Introduction

The *Posterior Analytics* is the summit of Aristotle’s achievement in logic. It investigates the logical requirements for demonstration, that is, for proving a necessary conclusion from necessary premises. Since a proof of this kind holds the first place among arguments, the treatises in Aristotle’s *Organon* which precede the *Posterior Analytics*—the *Categories*, the *On Interpretation* and the *Prior Analytics*—are ordered especially to clarifying its presuppositions. The treatises which follow it—the *Topics*, the *On Sophistic Refutations* and the *Rhetoric*—are concerned with arguments which are useful and important, but essentially less perfect than the demonstration. The work before us, therefore, is of the greatest importance.

How should we approach the study of this work? The subject matter is by its very nature difficult, and Aristotle’s text is often very brief and difficult to interpret. Hence, this new translation of Thomas Aquinas’s *Commentary on the Posterior Analytics*, a commentary which is valuable not only for its perceptive interpretations of Aristotle’s arguments, but also for its illuminating explanations of the structure of the work as a whole and of the order of its parts. To make his commentary as useful as possible for contemporary readers, I have provided a translation of the Latin text of Aristotle on which it was based and a supplementary commentary of my own. In this introduction, I will be discussing three topics of fundamental importance for the study of the *Posterior Analytics* today: the relationship of Aristotle’s logic to symbolic logic, the scope and subject matter of logic, and the status of the syllogism as an argument form. I will conclude with a brief statement of the most important logical presuppositions for the study of the *Posterior Analytics*, intended especially for those approaching this work for the first time.

Aristotelian Logic and Symbolic Logic

Aquinas provides an excellent introduction to the *Posterior Analytics* in the *proemium* to his commentary. But this introduction is not altogether adequate today, when the word “logic” immediately calls to mind symbolic systems, like propositional logic and predicate logic, through which contemporary students are introduced to this discipline. Something must be said, therefore, about how the logic contained in the several treatises which make up Aristotle’s *Organon* is related to the newer symbolic logic. Since I do not think that these are two different logics, unrelated or opposed to
each other, I shall be especially concerned, in these brief remarks, to prevent any misunderstanding on this point.

At first glance, Aristotelian logic and symbolic logic do seem quite different. Aristotle’s treatises appear as a kind of analysis of logical principles as they appear in ordinary language, beginning with simple expressions in the *Categories*, moving to propositions in the *On Interpretation*, and then to arguments in the *Prior Analytics* and the treatises which follow it. Symbolic logic, on the other hand, appears as a series of logical systems, constructed with symbols for propositions and for logical functions. Nevertheless, the two approaches are not in principle opposed. For the symbolic systems have been constructed so as to have applications in ordinary language, and it is possible, with proper care, to move from the verbal expression of an argument to its symbolic expression and vice versa.

However, the two approaches are related somewhat differently to the subject matter of logic. Logic appears first in speech, and it is through an analysis of the logical principles revealed in speech that the science of logic is first established. Symbolic systems which have an application in logic presuppose these logical principles and are founded upon them. Symbolic systems are therefore derivative; the logical principles on which they are based are primary. It is these fundamental logical principles which Aristotelian logic and symbolic logic have in common. The two approaches differ in that Aristotle sought only to understand and explain these principles, whereas symbolic logicians seek also to use them in the construction of logical systems.

To make more concrete the distinction between symbolic systems and the fundamental principles on which they are based, let us look briefly at the propositional logic, the first of the symbolic systems. Its elements are easily stated. There are, first of all, symbols for propositions, e.g., p and q. Then there is the assumption that every proposition has a contradictory proposition opposed to it, so that if it is true, its contradictory is false, and if it is false, its contradictory is true. A third assumption is that any two propositions (or more) may be joined in a compound proposition which asserts that they are both true, and that this compound proposition can be contradicted by asserting that they are not both true.

Thus, if p and q symbolize propositions, and if every proposition has a contradictory, we may let ~p and ~q signify these contradictories. We can then symbolize the compound proposition as p & q, and its contradictory as ~(p & q). This last expression can then be symbolized by other functions which follow from it. For if p and q are not both true, then one or the other of them must be false (~p ∨ ~q), and if one is true, the other must be false (p ⊃ ~q).

What is important for our purposes is that the propositional logic is based on logical principles which are prior to it and which can therefore be studied independently of it. This is what we see, for example, in Aristotle’s *On Interpretation*. This treatise is not the construction of a symbolic system; it is rather an analysis of speech insofar as it signifies the true or the false.
other topics, we find definitions of the simple proposition and its parts and a
careful discussion of the ways in which such propositions can be opposed to
each other. In this way, the *On Interpretation* clarifies the truth of the logical
principles on which the symbolic system of propositional logic is based.

There is also a further point. A consideration of the logical principles
underlying the propositional logic enables us to show both the usefulness of
the system and its limits. The usefulness of the propositional logic lies in the
fact that logic is concerned principally—though *not*, in my opinion, exclusively—
with inferences. The most general form for expressing inferences or logical
consequences is the conditional statement, a statement of the form
“If p, then q.” Now inferences can be based on many different logical prin-
ciples—on the nature of relations, on the rules for the conversion of proposi-
tions, on the principles of the syllogism, etc., as we shall see below—and
these principles are not assumed in the construction of the system of propo-
sitional logic. In this respect the system is limited; it cannot deal with these
different kinds of inferences per se. Nevertheless, all inferences, however dif-
f erent the principles on which they are based, have as a consequence that it
will *not* be the case both that p is true and q is false. (Sometimes the inference
is even stronger, i.e., that *necessarily* it is not the case both that p is true and q
is false—the so-called “strict” implication.) It makes no difference, so far as
this consequence is concerned, whether q can be derived logically from p
without reference to the truth or falsity of p and q (e.g., “If George is taller
than Henry, then Henry is shorter than George.”), or whether it *cannot* be so
derived, but depends on at least one of the propositions being factually false
(e.g., “If the moon is made of green cheese, then I am studying the *Posterior
Analytics*.”). Because a statement of the form “¬(p & ¬q)” follows from condi-
tionals of *every* kind, it is clear that in this respect, though not without quali-
fication, all inferences can be symbolized within the propositional logic.

To summarize briefly, systems of symbolic logic must be based on logical
principles which are first revealed in speech. Both the usefulness and the
limitations of such systems must be evaluated in the light of these principles.
Hence, the importance of the treatises in Aristotle’s *Organon*. They are not,
properly speaking, treatises in Aristotelian logic, but rather Aristotle’s trea-
tises on logic; they are not logical systems, but rather investigations of the
logical principles which underlie all such systems. It follows that these trea-
tises may be studied without reference to the systems of symbolic logic; for
the logical relevance of these systems is a function of their relation to the fun-
damental principles which Aristotle sought to clarify in the *Organon*.

Let me conclude by emphasizing that I am not arguing here for the ade-
quacy or even for the truth of Aristotle’s logical investigations. Still less am
I suggesting that symbolic logicians are not also interested in understanding
the fundamental logical principles on which symbolic systems are based.
I have been concerned only to remove a source of misunderstanding which
might be an obstacle to the fruitful study of the *Posterior Analytics*. For this
treatise, inasmuch as it gives us an account of the logical principles on which demonstrative proof depends, is very much worth studying. Is the account true? This is a question for all logicians.

The Subject and Scope of Logic

There are many questions about the subject of logic and its scope. Does it include a study of the supreme genera through which we conceptualize the terms which enter into our propositions and arguments? Does it include a study of propositions considered in themselves prior to their use in argument? Does it concern only the forms of argument, or does it extend beyond this to the content of arguments, distinguishing between demonstrative, dialectical and rhetorical arguments and investigating the principles proper to each? Aristotle would answer all of these questions affirmatively, as Aquinas explains in the prooemium to his commentary on the Posterior Analytics. Here we will touch only briefly on the scope and subject matter of logic, chiefly with a view to clarifying the difference between Aristotle’s approach and the approach followed by symbolic logicians.

A striking difference between symbolic logic and the logic taught by Aristotle is where each begins. The first treatise in the Organon is the Categories, a work concerned with the most universal predicates, the ten supreme genera. Symbolic logic begins with the propositional logic, a system for symbolizing logical inferences. Why this difference?

Let us look first at symbolic systems. It would be generally agreed, as I suggested above, that logic is principally, even if not exclusively, concerned with the construction and analysis of arguments and other logical consequences, and that, in all of these, something follows from something. Therefore, a first system for symbolizing logical inferences is appropriately based on a universal consequence of the assumption that one thing follows from another. But the system of propositional logic, as we saw above, is based on just such a consequence; for if p implies q, then it is not the case both that p is true and q false. Hence, symbolic logic, inasmuch as it is concerned with constructing systems for symbolizing logical inferences, begins with propositional logic. This system takes from the principles of logic only what is necessary for this purpose.

Aristotle, however, is not concerned with constructing symbolic systems, but with understanding the fundamental principles of logic as revealed in speech. Since arguments are based on propositions, he investigates the logical relations pertaining to propositions in his On Interpretation before considering arguments. But every simple proposition affirms or denies a predicate of a subject. Predicates are therefore even more fundamental than propositions, and, for this reason, Aristotle begins logic with an investigation of the first predicates, the supreme genera or categories through which we conceptualize the things which enter into our propositions and arguments. For although we conceive things through these supreme genera unreflectively and
without art, it is possible also to consider them reflectively and to distinguish them from each other. This is what Aristotle does in his Categories.

After considering predicates and propositions, the elements from which arguments are formed, Aristotle investigates arguments themselves. He first investigates the forms of argument (Prior Analytics), and then demonstrative arguments (Posterior Analytics), dialectical and sophistical arguments (Topics and On Sophistic Refutations) and rhetorical arguments (Rhetoric). His purpose is to understand the nature and properties of various kinds of arguments and to explain the kinds of premises from which they proceed and how these premises can be obtained.

From these reflections on the scope of logic, we can approach the question of its proper subject matter. If Aristotle’s view of the scope of logic is correct, then the study of logic will include a study of simple predicates, definitions and propositions, as well as of syllogisms and other forms of argument. How are these defined? According to Aristotle, the proposition is speech signifying the true or false, the definition is speech signifying what a thing is, and the syllogism is speech in which some things are laid down, and something other than these things follows necessarily because of them. From this it appears that the subject of logic is words and speech—not as such, however, but insofar as these signify things as we know and reason about them.

When we know and reason about things, we form certain relations of reason through which we relate things as we know them to the world and to each other. Thus, we apprehend “animal” through a universal concept, and we see that it is common to many kinds of animals and can be predicated of them. We therefore relate “animal” to each of these kinds of animals as a genus to a species. In a similar way, we relate each kind of animal to the individuals of which it is predicated as a species to individuals. The things thus related may then enter into further relations; they may become predicates of propositions or terms in a syllogism, for example. Speaking generally, therefore, we may say that logic is about words and speech insofar as these signify things as we know and reason about them.

That logic is concerned with things only insofar as they fall under relations of reason is clear even in the Categories, where it might seem that we are concerned with things which exist outside the mind, e.g., substance, quantity, quality, etc. But these are considered in logic only insofar as they are supreme genera, and they are distinguished from each other according to the modes of predication. Thus, logic considers substance and the other supreme genera as they exist in the mind and are signified verbally, not as

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1 These are defined, respectively, in the On Interpretation, I, 17a35–38, in the Topics, I, 102a1, and in the Prior Analytics, I, 24b19–20. The genus in each case is “λόγος,” and “λόγος” is “φωνή σημαντική.” See On Interpretation, I, 16b26ff.

2 See Thomas Aquinas, De Potentia, q. 7, a. 11, for a helpful discussion of relations of reason.
they exist in the world. This latter consideration belongs rather to natural science and to metaphysics.

The Syllogism

I turn now to the third topic mentioned above: the status of the syllogism. This is an issue of fundamental importance for the theory of demonstration, since, according to Aristotle, the demonstration is essentially a scientific syllogism, a syllogism by which we know scientifically.³ To see why this is so, we must consider the syllogism in relation to other kinds of inferences and proofs.

If the demonstration is essentially a syllogism, then there cannot be any other form of argument in which a conclusion follows necessarily from the premises. For if there were another such form, demonstration would be possible in that form as well. But then the demonstration would not be essentially a syllogism. Therefore, if Aristotle’s definition of the demonstration is correct, the syllogism must be the only form of argument in which the conclusion follows necessarily from the premises. By an argument, I do not mean just any kind of inference, but a genuine proof, as will become clear in the course of the discussion.

I propose to state a general argument for this thesis. But it will be helpful first to consider some possible objections to it. The most radical objection is probably that of John Stuart Mill, who held that the syllogism is not an inference—at least not a “real” inference—and cannot produce any new knowledge. A second objection is that modus ponens and modus tollens are argument forms in which the conclusion also follows necessarily from the premises. A third objection arises from necessary non-syllogistic inferences like the famous “horse’s head” inference, attributed to Augustus De Morgan: “A horse is an animal; therefore, the head of a horse is the head of an animal.”⁴

Mill’s Objection to the Syllogism

Let us begin with Mill’s attempt to prove that the syllogism is not an inference.⁵ His starting point for the main argument is that every inference is from particulars to particulars. Whenever we move by argument from the known to the unknown, we begin with a number of cases, in each of which the same subject has been found to possess the same attribute. We then conclude that a

³ Aristotle, *Posterior Analytics*, I, 71b10–19. As we shall see, to know scientifically in the full sense means to know the cause by which a thing is, that it is the cause, and that the thing cannot be otherwise.


⁵ John Stuart Mill, *A System of Logic*, Book II, Chapter III.
new, unobserved case will be similar. For example, if we have found that many individual men are mortal, we conclude that the Duke of Wellington, though presently alive, is likewise mortal. Of course, we may represent this inference as a deduction from the universal statement that all men are mortal, but the probability of this universal statement, like that of the conclusion about the Duke of Wellington, depends on the particular cases already observed. Real inferences, therefore, are from particulars to particulars. But every syllogism proceeds from a universal premise. Therefore, if we understand “inference” in this strict sense, the syllogism is not an inference.

This is a very brief statement of Mill’s argument, but it will suffice here, since I am not concerned so much with refuting Mill as with bringing out something about the nature of the syllogism. For this purpose, I want to call attention to the fact that Mill’s proof that the syllogism is not an inference is itself a syllogistic proof. It may be expressed in the form of the following second figure syllogism:

Every inference is from particulars to particulars.
No syllogism is from particulars to particulars.
Therefore, no syllogism is an inference.

No doubt this syllogism is “trivial.” Nevertheless, it is absolutely necessary for Mill’s conclusion, since it is impossible to prove a universal separation between “syllogism” and “inference” without a middle term. Mill does, in fact, supply a middle term, and the middle term is related to the other two terms in a valid syllogistic mode. Therefore, if we grant his premises, we must grant his conclusion.

This conclusion cannot be proved except by a syllogism. We cannot establish it inductively by looking at individual syllogisms, since this will show us only that syllogisms are not inferences in the sense that Mill has defined, i.e., it will show us only that syllogisms are not inferences from particulars to particulars. This is nothing more than what is stated in the minor premise. But Mill wants something stronger than this; he wants to show that syllogisms are not, in any real sense, inferences at all. For this purpose he requires a universal proposition expressing what an inference is, i.e., that it is an argument which proceeds from particulars to particulars. It is only when we join this proposition to the proposition which asserts that syllogisms do not proceed from particulars to particulars, that we can see why syllogisms are not inferences. This new knowledge was implicit in the two premises and became explicit when we brought them together and recognized the relationships between the three terms: “syllogism,” “inference” and “proceeds from particulars to particulars.”

The same point can be made in another way by observing that whenever we give a reason why some conclusion is true, we necessarily syllogize. Why are syllogisms not inferences? Because they do not proceed from particulars to particulars. The conclusion leaps out immediately when we give the reason,
and the reason is the middle term. Of course, this assumes that we have already established that all inferences are from particulars to particulars. This is why the syllogistic move is hardly noticed. All the difficulty lies in showing that genuine inferences are from particulars to particulars. Once this is established, the proof that syllogisms are not inferences is made easily and spontaneously by our natural logic.

**Modus Ponens and Modus Tollens**

The second objection requires a longer discussion. Modus ponens and modus tollens may be symbolized, respectively, as follows: If \( p \), then \( q \); but \( p \); therefore, \( q \). If \( p \), then \( q \); but \( \sim q \); therefore, \( \sim p \). These are forms in which every kind of logical inference can be expressed. Not all inferences are necessary, however, and not all necessary inferences are arguments in the strict sense, as we shall see. The meaning of any inference expressed in modus ponens or modus tollens form must be interpreted on the basis of the underlying logical consequence which it expresses in summary form. We shall consider three of these: immediate inference, syllogistic argument, and non-syllogistic argument.

The following examples illustrate what may be called “immediate inference.”

If Socrates was the teacher of Plato, then Plato was a student of Socrates.
But Socrates was the teacher of Plato.
Therefore, Plato was a student of Socrates.

If no man is wise, then nothing wise is a man.
But no man is wise.
Therefore, nothing wise is a man.

If it is false that some star does not glow, then it is true that every star glows.
But it is false that some star does not glow.
Therefore, it is true that every star glows.

The consequences expressed by the if-then propositions in these examples are based, respectively, on the nature of relative terms, on the conversion of the universal negative proposition, and on the contradiction between the universal affirmative and particular negative propositions. In each case, a true conclusion follows from an if-then proposition by modus ponens. Moreover, the conclusion follows necessarily, since the consequence expressed in the if-then statement is a necessary one.

Nevertheless, modus ponens inferences based on these and similar if-then statements are not, strictly speaking, proofs. For, suppose someone were to
ask for proof that Plato was a student of Socrates. Would it be helpful to tell him that Socrates was the teacher of Plato? He would reply that we have not proved the original proposition, but simply restated it in another way. What the questioner was looking for was some kind of historical evidence to show that there was a student-teacher relationship between Socrates and Plato. But we have not provided any evidence for this. Therefore, although the two statements necessarily imply each other, neither of them is a proof of the other.

The same analysis applies to the other two examples. If someone asks us for a proof that nothing wise is a man, he will surely be disappointed if we reply that no man is wise. He was looking for evidence of a universal negative relationship between human beings and wisdom, and, instead of providing this evidence, we have simply restated the negative relationship between human beings and wisdom in another way. Similarly, if he asks for a proof that all the stars glow, we cannot help him by saying that it is false to say that some stars do not glow. While admitting that the first statement will indeed be true if this second one is false, he will object that his question has not been answered. He still has no evidence showing that all the stars glow or even that any of them glow.

In general, when two statements are so related that one implies the other without providing any evidence for its truth, we have an immediate inference and not, strictly speaking, a proof. This is clearly the case in the examples above. Neither of the statements is evidence for the truth of the other, and any evidence offered in support of either one of them would be evidence in support of the other. As immediate inferences, they are perfectly valid; as proofs, however, they beg the question.

Let us turn now to modus ponens inferences based on if-then propositions which express syllogistic consequences. I have put each of these examples in syllogistic form by supplying the missing premise.6

If the platypus nurses its young, then the platypus is a mammal.
But the platypus nurses its young.
Therefore, the platypus is a mammal.

[Whatever nurses its young is a mammal.
The platypus nurses its young.
Therefore, the platypus is a mammal.]

If the soul is the first principle of life, then the soul is not a body.
But the soul is the first principle of life.
Therefore, the soul is not a body.

[No body is the first principle of life.
The soul is the first principle of life.
Therefore, the soul is not a body.]

These examples are syllogisms in the first, second and third figure respectively.

6
If every act of courage is an act of virtue, then not every act of virtue is free from pain.
But every act of courage is an act of virtue.
Therefore, not every act of virtue is free from pain.

[Not every act of courage is free from pain.
Every act of courage is an act of virtue.
Therefore, not every act of virtue is free from pain.]

In each of these cases, modus ponens is a proof in the strict sense, because the premises supply evidence for the truth of the conclusion. Thus, the fact that the platypus nurses its young is evidence that it is a mammal. The soul cannot be a body precisely because a body cannot be the first principle of life. Are all virtuous acts pleasant? The instance of painful acts of courage provides evidence for a negative response.

Let us now consider three examples of modus ponens inferences which are arguments, since they provide evidence for the truth of the conclusion, but are not syllogisms. The first is an induction; the second, an enthymeme; the third, an example.\(^7\) I have re-expressed each of these in a simpler and more fundamental form.

If the albatross, petrel, shearwater, penguin, etc. nest in large colonies, then oceanic birds nest in large colonies.
But the albatross, petrel, shearwater, penguin, etc. nest in large colonies.
Therefore, oceanic birds nest in large colonies.

[The albatross, petrel, shearwater, penguin, etc. nest in large colonies.
The albatross, petrel, shearwater, penguin, etc. are oceanic.
Therefore, oceanic birds nest in large colonies.]

If George is honest, he will make a good mayor.
But George is honest.
Therefore, he will make a good mayor.

[Good mayors are honest.
George is honest.
Therefore, George will make a good mayor.]

If capitalism brought prosperity to us, it will bring prosperity to Russia.
But capitalism brought prosperity to us.
Therefore, capitalism will bring prosperity to Russia.

[Capitalism brought prosperity to us.
Therefore, capitalism will bring prosperity to Russia.]
These may all be called proofs, since, in each case, the conclusion is supported with evidence of some sort. But they are all less perfect than the syllogism. Thus, the enthymeme and the example, although they give the conclusion some plausibility, do not rigorously imply it, since it is possible for the antecedent to be true and the consequent false. The induction is better, but the conclusion does not follow necessarily unless we assume either that all oceanic birds have been enumerated, or that the other oceanic birds are the same as those enumerated. All of these argument forms are less perfect than the syllogism, in which the conclusion follows from the premises necessarily and without any additional assumptions.

What can we conclude from these examples? The main point is that the interpretation of an inference expressed in modus ponens form depends on logical principles which are more fundamental. Modus ponens may express no more than an immediate inference, or it may express a syllogistic or a non-syllogistic proof. Moreover, we can always restate a modus ponens argument in a more fundamental form, with propositions stating the premises (including any implicit premises) and the conclusion. Nothing is lost by dropping the if-then proposition, since it merely asserts that the conclusion follows from the premises. Whether or not the conclusion actually does follow (and whether it follows necessarily or not) will be evident from the premises themselves, once the underlying logical form is clear.

This does not mean, however, that we have no need of conditional propositions and of modus ponens and modus tollens. They are not necessary if we wish to assert the truth of certain premises and then draw a conclusion. But they are necessary when we want to state what conclusion would follow if certain premises were admitted, without committing ourselves to the truth of these premises. Once we have established that the conclusion would indeed follow from the premises, we may then want to assert the truth of the premises and draw the conclusion by modus ponens, or we may want to reject the conclusion and then reject one of the premises by modus tollens. Modus ponens and modus tollens are therefore both useful and important.

What implication does this analysis have for our thesis, i.e., that the syllogism is the only form of argument in which the conclusion follows necessarily from the premises? We have seen that in some cases modus ponens is equivalent to a syllogism, and that in other cases it expresses either a less perfect form of argument or an inference which is not, strictly speaking, a proof. However, while it has been shown that the syllogism is superior to the induction, the enthymeme and the example, it has not been shown that it is superior to all forms of argument. I have not shown, therefore, that the syllogism is the only form of argument or proof in which the conclusion follows necessarily from the premises. This thesis must therefore be established by a general argument.
Before stating this general argument, I wish to consider the third objection mentioned above, the objection based on inferences like the following: “A horse is an animal; therefore, the head of a horse is the head of an animal.” The conclusion in this inference follows necessarily from the premise, but it does not follow syllogistically. Therefore, if the premise is actually a proof of the conclusion, then the syllogism will not be the only form of argument in which the conclusion follows necessarily from the premises.

But this inference is clearly not a proof, since the premise provides no evidence for the truth of the conclusion. If someone were really in doubt about whether the head of a horse is the head of an animal and were looking for a proof of this, he would not be helped by being told that a horse is an animal. For since the parts of a substance are classified, as regards genus and species, in exactly the same way as the substance itself is classified, it is possible to move from the antecedent proposition to the consequent proposition and back again without proving either one. If the horse is a species of animal, then the horse’s head is a species of animal head, and vice versa. Moreover, evidence for the truth of either of these propositions is evidence for the truth of the other. To see this more clearly, imagine a case in which there is doubt about whether or not a certain organism is an animal. If we can show that it has an organ of sensation, we will have evidence to prove both that the organ is an animal organ and that the organism to which it belongs is an animal. Similarly, if we can show that the organism has no organs of sensation, we will have simultaneously proved both that its organs are not animal organs and that it itself is not an animal.

Endless examples of this sort can be multiplied simply by logic, without introducing evidence to prove any of them. Thus, if a horse is an animal, then whoever likes a horse likes an animal, and whoever shoots a horse shoots an animal, and a saddled horse is a saddled animal, and a dead horse is a dead animal, etc. All of these are valid inferences, but none of them is a proof.

We could perhaps prove the validity of the inference from “A horse is an animal” to “The head of a horse is the head of an animal” by deducing it from the logical rule which justifies it. For this purpose, we would have to assume the rule itself as our major premise, i.e., that the genera and species of the parts of a substance correspond to the genera and species of the substance itself. The relation of horse and horse’s head to animal and animal’s head could then be subsumed under the rule, and the validity of the “horse’s head” inference would follow as a conclusion. But this is not an objection to the thesis just established, since a proof of the validity of an inference is not a proof of the truth of the conclusion.
The General Argument

I now turn to a general argument for the thesis that the syllogism is the only argument form in which the conclusion follows necessarily from the premises. Given the preceding examples and clarifications, this general argument is not difficult to state. Every argument which actually proves something must offer evidence of some kind to show either why the predicate of the conclusion belongs or does not belong to the subject or, at least, that the predicate of the conclusion belongs or does not belong to the subject. But to provide this evidence, we require a third term or something which takes the place of a third term, like the enumeration of singulars in an induction or a parallel instance in the argument by example. Now the syllogism is the only form of argument in which a third term is related to two other terms in such a way that the connection or separation of these two terms follows necessarily from the relationship posited, without any further assumptions. Every genuine proof in which the conclusion follows necessarily from the premises, therefore, is either a syllogism or reducible to a syllogism. Since a demonstration is a kind of proof, and one in which the conclusion follows necessarily from the premises, it follows also that the syllogism is the only form of argument in which demonstration is possible.

I say “either a syllogism or reducible to a syllogism,” because some syllogisms are stated informally and with a premise missing, as when we say, for example, that a bat’s hearing enables it to fly at night. Also, there are arguments which do not appear to be syllogisms because of the unusual way in which they are expressed. These arguments are reducible to syllogisms, however, and their premises can be re-expressed in syllogistic form. Here is an example from Aristotle:8

The destruction of a non-substance does not destroy a substance.
If the parts of a thing are destroyed, then the thing is destroyed.
Therefore, all the parts of substance are substance.

Although it may not be immediately obvious, the premises of this argument necessarily imply the conclusion. Moreover, the premises supply a reason for the conclusion. Why is it that the parts of substance are substance? Because their destruction brings about the destruction of the substance, and this would not be the case if they were non-substances. Thus:

Whatever is such that its destruction destroys a substance is substance.
The parts of a substance are such that their destruction destroys a substance.
Therefore, the parts of substance are substance.

Another example, also from Aristotle:  

If a man exists, an animal exists.
If an animal exists, a substance exists.
Therefore, if a man exists, a substance exists.

The difficulty in this example is that the premises and conclusion are conditional statements rather than categorical statements. We must first ask why the existence of a man implies the existence of an animal, and why the existence of an animal implies the existence of a substance. If it is because man is an animal and an animal is a substance, we have a first figure syllogism proving that man is a substance. We can then conclude further, by immediate inference, that if man is a substance, then the existence of a man is the existence of a substance and if a man exists, a substance exists.

Consider also the following argument:

The majority of philosophers are wise.
The majority of philosophers are good.
Therefore, at least one philosopher is both wise and good.

Why is there at least one philosopher who is both wise and good? Because philosophers belong to a class in which a majority of the members are wise and a majority of the members are good. We may therefore re-express this argument in the form of a first figure syllogism by supplying the major premise:

Every class in which the majority of members are wise and the majority of members are good has at least one member who is both wise and good.
But the class of philosophers is such a class.
Therefore, the class of philosophers has at least one member who is both wise and good.

Preparing to study the Posterior Analytics

These notes on presuppositions are intended chiefly for readers unfamiliar with Aristotle’s logical treatises. They include only those topics which seem to me absolutely essential for even a first reading of the Posterior Analytics. Ideally, of course, the treatises in the Organon which logically precede it—the Categories, the On Interpretation and the Prior Analytics—should be studied in their entirety. But it is possible to read the Posterior Analytics with profit, presupposing something less than this.

9 Ibid, 47a29–32.
10 I have adopted this argument from a similar one attributed to De Morgan.
I think that a careful reading of the whole of the *Categories* is essential. Since it is the first treatise in the *Organon*, it has no presuppositions.\(^\text{11}\) Moreover, it is not lengthy, and, on the whole, not difficult, although there are points of difficulty in it. Its principal subject is the ten supreme genera, the first predicates through which we conceptualize the things about which we speak and argue. It might be thought of as a study of the principles of conceptual analysis; for by distinguishing the various families of concepts, we are better able to clarify our thoughts.\(^\text{12}\) Besides the ten supreme genera, the *Categories* considers five post-predicaments: opposition, priority, simultaneity, motion and having. These are found in more than one category, and have a number of different senses, an understanding of which is useful both for the study of logic and for its use in other disciplines. Of special importance is the distinction between relative, contrary, privative and contradictory opposites.

The *On Interpretation* is concerned with the proposition. The most essential topics for the study of the demonstration are: the definition of the proposition; the distinction between simple propositions, in which one thing is predicated or denied of one thing, and propositions which are one by conjunction; the distinction between universal, particular, indefinite and singular propositions; the difference between contradictory and contrary opposition; and modal propositions, i.e., propositions which assert that it is necessary for a predicate to belong to a subject or that it is impossible for it to belong, or that it is possible for it to belong or not to belong or both.

The first seven chapters of the *Prior Analytics* are concerned with the modes and figures of the syllogism. Especially important are: the rules for the conversion of propositions; the definition of the syllogism; the principle of the syllogism, i.e., that what is said or denied of all of a subject is said or denied of what falls under that subject; the distinction between the three figures; the valid modes in each figure; and the reduction of second and third figure syllogisms to the first figure. The theory of modal syllogisms is less critical, since demonstrations proceed from necessary premises, and the conversion of necessary propositions and the valid modes and figures of modal syllogisms with such premises do not differ from non-modal syllogisms. It is helpful also to understand the difference between syllogisms, inductions, inductions,

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11 However, for a clearer understanding of the *Categories*, it is helpful to read Porphyry’s *Isogoge*, a treatise written specifically as an introduction to Aristotle’s *Categories*. It discusses the five universals or predicables, i.e., genus, species, difference, property and accident. See the references for an English translation of this work.

12 Why there are ten categories? Do these exhaust the possibilities? In two important texts, Aquinas proposes logical divisions of the categories based on the modes of predication. The first is found in his commentary on Aristotle’s *Physics*, Book III, Lectio 5; the second, in his commentary on Aristotle’s *Metaphysics*, Book V, Lectio 9.
enthymemes and examples. These are discussed in Book II of the *Prior Analytics*, 68b15–69a20 and 70a3–70b40.

Finally, it is important to read something from the *Topics*, Aristotle’s treatise on dialectical or probable argument. I would suggest Book I and a sampling of the dialectical “places” from Books II–VII.13 This background reading is helpful for understanding the theory of demonstration, since necessary arguments are opposed to probable arguments, and things are clarified by contrast with their opposites. Moreover, the *Posterior Analytics* often refers to dialectics and clearly assumes some familiarity with it.

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13 Robin Smith has a new translation, with commentary, of Books I and VIII of the *Topics*. See the references for a complete citation.