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THE SUBTLETIES OF ARISTOTLE ON NON-CAUSE

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Modern logicians understand non-cause as cause as the fallacy of hasty generalization, and indeed that is Aristotle's view of the matter in the *Rhetoric*. What has largely been lost sight of is the apparently quite different account developed by Aristotle in *On Sophistical Refutations*. This we think is a pity, for Aristotle has constructed an approach to non-cause which is extremely subtle and embedded in a powerful theory of argument. Our purpose in this paper is to bring these views to the broader attention of the research community in logic; but we shall also show that the apparently different treatments of the fallacy in the *Rhetoric* and *On Sophistical Refutations* aren't all that different after all.

At the beginning of the appendix to the *Topics* — the work known as *On Sophistical Refutations* — Aristotle writes that he will discuss “sophistical refutations, i.e. what appear to be refutations but are really fallacies instead.” (164a20–21) This passage indicates that the ensuing study of sophistical refutations and fallacies trades on the understanding of (real) refutations or, as we shall call them, “dialectical refutations.” A sophistical refutation is an argument that falls short of the requirements for a dialectical refutation. Our first task is to determine what Aristotle takes a dialectical refutation to be.

1. *Dialectical propositions and problems*

We begin with the distinction between dialectical *propositions* and dialectical *problems*, as these are explained in the *Topics*. They differ in three ways: by way of content, logical form, and function.

As to content, “a dialectical premiss [or proposition] is the asking of something acceptable to everyone, most people, or the wise”. (*Top.* 104a9–10)¹ Dialectical propositions are thus those that are believed to have a *prima facie* degree of credibility because they are universally or widely held or because

¹On the whole we quote from Aristotle (1984); that is, from *The Complete Works of Aristotle* edited by Jonathan Barnes. One exception is that we use Aristotle 1997, Smith's translation of Books I and VIII of the *Topics*. Other exceptions are noted in the text.

they are held by someone whose opinion deserves respect. The Greek term for such a proposition is *endoxon*. In contrast,

A dialectical problem is a point of speculation, directed either to choice and avoidance or to truth and knowledge ... about which people either have no opinion, or the public think the opposite of the wise, or the wise think the opposite of the public, or each of these groups has opposed opinions within itself (*Top.* 104b1–6).

Dialectical problems differ in content from dialectical propositions in that what marks them as problems is that their status is unsettled — general or expert opinion is not clear on what the answer to the problem is. Dialectical problems lack the very thing that makes a proposition an *endoxon*.

That there is this difference in content is itself a consequence of the difference in logical form. The logical form of a dialectical proposition is, “Is A B?”; for example, “Is it the case that two-footed terrestrial animal is the definition of man?” (*Top.* 101b30) All dialectical propositions have to have this form, and they must be answerable by Yes or No. (*Top.* 158a16–17) In contrast, the logical form of a dialectical problem is that of a disjunctive proposition, “Is A B or is A not-B?”; for example, “Whether two-footed terrestrial animal is the definition of man or not?” (*Top.* 101b33) A question of this form cannot be answered (non-vacuously) by a simple Yes or No. The answerer must choose one of the two disjuncts, thereby committing to one of two propositions, either “A is B” or “A is not-B.” We can see that the logical forms of both dialectical propositions and problems determines the logical forms of the answers to be given.

Lastly, we may distinguish dialectical problems and propositions by their different functions in refutations. The function of a dialectical problem is to give rise to a dialectical discussion; in opting for one of the two possible answers, a thesis is established that will be the target of a refutation.² The function of dialectical propositions, to be answered by a Yes or a No, is to provide the grounds for the possible refutation of the thesis by being the premises from which the refutation is fashioned.

² Actually, Aristotle would have preferred to reserve the term “thesis” for the famous philosopher’s views that are contrary to received views (*Top.* 104b20), but he allows that it is the practice to call all answers to dialectical problems theses (*Top.* 104b35), and we will follow this convention.

2. *Dialectical arguments*

Aristotle contrasts dialectical arguments with other kinds of arguments in at least two places.³ In the *Sophistical Refutations* (2, 165a37–165b12) he lists four kinds of arguments used in discussion: (1) scientific arguments which reason from first principles appropriate to a subject and not from opinions of the answerer; (2) dialectical arguments which reason from generally accepted opinions to a contradiction; (3) examination arguments which reason from opinions held by the answerer; and (4) contentious arguments which reason from, or seem to reason from, opinions which are, or appear to be, generally accepted.

One of the things remarkable about this classification of kinds of arguments is that they are individuated on the basis of the status of their premisses. But whatever the status of the premisses may be, they are meant to be premisses in *sullogismoi*, or in the case of contentious arguments, premisses in what appear to be *sullogismoi*. Aristotle defined *sullogismoi* with hardly any variation in the *Topics*, *Sophistical Refutations*, and *Prior Analytics*.⁴

A deduction [*sullogismos*] ... is an argument in which, certain things being supposed, something different from the suppositions results of necessity through them. (*Top.* 100a25–27)

*Sullogismoi*⁵ are restrictions of valid arguments (Aristotle would say, arguments whose premisses *necessitate* their conclusions; we assume the appropriate Deduction Metatheorem). They are valid arguments which satisfy further conditions. One is that they not be circular. Another is that none of the premisses be redundant. A third condition, which is not mentioned in this definition, is that syllogisms cannot have multiple-conclusions. Syllogisms also honour an operation which we call “argumental conversion”.

Arg Conv: $\langle \{P_1, P_2\}, Q \rangle$ is a syllogism if and only if $\langle \{P_1, \neg Q\}, \neg P_2 \rangle$ is also a syllogism.

Thanks to those four conditions Aristotle’s logic of syllogisms is the first intuitionistic, relevant, non-monotonic, hyperconsistent logic. (cf. Woods and

³The other place is *Topics* I i.

⁴*Topics* 100a25–26, *Sophistical Refutations* 165a1–2, *Prior Analytics* 24b18–20.

⁵Below we often use the term “syllogism” but always with the understanding that it is a translation of *sullogismoi*, the term just defined. Recent scholarship (Aristotle 1984, 1989, 1997) favours translating *sullogismoi* as “deduction,” a usage we also adopt.

Hansen 1997: 236–237) We return to the concept of *sullogismos* below. For now we are primarily interested in stressing that a dialectical argument is a *sullogismos* with a particular kind of premisses, namely, dialectical propositions.

3. Dialectical refutations

Now we have nearly all the components needed for the concept of dialectical refutation. The rest are brought forward in the following passage from *On Sophistical Refutations*.

[T]o refute is to contradict one and the same attribute — not the name, but the object and one that is not synonymous but the same — and to confute it from the propositions granted, necessarily, without including in the reckoning the original point to be proved, in the same respect and manner and time in which it was asserted. (167a23–27)

This passage repeats the three necessary conditions of a *sullogismos*, but it also adds two other factors essential to a dialectical refutation. First, there is the requirement that the syllogisms take as premisses the “propositions granted,” that is, the answers given by the respondent. This means that there is a compound requirement on the premisses of a dialectical refutation: not only must they be *endoxa*, they must be given as answers. (This gives us a very strict form of dialectical discussion.) Second, the point of the refutation is to deduce a proposition that strictly and explicitly contradicts the thesis maintained by the answerer. This is done by constructing a deduction, that is to say, a *sullogismos* with the dialectical questions as premisses, and a conclusion which is the contradictory of the answerer’s thesis. In nearby passages Aristotle writes that a refutation is *proof* of a contradictory (e.g., 1955: 167a37), a qualification that will prove to have some significance below. In general, then, a dialectical refutation may be said to have three distinct parts, or stages.

Table 1

STAGE 1	A dialectical <i>problem</i> is posed, and an answer given. The answer is the <i>thesis</i> targeted by the ensuing refutation
STAGE 2	Further questions are put to the answerer. The answers to the questions are dialectical <i>propositions</i>

STAGE 3	By means of a dialectical <i>sullogismos</i> whose premisses are a subset of the answers given at Stage 2, the interlocutor proves a proposition that is the <i>contradictory</i> of the thesis (the answer given at Stage 1)
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4. *Sophistical refutations*

Contentious arguments are arguments that have the appearance of being dialectical arguments. In fact, however, they fail to be dialectical arguments because either (a) their premisses are not reputable opinions, although they appear to be, or (b) their 'deductions' are only apparently *sullogismoi*. Whatever may be said of the kind, 'contentious argument,' may equally be said of the kind, 'sophistical argument;' the only difference lies in the intentions of the arguers.

[T]he same argument will be sophistical and contentious, but not in the same respect; rather, it will be contentious in so far as its aim is an apparent victory, while is so far as its aim is an apparent wisdom, it will be sophistical. (*Soph. Ref.* 171b31–33)

Hence, a sophistical argument is one that either does not really have *endoxa* as premisses, or does not really deduce its conclusion syllogistically. A sophistical refutation, then, will be a refutation that appears to be dialectical but fails to be so because either it has (a) a bogus dialectical premiss (given as an answer), (b) a premiss that was not given as an answer, (c) an argument that is not a *sullogismos*, or (d) a concluding statement that does not really and explicitly contradict the answerer's thesis. It is important that none of the fallacies and sophistical refutations examined in *On Sophistical Refutations* is analyzed in ways that involve the first two possibilities.⁶ As we have argued elsewhere (Woods and Hansen 1997), Aristotle's analysis of the thirteen sophistical refutations is always in terms of either a faulty *sullogismos* or a good syllogismos whose conclusion fails to contradict the required thesis. (See Figure 1). Both these are logical matters, of course, and they occur at the third stage of dialectical refutations.

⁶ A certain analysis will see many-questions-in-one as an exception to this general claim. It may be viewed as being a violation of condition (a) since the answers are, strictly speaking, on Aristotle's terms, not propositions. We hope to explore Many Questions in more detail at another time.

Figure 1

STAGE I	
Interlocutor	Answerer
Is Molly's money in the bank or not?	<i>Thesis (T)</i> : Molly's money is not in the (river) bank
STAGE II	
Question <i>m</i>	Answer Y/N (becomes premiss <i>P1</i> of interlocutor's deduction)
Question <i>n</i>	Answer Y/N (becomes premiss <i>P2</i> of interlocutor's deduction)
etc.	etc.
STAGE III	
<i>Possible Conclusion 1 (T')</i> : "Molly's money is in the (financial) bank" [Follows syllogistically from answers <i>P1</i> , <i>P2</i> , ... but does not contradict thesis]	
<i>Possible Conclusion 2 (T)</i> : "Molly's money is in the (river) bank" [Contradict thesis but does not follow syllogistically from answers <i>P1</i> , <i>P2</i> , ...]	

Supposing the premisses to be in order, the mistake to be identified will be either a faulty syllogism or a conclusion that fails to contradict the initial thesis. This bifurcation of possibilities fits well with Aristotle's classification of fallacies into those dependent on language and those independent of language. The language dependent fallacies (ambiguity, amphiboly, combination, division, etc.) are those which can mask an apparent contradiction. For example, the term "right" is sometimes used to mean "morally right" and

sometimes to mean "legally right;" hence, a sentence of the form, "X is right & X is not right," may not be a contradiction at all, and this possibility could give rise to a sophistical refutation. However, it may be that the conclusion claimed *is* the real contradictory of the given thesis. Then, if the refutation is sophistical, the fault will lie in the fact that the argument to the contradictory is not a *sullogismos*. In that case, the mistake will be either a bad deduction owing to an equivocation (again, one of the language dependent fallacies), or a bad deduction containing one of the language-independent fallacies (accident, *secundum quid*, consequent, begging the question, non-cause and many questions). This last group of fallacies, is unlike the language dependent fallacies in that they cannot mask fake contradictions, only failed deductions.

It is worthwhile to remark on another feature of the language-dependent fallacies. Let p be the proposition expressed by the last sentence, S, of a refutation that is sophistical because p fails to contradict the thesis, $\text{not-}p^*$. Then the refutation can be rewritten with last sentence, S+1, expressing the proposition p^* . The contradiction between the end of the deduction and the thesis is now genuine. However, whatever we would have called the failure of p to contradict $\text{not-}p^*$ (ambiguity, say), is now transferred to the deduction from p to p^* . So, in general, failures of contradiction can be turned into successful contradictions at the cost of undermining a *sullogismos* (e.g., the move from the first to the second conclusion in Figure 1). This is a point of considerable importance. It means that all the fallacies on Aristotle's list can be expressed as syllogistic failures, as failures of deduction.

5. *Non-cause as a sophistical refutation*

We now have the wherewithal to proceed to our analysis of the fallacy of non-cause as cause. Aristotle classifies the fallacy as a language-independent error. This suggests that he conceives of it as a fault that can affect only the deductive aspect of a refutation rather than contradictions. What he refers to as a non-cause in *Sophistical Refutations* 5 (and *Prior Analytics* B 17) is a proposition that is mistakenly thought to be a required premiss for the deduction of an impossibility. Modern readers will not hesitate to say that it is wrongheaded to speak of the premisses or assumptions of a deduction as 'causes' of its conclusion. Below (Section 7) we will return to the question of how 'cause' is to be understood in this context.

Aristotle introduces the fallacy of non-cause as cause as arising in connection with *ad impossibile* deductions.

If, therefore, what is not a cause is enumerated among the questions which are necessary for the production of the resultant impossibility, the refutation will often seem to come about as the result of it; for example, in the argument that 'soul' and 'life' are not identical. For if coming-into-being is contrary to perishing, then a particular kind of coming-into-being will be contrary to a particular kind of perishing; now death is a particular kind of perishing and contrary to life; life, therefore, is a coming-into-being and to live is to come-into-being. But this is impossible; and so the soul and life are not identical. (1955: 167b24–31)

Here Aristotle has distilled an argument as it might have occurred in a philosophical discussion. Let us attempt to reconstruct a plausible version for a dialectical setting.

Figure 2

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- (1) Q. Are soul and life the same or not? [Dialectical problem]
 (2) A. Soul and life are the same. [Thesis]
- (3) Fine. Let us suppose that soul and life are the same. [Assumption]
 (4) OK. [Assumption accepted]
- (5) Q. Is it so that if coming-to-be is contrary to perishing, then a particular form of perishing will have a particular form of coming-to-be as its contrary? [Dialectical proposition]
 (6) A. Yes. [Premiss for Q]
- (7) Q. Is not death a particular form of perishing? [Dialectical proposition]
 (8) A. Yes. [Premiss for Q]
- (9) Q. Is not death contrary to life? [Dialectical proposition]
 (10) A. Yes. [Premiss for Q]

- (11) Q. Therefore, life is a particular form of coming-to-be, and to live is to come-to-be. [Conclusion]
- (12) A. Yes. [Conclusion conceded]
- (13) Q. But "to live is to come-to-be" is impossible?
[Dialectical proposition]
- (14) A. Yes. [Premiss for Q]
- (15) Q. Therefore, soul and life are not the same, are they? [Conclusion]
- (16) A. No. [Conclusion conceded]
-

In this reconstruction of Aristotle's example (Figure 2) the dialectical problem is asked at (1) and the answerer's thesis is given at (2). At (3) and (4) both parties agree to treat the thesis (that soul and life are the same) as an assumption in the ensuing discussion. From (5) to (10) are a number of dialectical propositions, asked and answered. At (11) a conclusion is drawn and at (12) it is recognized by the answerer. Immediately following this, at (13) and (14), another question is asked which looks back to what has just been said, and it is observed that the proposition at (11) and (12) is impossible. Because the answer at (11) and (12) is impossible, the original assumption at (3) and (4) is now rejected. Aristotle's analysis of the mistake follows immediately after the example.

But this conclusion is not the result of reasoning; for the impossibility occurs even if one does not assert that life is identical with the soul but merely says that life is contrary to death, which is a perishing, and that coming-into-being is contrary to perishing. (1955: 167b31–33)

The mistake is this: Since the impossibility follows from the other answers alone — i.e., without the use of the assumption — the conclusion (the proposition that soul and life are not the same) has not been deduced *syllogistically*. Since the argument is not a *sullogismos* it is not a refutation either. Even so, Aristotle thinks such arguments are "not absolutely inconclusive but only inconclusive as regards the point at issue." (167b34, Forster trans.) "The point at issue" is, of course, the *thesis*. So, we surmise, Aristotle thinks the argument does indeed show that there are inconsistent concepts at work, but it does not specify the precise source of the inconsistency.

In his 1866 commentary on Aristotle's *On Sophistical Refutations*, Edward Poste suggests further examples of non-cause fallacies in mathematical reasoning. Some of his examples are repeated by H.W.B. Joseph, who adds an example of his own:

It is ridiculous to suppose that the world can be flat; for a flat world would be infinite, and an infinite world could not be circumnavigated, as this has been. (Joseph 1916: 594)

Joseph remarks that the impossibility is due to the second assumption, that a flat world is infinite, not to the initial assumption, that the world is flat. The initial assumption is a non-cause of the conclusion and, therefore, the argument can not succeed in showing it to be false.

More recently, John Corcoran has found the non-cause kind of error worthy of notice although he does not discuss it as a fallacy or recall its Aristotelian genesis.

Sometimes the search for an argumentation that settles an hypothesis can lead to a surprising and disconcerting result. For example, sometimes we can think that we have deduced a conclusion thought to be false from a hypothesis augmented by premises thought to be true and then discover that the hypothesis itself played no role in the reasoning. (Corcoran 1989: 20–21)

How might we formally represent what Aristotle says about non-cause, and what his example, together with Joseph's and Corcoran's exhibits?

Non-cause is one of the Aristotelian fallacies for which Hamblin thinks that a "formal analysis is very much in order." (Hamblin 1970: 206). Hamblin thinks that its schematic structure can be represented thus:

S (hypothesis)
 (S & T) → U
 –U
 Hence, –S

It is our view that this invalid schema, which is adapted from Hamblin (1970: 207), does not in fact capture the non-cause fallacy. In refutatory reasoning, there is a difference between (i) inferring that a particular assumption or premiss is false when it might just as well be the case that some other assumption, also needed for the argument, is the real culprit, (Hamblin 1970: 78) and (ii) inferring that an assumption *not needed at all* for the conclusion (rather than some other assumption that is needed) is false. On the

understanding that the assumption W is logically independent of the other premisses, the following invalid schema captures Aristotle's point.

W (hypothesis)
 (S & T) → U
 not-U
 Hence, not-W

6. *How non-cause fits (and doesn't) into the dialectical framework*

It is important to emphasize that Aristotle does not think of refutations as *reductio* kinds of argument. Although he is indifferent about the use of arguments *ad impossibile* in the context of constructing demonstrations in science, Aristotle recommends against using them in dialectics. "When he has deduced the impossible (result)," says Aristotle, "then unless it is extremely obvious that it is false, people will say that it is not impossible, so that the questioners do not get what they want." (*Top.* 158a1-2) This is an interesting remark when it is compared to the discussion of the non-cause fallacy: A fallacious *ad impossibile* argument may deceive the unwary, but an honest one is likely to be unconvincing.

Aristotle makes it plain that what the dialectician has to prove in a refutation is not a *contradiction* or an impossible statement, but a statement *contradictory* to the thesis. This raises the question of how a non-fallacious *reductio ad impossibile* argument could be made to fit the general criteria of a refutation. If we can show how this is possible, then we can see in which respects the non-cause fallacy imitates a dialectical refutation. Figure 3 illustrates our answer to this question.

Figure 3

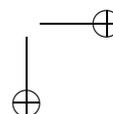
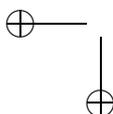
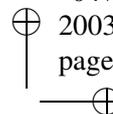
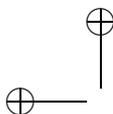
Questioner	Answerer	Aristotle's example
1. T or not-T?		[<i>Problem</i> : soul = life or not (soul = life)?]
2.	T	[<i>Thesis</i> : soul = life]
3. T		[<i>Reductio assumpt</i> : soul = life]

4.	$P_1?$	P_1	<i>[dialectical propositions:</i>
5.	e.g., Death is contrary to life]
6.	$P_n?$	P_n	
7.	Q		<i>[impossible conclusion: to live</i> is to come-to-be]
8.	–T		<i>[assumption inferred false:</i> not (soul = life)]

The left-hand and centre columns are a schematic outline of how a successful *ad impossibile* argument would fit the requirements of a dialectical refutation. The right-hand column indicates how Aristotle's example fits the schema. The schema differs from the one for a standard (non-indirect) dialectical refutation at lines 3, 7 and 8. At line 3 is the introduction of the *reductio* hypothesis and at line 7 the ensuing impossibility. Line 8 signals that the assumption introduced in line 3 is now inferred to be false. This last inference is not, strictly speaking, syllogistic, as Aristotle knows. Before going on to explain this point, we should note that the schema satisfies the Aristotelian requirement that the conclusion of the refutation (line 8) should be a contradictory of the thesis. If the non-cause fallacy has occurred, then the 'refutation' would still *appear* to have the schematic structure of Figure 3. We should say, again, that two kinds of failures are possible. The *reductio* argument might be a genuine *sullogismos* with a conclusion that only seems to contradict the thesis; this would be an instance of the fallacy *ignoratio elenchi*. The other possibility is that the deduction contains a mistake (even though its conclusion is a genuine contradictory of the thesis). If the mistake is that the assumption is unneeded for the deduction of the impossibility, then the deduction commits the non-cause fallacy.

The way in which *reductio* refutations differ from non-*reductio* refutations is that the ultimate conclusion of the *reductio* argument — that is, the proposition that is to contradict the thesis — is not syllogistically inferred. This should be plain from a study of Figure 3; the inference from line 7 to 8 is not a syllogism because it is not necessitated by line 7. Aristotle is aware of this in his more mature work, *Prior Analytics*.

[A]ll [the indirect proofs] which come to a conclusion through an impossibility *deduce* the falsehood, but *prove* the original thing from an assumption when something impossible results when its contradiction is supposed, proving, for example, that the diagonal is



incommensurable because if it is put as commensurable, then odd numbers become equal to even ones. (Aristotle 1989: 41a24–27)

Aristotle is distinguishing what is deduced from what is proved. It is the impossibility ("to live is to come-to-be," in the example we have been studying) that is deduced (or apparently deduced); in other words, the impossibility is the last line of a syllogistic deduction. However, what the dialectician is supposed to prove (but fails to do in the case of non-cause) is that soul and life are not the same, and this is not (even apparently) proved by means of a syllogism, but by reasoning about the syllogism that deduced the impossibility. In his commentary on this passage Smith writes,

Note that Aristotle refers to arguments *coming to a conclusion* through an impossibility and says that they *prove* the intended conclusion when they *deduce* a falsehood or impossibility. According to the analysis presented here, an argument through impossibility is not, strictly speaking, a *deduction* of its intended conclusion, but only of the 'impossibility': the real conclusion is reached 'from an assumption' or 'from an agreement.'⁷ On such a view, we should not really speak of *deductions* through an impossibility, but only *arguments* or *proofs* through an impossibility (which will contain deductions *of* an impossibility). Aristotle appears to make some effort to conform his language to this, However, he is not very consistent about this, and quite frequently reverts to speaking of deductions, or deducing, through an impossibility or from an impossibility. ... The reason, no doubt, is that these are part of the received technical vocabulary of his day, not his own coinage, and thus have an established usage towards which he inclines. (Smith 1989: 141–42)

Hence, the qualification to be added to the general description of dialectical refutations is that the questioner is *to prove* the contradictory of the answerer's thesis. In every case but that of an indirect proof, the proof is the deduction; in the other cases the proof *depends* on a deduction. 'Proof' here must be understood, as dialectical proof rather than demonstrative proof since the premisses from which it begins are dialectical premisses given as answers.

⁷The use of 'agreement' is an indication that Aristotle thought that his comments about the *ad impossibile* were relevant to dialectics as well as demonstrative reasoning.

In conclusion, then, there are two points of interest about Aristotle's theory of dialectical refutation that arises from the study of non-cause as a sophistical refutation. The one, mentioned earlier, is that the conclusion of the refutation of a thesis is not a contradiction but a contradictory, even when the proof is a *reductio* argument. The second is that not all dialectical proofs are deductions only; the ones involving *reductio* arguments are deductions plus something else.

7. 'Causes' as assumptions or premisses

The word translated as "cause" in "non-cause as cause" is the Greek term *aitia*. It can mean "reason," "cause," "responsibility," "blame," "charge," "accusation" or "fault." It is now common to translate *aitia* as "explanatory factor" rather than "cause." It would be more sensitive to our prejudices against associating causes with propositions, and consistent with Aristotle's meaning, to rename the fallacy as the "non-reason as reason fallacy," or the "non-explanatory factor as explanatory factor fallacy."

Aristotle does not restrict the use of *aitia* as a logical cause or explanatory factor to refutations. In general, he thinks of premisses as *aitia* of conclusions. What makes the non-cause fallacy unique is not that it is more involved with 'causes' than other kinds of syllogisms but only that it involves a mistake about the employment of assumptions as 'causes' that is deadly consequential in refutation-arguments.

The concept *aitia* also figures centrally in a well known passage in the *Posterior Analytics*. Scientific principles which are the ultimate explanans of scientific explanations "must be true, primary, immediate, better known than and prior to the conclusion, which is further related to them as effect to cause" (1941: 71b21–23; emphasis added).⁸

We may wonder which of the Aristotelian senses of "cause" — efficient, formal, final, or material — is the one that bears on the premiss-conclusion relation. In the *Physics*, Aristotle addresses this question directly.

All the causes now mentioned fall into four familiar divisions. The letters are the causes of syllables, the material of artificial products, fire, &c., of bodies, the parts of the whole, and the premisses of the conclusion, in the sense of "that from which". (*Phys.* 195a15–19)⁹

⁸ Mure's (1941) translation. Tredennick (Aristotle 1960) translates the last phrase as "causative of the conclusion"; Barnes' newer translation (Aristotle 1984) has "explanatory of the conclusion"; McKirahan (1992) prefers "grounds" or "explanatory grounds".

⁹ See also *Metaphysics* 1013b17–21 for an almost identical passage.

It is *aitia* that is here translated as 'cause,' and premisses, quite generally, are said to be the causes of conclusions. The phrase, "that from which," indicates that Aristotle takes premisses to be the material causes of conclusions. In other words, premisses are to conclusions as bronze is to statues, as notes are to melodies, as flour, yeast and milk are to bread.

Not everyone is ready to acquiesce in this interpretation of Aristotle. McKirahan, for example, does not think that material cause can "describe the relation between principles and conclusions, since principles are not found in conclusions as bronze is found in a statue and silver is found in a bowl." (McKirahan 1992: 207) Moreover, McKirahan finds the concept of *aitia* out of place in connection with demonstrations. He writes:

[E]ven if Aristotle does mean that the principles of a proof are the material cause of the conclusion, it is uncertain what the claim amounts to. It extends the notion of material cause to cover more ground than it did originally ... [f]or the premisses of proofs have nothing to do with the philosophical projects in which the notion of matter is used. They do not persist in the conclusions, are not the underlying substratum of change, or principles of individuation (McKirahan 1992: 227–28)

Although McKirahan's objections are made with respect to demonstrations they also apply to the broader concept of deductions. However, McKirahan's argument seems to us not to provide strong reasons to abandon the assimilation of *aitia* to material cause in *sylogismoi*. There are, after all, Aristotle's own words to consider and since our purpose is exegesis of an Aristotelian text, we are forced to explicate the problem by means of the concepts Aristotle dealt with. Furthermore, McKirahan's argument supports the claim that Aristotle was inconsistent in his use of "material cause" when he extended it to include the premisses of *sylogismoi*, not the claim that it was not Aristotle's view.

The upshot of this discussion is that we must explore — from the point of view of an informal logical theory — what the consequences are of viewing premisses as material causes of conclusions. We believe that there is an intimate connection between three components of Aristotle's informal logic: (a) the definition of "syllogism," (b) the thesis that premisses are the material causes of their conclusions, and (c) the analysis of the non-cause fallacy.

Let us consider again the definition of a *sullogismos*.

[A] deduction (*sulligismos*) rests on certain statements such that they involve (i) necessarily (ii) the assertion of something other than

what has been stated, (iii) through what has been stated (1984: *Soph. Ref.* 165a1–2)

The first condition is that the premisses jointly necessitate the conclusion. Hence, the premisses are sufficient for the conclusion. The second condition is a prohibition against stating the conclusion as one of the premisses; hence, it forbids at least the most obvious kind of begging the question or circularity. The third and last condition, that the conclusion comes about through what has been stated indicates that the conclusion *depends* on the premisses.

Returning to the claim that premisses are the material causes of their conclusions, we ask what implication this could have for Aristotle's theory of deduction? It suggests to us that *the premisses of a syllogism are necessary for that syllogism as this bronze is necessary for this statue, or as these words are necessary for this poem.* That they are necessary and indispensable in constituting the thing in which they exist implies that there is no extraneous 'matter' in the thing in which they exist. In other words, if P is the set of premisses for a syllogism with conclusion, C, then there is no syllogism with a proper subset of P as premisses and conclusion C. Do the texts support this view?

In the *Topics* Aristotle says, "[E]very deductive premiss either is among those the deduction is from or is for the sake of one of these" (1997: 160a35–36), indicating that there cannot be any extraneous premisses. A few paragraphs later Aristotle summarizes five ways in which an argument in a dialectical setting can be criticized. The fourth way is if a syllogism "comes about with certain premisses taken away (for sometimes more premisses are taken than those necessary, so it is not in virtue of their being so that the deduction comes about). (1997: 161b28–31) The claim is that if there are more premisses than are necessary for the conclusion, they are not part of the syllogism. Aristotle takes up the same theme again in the *Prior Analytics* when discussing scientific deductions.

We must inquire then whether anything unnecessary has been assumed, or anything necessary has been omitted, and we must posit the one and take away the other, until we have reached the two propositions; for unless we have these, we cannot reduce arguments put forward in the way described. (47a17–22)

Here, then, is the requirement not only that missing premisses should be supplied but also that superfluous premisses be omitted. Aristotle notes that if all the premisses needed are not present then it will not be possible to "lead back" to the more basic premisses that give the ultimate explanation of the conclusion, in this case scientific first principles. We may add that

superfluous explanans are also to be avoided since they would make the road back to the principles ambiguous and fraught with difficulties.

If we are correct about the present point, then it follows that non-cause is a special case of a fallacy of relevance, in the sense of relevance captured by the requirement that syllogisms not have superfluous premisses. Suppose, then, that

$$\begin{array}{l} P_1 \\ P_2 \\ \hline Q \end{array}$$

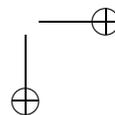
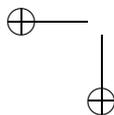
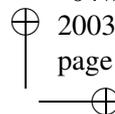
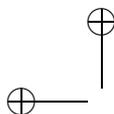
is a syllogism. This, the condition in question, guarantees that

$$\begin{array}{l} P_1 \\ P_2 \\ P_3 \\ \hline Q \end{array}$$

is not a syllogism, owing to the redundancy of P_3 . The non-redundancy condition requires that in a syllogism all premisses must be used, that each is a necessary condition of the argument's qualifying as a syllogism. This clearly resembles one of the conceptions of relevance driving the thinking of present-day relevance logicians. On such an account, a proof from hypothesis is a relevant proof if and only if each of the hypotheses is exploited in at least one line of the proof (Anderson and Belnap 1975).

We reason as follows: since premisses are material causes of their conclusions, there are no redundant premisses in a syllogism. Obviously, this has bearing for the non-cause fallacy. Deductions can be either direct or indirect. If they are indirect they are subject to the same restraints as are direct deductions. To have an extraneous assumption in an indirect deduction can lead to a fallacy; it is also inconsistent with the claim that premisses are material causes of their conclusions insofar as there can be no extraneous or redundant material causes. On this view, the prohibition against idle assumptions in *reductio* arguments — non-causes — is owed ultimately to the third conditions on syllogisms, that the conclusion comes about *through* what has been stated, i.e., that it depends on what has been stated *and nothing else*.

We must guard against a possible misinterpretation. It is not Aristotle's view that premisses are necessary and sufficient conditions of conclusions where "conclusion" is understood as merely a statement independent of the premisses. This would yield obviously inconsistent results. For example,



- (A) All Greek citizens are men
All men are human
 All Greek citizens are human
- (B) All Greek citizens may vote
All who may vote are human
 All Greek citizens are human

The premisses in A and B are not necessary conditions of the statement, "all Greek citizens are human," for then the statement would have two distinct sets of necessary and sufficient conditions, an unlovely result. Correctly stated, the view is that because premisses are the material causes of *the syllogisms in which they occur*, they are persistent elements of such structures and they individuate the syllogisms whose premisses they are. Thus, in Aristotle's view the connection of premisses to conclusions is much more intimate than that afforded by the semantic concept of deductive validity. For Aristotle, a proposition is a premiss in a *sullogismos* if, and only if, it stands to the conclusion of the *sullogismos* in such a way that it contributes to the presence of the conclusion; that is, a proposition is a premiss of a *sullogismos*, *S*, if, and only if, it is a necessary condition for the conclusion of *S* in *S*. In particular, in syllogism A above, the premisses are necessary and sufficient for the conclusion *qua* conclusion in that syllogism. *Mutatis mutandis* for syllogism B.

The requirement that premisses must be individually necessary for a conclusion in a given syllogism ties the non-cause fallacy to a central logical doctrine. The Aristotelian fallacies — at least the ones presented in *On Sophistical Refutations* — are not some grab-bag of theoretically unconnected dialectical *faux pas*; they are individually definable violations of the compound concept of a *dialectical refutation*.

8. *The other 'non-cause' fallacy*

It is generally agreed that the ancestral lineage of what is today known as the fallacy *post hoc, ergo propter hoc* is not the discussion of non-cause in the *Sophistical Refutations* which we have been studying but, rather, this passage in Aristotle's *Rhetoric*.

Another line consists in representing as causes things which are not causes, on the ground that they happened along with or before the



event in question. They assume that, because B happens *after* A, it happens *because* of A. (*Rhet.* 24 1401b30–31)

According to Hamblin (1970: 80) ‘cause’ is here “given a scientific, non-logical sense;” that is, ‘cause’ is used the way that we use it in “cause of an event.” It is not surprising, therefore, that the term translated as ‘cause’ in this passage is *aition*.

Joseph explains, as well as anyone, the difference between the *logical* non-cause fallacy (which he calls ‘false cause’ or *non causa pro causa*) and the *event* non-cause fallacy (which Joseph recognizes as *post hoc*).¹⁰

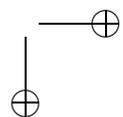
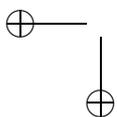
... the locus *Post hoc, ergo propter hoc* is not quite the same as that of *Non causa pro causa*: in other words, the type is a little different. In *False cause* we are dealing with the logical sequence of premisses and conclusion; the fallacy lies in connecting the conclusion with a particular premiss which might, so far as getting the conclusion is concerned, have been equally well included or omitted; and because the conclusion is false we erroneously infer this premiss to be false also. In *Post hoc, ergo propter hoc* we are dealing with the temporal relation of cause and effect; the fallacy lies in connecting the effect with a particular event which might equally well have happened or not happened, so far as the effect in question is concerned; and we erroneously suppose that the effect which did occur, occurred because of that event. (Joseph 1916: 596)

Seen this way, at a certain level of abstraction, there is an isomorphism between the logical non-cause fallacy and the causal non-cause fallacy. If we invent the term ‘kause’ and stipulate that it has two distinct senses, “logical cause” and “event cause”, then, read consistently, in one sense of ‘kause’ we have the non-cause fallacy of *On Sophistical Refutations*, in the other sense of ‘kause’ we have the non-cause fallacy of the *Rhetoric*.

Table 4

(1) the kause exists
(the ‘premiss’ has been laid down; the antecedent event does occur)

¹⁰ Joseph (1916: 596) observes: “if anyone likes to use the name *False cause* as equivalent to *Post hoc, ergo propter hoc*, there is not much harm done; for the fallacy which in the *Sophistici Elenchi* Aristotle describes under the name is not one that we have much occasion to speak of”.



- (2) the cause is prior to the thing it is a cause of
 (the 'premiss' is epistemically or logically prior; the event is temporally prior or, at least, not later)
- (3) the thing it is said to be a cause of did come about but not because of this cause
 (in fact the 'premiss' played no role in bringing about the conclusion; in fact the first event had no part in bringing about the 'effect')
- (4) it appears that the thing in question is caused by the cause

9. Conclusion

We have attempted to give non-cause its due. First, by describing the setting and the logical components needed for dialectical refutations. Then by showing the particular way in which non-cause fails to be a real refutation. Our discussion gave rise to the broader question of how Aristotle envisioned the relationship, in general, between premisses and conclusions, and what the implications of his use of *aitia* has for his logical theory. While not denying the obvious differences between the logical non-cause of the *Organon* and the causal one of the *Rhetoric*, we note a strong similarity on the abstract level between the two fallacies. It is also evident that no one in the history of logic surpasses Aristotle in the care elevated to the conditions under which statements are correctly describable as *premisses*. This in effect is the central moral of the Aristotelian analysis of non-cause, and in our respectful submission is indeed a matter worth knowing.¹¹

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