. 19, 100a14-100b5.
[II.19d–Recasting Account] Let us say again (πάλιν) what we have just said but not said clearly (σαφῶς). When one of the undifferentiated items (ἄδιαφόρων ἐνός) makes a stand (στάντος), there is a primitive universal (πρῶτον καθόλου) in the soul; for although you perceive particulars (γὰρ σισθάνεται μὲν τὸ καθ᾽ ἐκαστὸν), perception is of universals (ἡ δ’ σισθήσις τοῦ καθόλου ἐστιν),—e.g. of man, not of Callias the man. Next, a stand is made (ιστάνται) among these items, until something partless (τὰ ἀμέρη) and universal makes a stand. E.g. such-and-such an animal makes a stand, until animal does; and with animal a stand is made in the same way. Thus it is plain that we must get to know the primitives (τὰ πρῶτα) by induction (ἐπαγωγή); for this is the way in which perception instills universals (γὰρ ἡ σισθήσις οὕτω τὸ καθόλου ἐμποιεῖ).

“When one of the…items makes a stand (στάντος)…. Next a stand is made (ιστάνται) among these items, until…” It is more likely that the simile account does not refer back to the genetic account, but it intends forward to the recasting account. Based on the image in the simile, we suggest that the simile account does not describe what is going on at the level of perception, but what happens after perception, that is, one universal making a stand, and another doing the same, until the archê (ultimately explanatory universal) comes to stand still in the soul. Thus, there must an adjustment of meaning of perception in this account, which cannot be not on a par exactly with the one in the genetic account.

We now reach the final account of the process of knowing principles, that is, what we call ‘the recasting account’ in view of the statement that Aristotle will again (πάλιν) recast what he said before more clearly (σαφῶς). What is foremost modified in this account is the earlier version of perception. The power of perception is said to have direct grasp of universals: “for although you perceive particulars, perception is of universals.” This deliberate declaration is a

147 On this account, Lesher’s interpretation seems doubtful that the simile has still connection to the perception in the genetic account: “The entire process Aristotle seeks to illuminate through his simile…proceeds in two phases or states. In the first stage, individual sense impressions gain a purchase in the soul in much the same way in which a seal imparts its design to a malleable substance. The second stage begins when we realize that one of the sensible particulars retained in our memory is a thing of a certain kind, or as Aristotle would put it, when we are able to identify a ‘this’ as a ‘such’. J. Lesher, “A note on the Simile of the Rout in the Posterior Analytics ii 19,” 4.
148 About the scholarly opinions on ‘again’ and ‘clearly, see respectively: J. Barnes, Aristotle: Posterior Analytics, 265; J. Lesher, “Comment on Tuominen,” 151-152.
kind of final blow to the theory of recollection, specifically to Plato’s firm thought on sense perception in which universal forms are never encountered. Still, it is also appalling and puzzling to some readers, since it appears to be in contradiction with Aristotle’s own thought that universals cannot be perceived in I.31:\footnote{PoAn. I. 31, 87b28-33.}

You cannot understand anything through perception (Οὐδὲ δὲ ἀἰσθησίως ἔστιν ἐπὶστασθαι). Even if perception is of what is such-and-such (τοῖοῦδε), and not of what is a this-so-and-so (τοῖοῦδε τινος), nevertheless what you perceive must be a this so-and-so (τόδε τι) at a place and at a time. It is impossible to perceive what is universal and holds in every case. For no universal is a this, nor is it found at some time: in that case it would not be universal, since it is what is found always and everywhere which we say is universal.

Our interpretation that even perception in the genetic account consists of awareness of universals, though minimal and hazy, needs to be made consistent and not in contradiction with the above passage. Recall, then, our claim in §1.3 that for Aristotle, the particular (τόδε τι) is an instantiation of a universal (Fx) at a place and at a time, e.g. ‘this figure in this semi-circle’ in PoAn. I.1, and our other claim in §2.2 and §4.2 that these particulars enter into a demonstrative network not as bare particulars but as instantiations of universals. If we read carefully a clause in the above and two more sentences that follow in I.31, we can see that Aristotle is not denying that perception is of universals:

Even if perception is of what is such-and-such (τοῖοῦδε)… (87b28-29)

Rather, it is plain that even if we could perceive that triangles have angles equal to two right angles, we would still seek a demonstration and would not, as some people say, already understand (ηπιστάμεθα) it. Particulars must be perceived, whereas we have understanding in so far as we get to know universal. (87b35-39)

What Aristotle is denying in I.31 is not that perception is of universals—perceiving (Fx)—but someone’s false belief that perceiving is a kind of understanding. As we can see in the above
passage, Aristotle distinguishes knowing universal causes of certain facts from perceiving just
certain features of particulars. Aristotle has rather a firm belief that without perception we
cannot even initiate our demonstrative inquiry, notwithstanding having understanding.  

It is clear too that if some perception is wanting, some understanding must also be wanting—understanding which it is impossible to get if we learn either by induction or by demonstration, if demonstration depends on universals and induction on particulars, if it is impossible to study universal except through induction..., and if it is impossible to make an induction without having perception... It is not possible to get understanding of these items—neither from universals without induction nor through induction without perception.

Here, perception-induction-universal-demonstration-understanding are continuously conjoined
by the relation of each being a necessary condition of the latter. From the backdrop of this
relation, we can easily comprehend the last statement of the recasting account: “Thus it is plain
that we must get to know the primitives by induction; for this is the way in which perception
instills universals.” Such a role that Aristotle ascribes to perception in demonstrative knowledge
could not be interpreted by reference to the theory of cognition in De Anima. Some scholars try
to make a connection between the perception in the parenthesis—“e.g. of man, not of Callias the
man”—with the accidental perception in DeAn. II.6. But the perception in the recasting account
cannot be interpreted by any mentions of Aristotle on proper, common, or accidental perceptions.

As we examined in the second section of this chapter, the perception that instills
universals is rather perceptual-noësis, a perception (αἰσθησις) that is always accompanied by
thought (νοήσις). Noûs is already engaged in this kind of perception. We claimed before that
the activity of perceptual-noësis, which is induction, is paradigmatically performed in
demonstrative inquiry. Hence, we view the sequence of stops in the recasting account, man-
being such and such an animal-animal, not as the Porphyrean tree from infima species to suumum

150 PoAn. I. 18, 81a38-81b9.
but as the series of universal causes through which the first universal (πρῶτον καθόλου) stemmed from one of the undifferentiated items (ἀδιαφόρων ἐνός) is more and more articulated in successively upward demonstrations. Here, we read ‘one of undifferentiated items’ as identical in meaning to ‘one notion’ (ἐνώνημα) of experience, whether named or unnamed, and we regard ‘something partless’ (τὰ ᾄμέρη) as a relative concept, referring to the next level of universals that stands in the relation to previous universals in the upward demonstrations.

From this view, we pay attention once again to the last recapitulating sentence: “Thus it is plain that we must get to know the primitives (τὰ πρῶτα) by induction; for this is the way in which perception instills universals.” It is more likely that τὰ πρῶτα refer back to the first universal (πρῶτον καθόλου) rather than the primitives in the sense of the last universal cause, since Aristotle does not seem to change the meaning of the same term in the one account. Then, the stage on which Aristotle puts emphasis concluding the recasting account is the initial stage where perception encounters universals. This is the place where a demonstrative inquirer gets a non-incidental grasp of certain perceptual facts. If demonstrative knowledge hinges on non-incidental knowledge of certain facts, Aristotle seems to secure the epistemic ground of demonstrative knowledge by the last sentence.

As in the genetic account, Aristotle’s idea on the relation between perception and universals is persistent in the recasting account. The epistemic continuity of human cognitions from perception-memory-experience-noûs is regained but recapitulated simply by the perceptual-noësis in the recasting account. This is a dramatic and effective move for Aristotle to make against Plato’s theory of recollection. Aristotle’s punch is that there is no unbridgeable gap

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151 See; J. Barnes, Aristotle: Posterior Analytics, 266.
between perceptual knowledge of particulars and noetic knowledge of universals. They meet continuously in demonstrative inquiry.
Conclusion

The project of this dissertation has been to recover the role of the principles of Aristotelian science within the epistemic processes of demonstrative investigations, and as a result, to have a unified vision of demonstrative knowledge (*hē apodeitikē epistēmē*) in the *Posterior Analytics*. It has been argued that hypothesis and (nominal) definition as the principles or starting points are operative in the non-incidental grasp of the initial facts of demonstrative inquiry.\(^1\) Demonstration as presented in this study is a dynamic movement of reasoning that seeks to find causes for particular facts. As this thesis was argued, the actual domain of demonstration was identified: understanding particular things in their universality, i.e., by virtue of their what-ness. Demonstrative knowledge is not the ideal structure of a system of a finished science. It is a continual epistemic process that brings the reasoner closer to the essences of entities in the empirical world, even though some fallibility may remain within the process.

In concluding this study, there is need to reflect upon this attempt of reinterpreting the *Posterior Analytics* within the broader context of Aristotelian scholarship and beyond. The critical target of this dissertation has been the axiomatic deductive interpretation of the treatise that was dominant in the twentieth century. In the introduction, it has been described how the axiomatic interpretation emerged in accordance with the change of perspective on Aristotelian logic in general. Unarguably, this change was in part the result of the new mathematical logic,

\(^1\) Probably, a strong objection to this argument would that it commits Aristotle to employ ambiguously the important term, *archê*, that is. *archê* as the starting point of demonstrative inquiry vs. *archê* as the starting point of demonstrative deduction. Aristotle himself acknowledges the ambiguity in *PoAn*. I.2, distinguishing ‘prior by nature’ from ‘prior in relation to us’. The basic stance of this dissertation is that we have to take the perspective of ‘*archê* in relation to’, when reading the ‘hypothesis’ and ‘definition’ as principles. If not, would there be any other stance but to accept the axiomatic reading for demonstrative knowledge?
which was central to the reading of Aristotle coming out of analytic philosophy. The revived interest of the last century in Aristotle’s works as well as many other texts in ancient philosophy was, by and large, driven by Anglo-American scholars who were trained with the argumentative tools of analytic philosophy.\(^2\) It was rather natural for them to bring along their own interests and background assumptions in their interpretation of the texts, as it has always been and will be, to engage philosophical discussions with classic texts. In the attempt to relocate Aristotelian demonstrative knowledge more accurately within the long tradition of interpretation of it,\(^3\) this dissertation has had a consequence of removing an assumption of the axiomatic interpretation—that is, that the basic unit of knowledge is the proposition—from the overall vision of demonstrative knowledge.

Further studies around the project of this dissertation will be various and significant. The relationship should be explored between the demonstration as a tool for the sciences and the dialectic or the method of *endoxa*, by which Aristotle is still viewed by many to advances his investigations of nature, soul and human virtues.\(^4\) Whether Aristotle’s theory of knowledge (*epistêmê*), signification, and cognition envisaged in the *Posterior Analytics* can be squared with contemporary philosophy of science,\(^5\) semantics\(^6\) and epistemology is a question that should be asked. Moreover, it will be a demanding but valuable question to ask whether Aristotle’s theory

\(^3\) Whether the project of this dissertation is just a reconstruction of the tradition, or a re-interpretation within the tradition, would have to be judged by the very arduous work of reexamining the ancient, medieval and renaissance commentaries on the *Posterior Analytics*.
\(^4\) For an instance of the doubt about the use of the dialectic in Aristotle’s works, see A. Madigan, “Dialectical inquiry in Aristotle, *De Anima I,*” a lecture delivered at Lecture Series of the School of Philosophy at CUA (fall, 2012).
of demonstrative knowledge deeply embedded in his metaphysical notions like essence, property, and necessity can still be a viable option with reference to recent philosophies and sciences.
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