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COMMENTS ON GEORGE BOGER'S "ARISTOTLE ON FALLACIOUS REASONING..."

David Hitchcock
Department of Philosophy
McMaster University
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Introduction

In the western tradition, formal logic and fallacy theory both originate with Aristotle. They have developed largely independently, with current textbook treatments of the so-called "informal fallacies" making little use of sophisticated contemporary work in formal logic, and vice versa. It is not obvious that this should be so, and indeed John Woods and Douglas Walton (e.g. in their 1989) have done considerable fruitful work in applying formal methods to the analysis of the fallacies.

Historically, the divorce of fallacy theory from formal logic is supposed to have occurred at the very beginning; in other words, they were never married. Interpreters of Aristotle hold that his fallacy theory, at least that part of it found in his *Sophistical Refutations*, came first, and does not reflect the formal logic of the *Prior Analytics*. Bochenski (1961), for example, speaks of Aristotle's three logics: the first logic found in the *Topics* and *Sophistical Refutations*; the second logic found in Book A of the *Prior Analytics* with the exception of chapters 8-22; and the third logic found in chapters 8-22 of Book A of the *Prior Analytics* and in its Book B. As to the *Topics*, Bochenski says that it "undoubtedly comes at the start. There is to be found in it no trace of the analytic syllogism, no variables, no modal logic, and the technical level of the thought is relatively low." (Bochenski 1961: 43) He thinks of the *Sophistical Refutations*, which is in effect the ninth and last book of the *Topics*, as composed a little later than the other eight books, but as also preceding Aristotle's second logic. For similar views on the chronological position of the *Topics* and the *Sophistical Refutations* in relation to the *Prior Analytics*, see Ross (1949: 6), Kneale and Kneale (1962: 23-24), Bochenski (1963: 22), Barnes (1981: 43-48), Rist (1989: 76-82), Smith (1994: 140, 149), Dorion (1995: 25-27) and Woods (1996: 18).

George Boger challenges this consensus. He argues that Aristotle's analysis of the fallacies recognized in *Sophistical Refutations* presupposes the formal logic of *Prior Analytics* A4-6. What makes the fallacious arguments appear to be *sullogismoi*, Boger holds, is that they appear to conform to one of the panvalid patterns identified in *Prior Analytics* A4-6. But the appearance is deceptive, as we see when we attend closely to what the words in the argument signify. Thus Aristotle has a clear sense of the difference between the formal or syntactic questions addressed in the *Prior Analytics* and the semantic questions addressed in the *Sophistical Refutations*.

1. The genus of sullogismos

Let me register in passing a reservation about Boger's novel proposal for the genus to which the *sullogismos* of the *Prior Analytics* belongs. Twentieth century scholarship has put forward three candidates for this genus: an argument (Keynes 1887, Ross 1949, Eaton 1959), a proposition (Lukasiewicz 1957, Bochenski 1963, Patzig

1968), a deduction or chain of reasoning (Smiley 1973, Corcoran 1974, Smith 1984, Woods 1996: 44). Boger proposes a fourth candidate: an argument pattern. He notes, correctly, that in *Prior Analytics* A4-6 Aristotle determines the cases where there is a *sullogismos* by considering for each possible pair of premiss patterns with three terms whether any proposition pattern follows of necessity. But, it seems to me, it does not follow that the *sullogismos* is the pattern where something follows of necessity, and Aristotle never says that it is. Rather, according to his constant definition of *sullogismos*, the *sullogismos* will be an argument conforming to such a pattern.

This controversy about the genus of an analytic *sullogismos* does not affect Boger's main point. For the question can still be raised whether Aristotle's analysis of fallacies in the *Sophistical Refutations* presupposes the formal logic of *Prior Analytics* A4-6.

2. Identifying presuppositions of fallacy analysis

How does one decide whether a philosopher's analysis of a fallacy presupposes a certain formal system? The most obvious evidence would be explicit appeal to that system, an appeal which is not mere window dressing but contributes to the substance of the analysis. In other words, if the reference to the formal system were eliminated, the analysis of the fallacy would become incomplete.

Clearly Aristotle's analysis of the thirteen fallacies discussed in *Sophistical Refutations* makes no such explicit appeal to the formal system of the categorical syllogistic found in *Prior Analytics* A4-6. He uses none of the technical terminology of those chapters; such expressions as "the middle [sc. term]", "the extremes", "the first figure", "belongs to", "is predicated of", "universal", and "particular" do not occur in the *Sophistical Refutations*. Nor is there any trace in the *Sophistical Refutations* of the ubiquitous and theoretically crucial use in the *Prior Analytics* of letters as metalinguistic variables ranging over terms.

Boger of course does not claim any such explicit appeal. But its absence is worth noting. If at the time of writing *Sophistical Refutations* Aristotle had already written *Prior Analytics* A4-6, or at least had a germinal view of its formal theory, one might have expected him to make use of its terminology and in particular to imitate its use of letters as variables, for example in his discussion of the fallacy of consequent (167b1-20, 168b27-169a5, 181a22-30). The argument from silence is not conclusive, but it should give us pause.

The alternative way to show that analysis of a fallacy presupposes a formal system is to show that the formal theory is implicit in the analysis. That is Boger's strategy. He considers 11 of the many examples which Aristotle analyses, examples taken from Aristotle's discussion of six of the 13 fallacies: equivocation, ambiguity, combination, form of expression, secundum quid, consequent. In each of these cases, Boger holds, the argument under discussion can be rephrased so as to appear to conform to one of the panvalid argument patterns identified in *Prior Analytics* A2-4. Aristotle does not himself rephrase the arguments to bring out this fact, but his analysis enables us to say why the appearance is deceptive. In general, what is involved is a fallacy of four terms, in which a verbally identical expression in the two premisses is not a genuine middle term but rather two terms distinguished by their meaning. In one case, we have the fallacy of illicit conversion. Thus the informal fallacies, or at least the ones whose analysis is reviewed by Boger, turn out to be formal fallacies.

How representative are the examples Boger chooses? For Aristotle, a sophistical refutation is a merely apparent refutation. Since a refutation is a *sullogismos* whose conclusion is the contradictory of a thesis propounded by

an answerer, there are two distinct ways in which a refutation can be sophistical or merely apparent. It can appear to be a *sullogismos* when it is not. Or it can appear that its conclusion contradicts the thesis when it really does not. (Cf. Hansen (1993) for a more elaborate discussion.) Boger quite rightly excludes from consideration the latter sort of case, since the analytic theory of the *sullogismos* is not relevant to it. As to the case of the merely apparent *sullogismos*, the definition of the *sullogismos* allows this to happen for a variety of reasons: because a premiss only appears to be a single proposition when it is really more than one, because there appears to be more than one premiss when there is really only one, because the conclusion appears to follow necessarily when it really does not. Quite rightly, Boger focuses on this last type of reason. It is this sort of case where the analytic theory of the *sullogismos* might be expected to shed light on what constitutes the fallacy.

Of the seven fallacies which Boger omits from consideration—division, accent, accident, non-cause, ignoratio elenchi, assuming the point, making several questions into one—the first three can give rise to merely apparent *sullogismoi* whose conclusion merely appears to follow from their premisses. So in a complete treatment Aristotle's examples of these three fallacies should be examined in the same way as the six Boger does deal with. So should Aristotle's other examples of the six.

I shall set aside this question of the representativeness of Boger's sample, and concentrate instead on the 11 examples for which he gives an analysis, as well as a 12th one which he cites but does not analyse. In my discussion of these examples, I shall keep in mind three distinct questions:

1. Can Aristotle's examples be analysed using the formal apparatus of *Prior Analytics* A4-6?
2. Must they be analysed this way?
3. Did Aristotle in fact analyse them this way?

To sustain his thesis, Boger needs at least a positive answer to question 1. Negative answers to questions 2 and 3 are not decisive refutations of his thesis, but one would expect at least that the way Aristotle does analyse these examples fits naturally into their treatment as apparently fitting one of the deductively valid patterns identified in *Prior Analytics* A4-6.

3. Boger's 12 examples

Here are the 12 examples, with my literal translation and brief comment:

1. *Ta kaka agatha; ta gar deonta agatha, ta de kaka deonta.* (165b34-35) "Evils are good; for musts are good, and evils are musts."

Aristotle takes this argument to be an example of equivocation, *homônumia*, which for Aristotle involves the illegitimate exploitation of the fact that a single word has a double meaning. This example looks as if it fits the pattern Darii (not Barbara, as Boger claims), since Aristotle's analysis makes clear that the minor premiss, which is in form indefinite, is intended to be particular. It is noteworthy, however, that Aristotle does not make the quantifiers explicit. In *Prior Analytics* A33 Aristotle points out that, with indefinite propositions like those in the present example, we can be led astray by the position of the terms, not noticing the difference between this belonging to that and this belonging to every that. Since the source of the mistake is a different one in this example, the author of A33 would have been expected to write instead: Some evil is good; for every must is

good, and some evil is a must. This argument from silence is not compelling, but Aristotle's systematic failure to include quantifiers in his examples to my mind casts doubt on the claim that he had already written *Prior Analytics* A when he wrote the *Sophistical Refutations*, and even on the claim that he had worked out the theory of categorical syllogistic.

2 and 3. *Ton auton kathêsthai kai hestanai, kai kamnein kai hugiainein. Hosper gar anistato, hestêken, kai hosper hugiazeto, hugiainei; anistato d' ho kathêmenos kai hugiazeto ho kamnôn.* (165b38-166a2) "The same man is sitting and standing, and is sick and healthy. For whoever stood up is standing, and whoever got well is healthy; but the sitter stood up, and the sick man got well."

These two additional examples of equivocation, *homônumia*, do not fit the panvalid pattern Barbara, contrary to Boger's claim. For in each case the minor premiss is a singular proposition with a definite description as subject, and the conclusion is a conjunction of two singular propositions, each with a definite description as subject. There is no example in the *Prior Analytics* of using a definite description as a term, nor does any conclusion of a *sullogismos* in the formal theory have the form of a conjunction. One might try to extend to definite descriptions the treatment of proper names which we find in *Prior Analytics* A33, that is, writing a universal quantifier before them. But "all the sitter" and "all the sick man" is awkward in English, and its Greek equivalent means the whole of something (Liddell-Scott-Jones). Note that Aristotle was not forced to express the conclusion as a conjunction. If he had had in mind the pattern Barbara as the apparent pattern of these sophisms, he could easily have rephrased the conclusions to read: "The seated man is standing", "The sick man is healthy". Even so, the problem of the definite description remains as a barrier to analysing these two arguments as apparently having the pattern Barbara.

4. *Ar' ho badizei tis patei? Badizei de tèn hêmèran holên.* (178b31-32) "Does someone tread on what he walks over? But he walks over the whole day."

The unstated conclusion of this elliptically expressed argument is that he treads on the whole day. Aristotle treats the argument as committing the fallacy of form of expression, which exploits the fact that two things which are really different are expressed in the same form. The logical form of this argument is in my view too complex to be captured by Aristotle's categorical syllogistic. Both verbs express relations rather than properties; their extension is not a class of individuals but a class of ordered pairs. One cannot force the major premiss into the form of a universal affirmative proposition from Aristotle's categorical syllogistic, since the predicate term includes a reference to the same individual as the subject term: Every thing walked over by someone is a thing trodden on by that person. For the formal analysis of this argument, we need contemporary predicate logic with relational predicates and bound variables:

For every x and every y, if x walks over y, then x treads on y.
a walks over the whole day.
Therefore, a treads on the whole day.

5. *Ara ho horai tis, touto horai? Horai de ton kiona, hôste horai ho kiôn.* (166a9-10) "What someone sees, does (he) this see? But he sees the pillar, so the pillar sees."

Aristotle treats this argument as an example of ambiguity, *amphibolia*, the fallacy of illegitimately exploiting the fact that words when combined signify more than one thing, although when separated they are simple. The

ambiguity here concerns the grammatical role of the word *touto*, which as far as its ending is concerned could be either subject or direct object of *touto*. Again the minor premiss and the conclusion are both singular propositions, and the conclusion has a definite description as subject. The minor premiss has a verb which expresses a relation. The form of the major premiss depends on how one interprets it grammatically. If one takes it so as to make a *sullogismos* out of the argument, it has the form: Everything seen by someone is a thing which can see. But the second premiss is not "The pillar is a thing seen by someone", as is required to get a Barbara *sullogismos*, but "The pillar is a thing seen by him". We need contemporary predicate logic again to reveal the valid pattern which this argument appears to have:

For every x and every y, if x sees y, then y sees.

a sees the pillar.

Therefore, the pillar sees.

6. *Ara ho su phêis einai, touto su phêis einai? Phêis de lithon einai; su ara phêis lithos einai.* (166a10-12)
"What you say to be, this do you say to be? But you say a stone to be; therefore you say you are a stone."

This is another example of ambiguity, *amphibolia*, exploiting again the ambiguous grammatical role of *touto* as subject or predicate completion of the infinitive *einai*. Here one might defend Boger's use of the indefinite "some" for "a", although the meaning is really different. One could therefore recast this argument as an apparent Darii *sullogismos*, which I would do somewhat differently than Boger, as follows:

Every thing you say to be is a thing you say to be.

Some stone is a thing you say to be.

Therefore, some stone is a thing you say you are.

7. *Ar' hôi eides su touton tuptomenon, toutôi etupteto houtos? Kai hôi etupteto, toutôi su eides?* (177a36-38) "By that by which you saw this man being beaten, by this was he beaten? And by that by which he was beaten, by this did you see?"

Each question is a proposition designed to serve as the major premiss of an argument, in the first case of the argument that he was beaten by your eyes (since you saw with your eyes the man being beaten), in the second case of the argument that you saw with a stick (because he was beaten with a stick). Aristotle treats the arguments as examples of the fallacy of combination of words; the meaning is not the same if one divides the words and if one combines them. In each case the major premiss can be analysed as a universal affirmative proposition, treating the singular term as a universal. But there is no basis in the *Prior Analytics* for treating a definite description like "that with which you saw him being beaten" or "that with which he was beaten" as a term. And in both arguments both the minor premiss and the conclusions are identity statements, not statements about class relations. To treat this argument as apparently of the form Barbara is forced.

8. *to on ouk estin on, ei tôn ontôn ti mê estin, hoion ei mê anthrôpos;* (167a2-4) "What exists is not existent, if it is not some one of the existents, for example, if it is not a man;"

Aristotle analyses this argument as an example of the fallacy of *secundum quid*, taking something said in a qualified way as if it were said without qualification. He envisages the following argument:

That which exists is not a man.

Therefore, that which exists is not.

This argument is not even apparently a *sullogismos*, because it has only one premiss. There is no indication in the text that the argument needs to be filled out with an extra premiss, nor is it necessary to do so. In fact, adding the premiss that that which is not a man is not would make the fallacy into an explicit premiss, contrary to the usual pattern in Aristotle's analyses, and would produce a genuine rather than merely apparent *sullogismos*.

9. *Ar' hê hugieia ê ho ploutos agathon? Alla tôi aphroni kai mê orthôs chrômenôi ouk agathon; agathon ara kai ouk agathon.* (180b9-10) "Is health, or wealth, good? But to the fool, i.e. the one who does not use it correctly, it is not good; therefore it is good and not good."

Aristotle treats this type of argument as another example of *secundum quid*. Here the form of reasoning is dropping the qualification, then conjoining the simplified conclusion with another assertion. Neither of these forms of reasoning looks like a mood of the categorical syllogistic. If one takes the first premiss to mean "All health (wealth) is good" and the tacit conclusion drawn from the second premiss to mean "Some health (wealth) is not good", then there is no logical mistake. The mistake rather consists in the first premiss, which is true only as a generality, not as a universal proposition.

10. *Ar' ho mê bouloît' an ho phronimos, kakon? Apobalein d' ou bouletai tagathon; kakon ara agathon.* (180b14-16) "Is what the wise man would not wish bad? But he does not wish to lose the good; therefore the good is bad."

This is another example of *secundum quid*, which Boger mentions but for which he does not give a syllogistic analysis. Clearly the mistake consists in reasoning from "he does not wish to lose the good" to "he does not wish the good", a move facilitated by the word order in the Greek. Once this (fallacious) move is made, rephrasing into a Barbara pattern is possible, if a little forced:

Every thing the wise man would not wish is bad.
All the good is a thing the wise man would not wish.
Therefore, all the good is bad.

But this is a genuine *sullogismos*, not merely an apparent one. The mistake is in the subargument to the minor premiss from the premiss that the wise man does not wish to lose the good. But this subargument is not even an apparent *sullogismos*, because it has only one premiss.

11. *Ei kakon estin ho kleptês, kai to labein esti kakon.* (180b18-19) "If the thief is a bad thing, to take is also a bad thing."

Aristotle gives here only the conditional associated with another example of *secundum quid*. Reconstructing in the light of Aristotle's proposed solution, which asserts that the thief does not wish the bad, but the good, we get the following argument:

The thief is a bad thing.
The thief wishes to take.
Therefore, to take is bad.

Boger amplifies the major premiss to the proposition, "what the thief wishes is bad", which could be defended by analogy to the immediately preceding argument about what the wise man would not wish. And with further

stretching we can get the apparent *sullogismos*:

Every thing which the thief wishes is bad.
Every taking is a thing which the thief wishes.
Therefore, every taking is bad.

But this is a genuine categorical *sullogismos* in the mood Barbara, not merely an apparent one. The error in the reconstructed version is a factual error in the second premiss: not every taking is a thing which the thief wishes, only a taking of something owned by someone else without the owner's consent. It is the wish for this sort of taking which is bad, not the unqualified wish to take. Aristotle however seems to locate the mistake in the major premiss. (Dorion (1995: 387) gives a strong argument for interpreting *labein* as meaning "to capture" [sc. the thief]; if this interpretation is accepted, the analysis would be parallel to that of the preceding example.)

12. *Apeiron to apan, labôn to men hapan agenêton (ek gar mê ontos ouden an genesthai), to de genomenon ex archês genesthai; ei mê oun gegonen, archên ouk echein to pan, hôst' apeiron.* (167b13-17) "The universe is infinite, assuming that the universe is ungenerated (for from what is not nothing is generated) and that what is generated is generated from a beginning; if then it is not generated, the universe does not have a beginning, so that it is infinite."

Aristotle analyses this argument as an example of the fallacy of consequent. Of all the examples discussed in the *Sophistical Refutations*, this argument, which Aristotle attributes to Melissus, is the only one which looks as if its author was himself convinced by it. It is clearly a chain of reasoning, which we might set out as follows:

Step 1:

From what is not nothing is generated.
Therefore, the universe is ungenerated.

Step 2:

What is generated is generated from a beginning.
The universe is ungenerated.
Therefore, the universe does not have a beginning.

Step 3:

The universe does not have a beginning.
Therefore, the universe is infinite.

Step 1 assumes as an unstated premiss that, if the universe were generated, it would be generated from what is not (since there is nothing other than the universe). It would be hard to put the resulting argument into syllogistic form, but in any case this step is not where Aristotle finds the error. He finds the error rather in step 2, which could in fact be put into syllogistic form:

Every generated thing has a beginning.
No universe is generated.

Therefore, no universe has a beginning.

Now the premisses are in the first figure, but in this figure when the first (major) term belongs to all the middle but the middle to none of the last (minor) term, there is no *sullogismos* of the extremes, as Aristotle argues at *Prior Analytics* A4 26a2-13. This is precisely the passage on which George Boger comments, where Aristotle sets out most fully his method of contrasted instances. Clearly, if Aristotle had written this passage before the *Sophistical Refutations*, he would have used the apparatus of his syllogistic to point out Melissus' error. Instead he points out the error of simple conversion of a universal affirmative proposition, an error on which he lays little stress at *Prior Analytics* A2 25a17-19.

4. Conclusions

The foregoing discussion of these 12 examples raises the following difficulties for Boger's thesis:

1) The sentences in Aristotle's examples of fallacies usually have a different logical form than that of the four types of sentences recognized in the categorical syllogistic. Boger's rephrasing of these sentences into *a*, *e*, *i* or *o* propositions is often forced. On my analysis, only three of the 12 arguments can be analysed as apparently fitting one of the patterns identified in *Prior Analytics* A4-6. And in one of those three cases, the argument put forward by Melissus, Aristotle does not use the analysis which *Prior Analytics* A4-6 most naturally suggests.

2) Aristotle nowhere attempts to analyse these sentences into syllogistic form, which would be surprising if he had the apparatus of the categorical syllogistic already available.

3) Where a premiss or conclusion is intended to be universal, Aristotle does not include the universal quantifier *pas*, even though he argues for the necessity to do so at *Prior Analytics* A31.

So far my reaction to Boger's thesis has been largely negative. But in my view there is an important core of truth to his position. The core of truth is that, apart from the argument of Melissus, the examples he analyses do exploit deductively valid patterns of argument. It's just that in most cases the deductively valid patterns which they seem to have are not found in *Prior Analytics* A4-6. The authors of these tricky arguments, whose earliest mention in the extant corpus of classical Greek literature is in Plato's *Euthydemus*, raised an important issue for logical theory. That issue is that the grammatical form of sentences is not necessarily isomorphic to their logical form. A logical theory must therefore be set out in a language which is at least partly artificial. Both Aristotle's syllogistic and Stoic propositional logic in my view meet this requirement.

Thus I take the rather unusual form of the *a*, *e*, *i* and *o* proposition-patterns in *Prior Analytics* A4-6 to be an accommodation to the tricky examples which we find in the *Sophistical Refutations*. Instead of writing "Every B is A", for example, Aristotle writes "A is predicated of every B" or "A belongs to every B". Why? Note that he writes instances of this pattern in his usual form, e.g. "every Aristomenes who is an object of thought is eternal" at A33 (47b28-29). What may lie behind Aristotle's unusual wording for the pattern is an appeal to the meaning of the particular instances; whatever the wording of the sentence, it must signify that A belongs to every B in order to count as an *a* proposition. Aristotle learned from his careful analyses of meaning in the *Sophistical Refutations* that ordinary language cannot be relied on mechanically for rules of deductive inference.

Nevertheless, it is surprising that, in his discussion of common errors in applying the formal system of *Prior*

Analytics A4-6 (A32-36, A46, B20-21), Aristotle does not mention the fallacy of four terms. Given his sensitivity in the *Sophistical Refutations* to shifts of meaning, one might have expected him to warn against failing to notice such a shift in the meaning of a term when one applies the syllogistic. The best explanation I can think of for his failing to give such a warning is that he envisages the syllogistic being deployed by someone working things out for themselves, rather than by someone in the dialectical context of the *Sophistical Refutations*. Except for the argument of Melissus, the fallacies discussed in the *Sophistical Refutations* are tricks of contentious debaters rather than mistakes people are likely to fall into on their own. So it is perhaps not necessary to warn people not to commit them in their own thinking. What is needed rather is advice on how to deal with them in a dialectical context, which is what the *Sophistical Refutations* already provides.

5. Summary

George Boger has given a lucid and careful presentation of Aristotle's first system of formal logic, the categorical syllogistic. I have given reasons for dissenting from his view that a *sullogismos* in the sense of this theory is a pattern of argument; rather, I argued, it is an argument which fits a pattern. I have given a literal translation and alternative analysis of the 12 examples of apparent *sullogismoi* which Boger mentions in his paper. Whereas Boger takes the 11 which he analyses as apparently fitting one of the patterns of the categorical syllogistic, I find that nine of the 12 appear to fit some other deductively valid pattern which Aristotle did not include in his categorical syllogistic. So I am sceptical of Boger's claim that Aristotle's analysis of the fallacies in the *Sophistical Refutations* presupposes the categorical syllogistic of the *Prior Analytics*. He is right however to draw our attention to the more fundamental point that the apparent *sullogismoi* of the *Sophistical Refutations* mimic deductively valid patterns of argument. The fact that they verbally fit such patterns shows that we cannot treat ordinary language formally. If we are going to have formal rules of inference, we will have to translate sentences of natural languages into an artificial or semi-artificial language. There is evidence that Aristotle made just such a translation in *Prior Analytics* A4-6.

Bibliography

Barnes, Jonathan. "Proof and the syllogism." In Berti, Enrico (ed.), *Aristotle on Science: The "Posterior Analytics": Proceedings of the Eighth Symposium Aristotelicum Held in Padua from September 7 to 15, 1978* (Padova: Antenore, 1981): 17-59.

Bochenski, I. M. *A History of Formal Logic*, translated and edited by Ivo Thomas. Notre Dame, IN: University of Notre Dame Press, 1961.

Bochenski, I. M. *Ancient Formal Logic*. Amsterdam: North-Holland, 1963.

Corcoran, John. "Aristotle's natural deduction system." In his *Ancient Logic and Its Modern Interpretations* (Dordrecht: Reidel, 1974): 85-131.

Dorion, Louis-André. *Aristote: Les Réfutations sophistiques: Introduction, traduction, commentaire*. Paris: Vrin, 1995.

Eaton, R. M. *General Logic*. New York: Charles Scribner's Sons, 1959.

Hansen, Hans V. "Sophistical refutations as fallacious deductions." Unpublished paper read at the annual meeting of the Ontario Philosophy Society, 1993.

Keynes, John Neville. *Studies and Exercises in Formal Logic*, second edition. London: Macmillan, 1887.

Kneale, William, and Kneale, Martha. *The Development of Logic*. Oxford: Clarendon Press, 1962.

Liddell, Henry George, Scott, Robert, and Jones, Sir Henry Stuart. *A Greek-English Lexicon*. Oxford: Clarendon Press, 1978.

Lukasiewicz, Jan. *Aristotle's Syllogistic from the Standpoint of Modern Formal Logic*, second edition. Oxford: Clarendon Press, 1957.

Patzig, Günther. *Aristotle's Theory of the Syllogism*, translated by Jonathan Barnes. Dordrecht: Reidel, 1968.

Rist, John M. *The Mind of Aristotle: A Study in Philosophical Growth*. Toronto: University of Toronto Press, 1989.

Ross, W. D. *Aristotle's Prior and Posterior Analytics*. Oxford: Clarendon Press, 1949.

Smiley, T. J. "What is a syllogism?" *Journal of Philosophical Logic* (1973) 2: 136-154.

Smith, Robin. "Aristotle as proof theorist." *Philosophia Naturalis* (1984): 590-597.

Smith, Robin. "Dialectic and the syllogism." *Ancient Philosophy* 14 (special issue) (1994): 133-151.

Woods, John. *Aristotle's Earlier Logic*. Unpublished manuscript, June 1996.

Woods, John, and Walton, Douglas N. *Fallacies: Selected Papers, 1972-1982*. Dordrecht/Providence: Foris Publications, PDA 9, 1989.

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