Fallacious Analogical Reasoning and the Metaphoric Fallacy to a Deductive Inference (MFDI)

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1. Introduction

In this article, we discuss Lightbody and Berman's proposal to introduce a new fallacy of analogical reasoning (Lightbody and Berman 2010): the *Metaphoric Fallacy to a Deductive Inference* (MFDI), which, in the authors' opinion, should be seen as a special case of *false analogy fallacy*.

We view the introduction of the MFDI as only partly justified. We argue that, in some relevant cases, the kind of fallacy involved can be more aptly (and more simply) described as an *equivocation fallacy*, that is, *quaternio terminorum*. Consequently, as far as these latter cases are concerned, there are no sufficient grounds to introduce a new fallacy.

Given our purposes, we also present a formalisation of *fallacious analogical reasoning* that uses a set-theoretic framework.

Our exposition is self-contained: in Section 2 we summarise some basic notions. In Section 3, we describe the structure of *analogical reasoning* and *fallacious analogical arguments*, whose examination is crucial for our purposes. In Section 4 we discuss *quaternio terminorum*. In Section 5 we address Lightbody and Berman's proposal and set forth our full argument.

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2. Some preliminaries

In this preliminary section, we briefly summarise some terminology, in order to provide the reader with all the notions required for the understanding of this work. All readers knowledgeable about logic may entirely skip this section.

The first, fundamental notion is that of *argument*. Arguments are made of *declarative* sentences, that is, sentences which *assert* something. The classical definition of declarative sentence dates back to Aristotle's *De Interpretatione*, *4*:

> Every sentence (*logos*) signifies, but not every sentence is declarative (*apophantikos*): only those sentences in which one can be right or wrong are declarative. For example, a prayer may be a sentence, but it is neither true nor false (Needham and Harbsmeier 1998: 182).

Hence, a sentence is a declarative statement which can be assigned a truth-value. Arguments are collections of a certain number *n* of sentences (n-1 premises and one conclusion). In particular, as Epstein and Kernberger explain,

> […] an argument is an attempt to convince someone that a particular statement, called the conclusion, is true. The rest of the argument is a collection of claims called premises, which are given as the reasons for believing that the conclusion is true (Epstein and Kernberger 2006: 5).[1]

Logicians are especially interested in checking that an argument is *valid*, that is, that the conclusion really follows from the premises. If the premises are also true, the argument is said to be *sound*. In other terms:

- an argument is *valid* if its conclusion is true, whenever its premises are true;
- an argument is *sound* if it is valid and all its premises are true.[2]

The argument in footnote 1 is both *valid* and *sound*, as the reader can easily realise. One can also verify the *formal validity* of a certain argument by checking that it fits a valid *argumentation scheme*.[3]

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[1] For the uninitiated, consider the following trite example of a two-premise argument (a syllogism, to be precise): (P_1) Socrates is a man; (P_2) All men are mortal; hence (C) Socrates is mortal.

[2] See, e.g., Walton (2005: 49).

The notions of validity and soundness are crucial for evaluating arguments, but they also have some shortcomings.

On the one hand, mere reliance on the *semantic* definition of *validity* expounded above may lead to the acceptance of unintuitive arguments (consider, for example, the cases of *a fortiori*, or *ex falso sequitur quodlibet*-style arguments). On the other hand, it is not uncommon to come across *fallacious* arguments which are only *prima facie* valid (see Tindale 2006: 2 or Walton 2010).

Furthermore, *validity* and *soundness* are too strong for the purposes of the ordinary language. In particular, since we will be concerned with analogical reasoning, it can be shown that validity and soundness are too restrictive for the purpose of assessing the *legitimacy* of analogical arguments.

For all these reasons, we propose introducing weakened versions of these notions. For a start, consider the following argument:

(P_1) John is 80 years old

hence

(C) John will be dead within 40 years

Strictly speaking, the argument is not *formally* valid (nor is it valid *tout court*, for that matter) since it is not an instance of a valid argumentation scheme: in principle, it might happen (although it is quite unlikely) that John will die at the age of 121 years. Yet, one feels some pressure to concede that, if the premise is true, the conclusion should also be held to be true. In other terms, one would feel that the mentioned argument, although not *valid*, is fully *legitimate*. But, if its legitimacy amounts to its validity, then the argument is not legitimate.

To fix this uncomfortable state of affairs, we introduce the notion of *strength* (see Groarke and Tindale 2004: 134, or Epstein and Kernberger 2006: Ch. 3), which is a weakening of that of validity:

[3] However, this is a *sufficient*, but not *necessary* condition for an argument to be valid. *Formal validity* is a stronger form of validity (see Groarke and Tindale 2004: 144-150), as an argument can still be *valid*, even if it is not *formally valid*. For example, consider the following argument: (P_1) John is a bachelor; hence: (C) John is unmarried. This is not a *formally valid* argument, since it is not an instance of any known valid *argumentation scheme*. However, it is obviously a valid argument, since the premise and the conclusion contain equivalent assertions.

- an argument is *strong* if it is very *likely* that its conclusion is true, whenever its premises are true.

By the definition just given, the argument above is *strong*. The concept of *strength* pairs with that of *goodness*, in the same way as *soundness* pairs with *validity*. We say that:

- an argument is *good* if it is *strong* and all its premises are *plausible*.[4]

An argument can be *strong* and not *good*. Consider one last example:

(P_1) Rio de Janeiro is covered with snow

therefore

(C) it must be quite cold in Rio

Although, conceding the truth of the premise, the conclusion is likely, such a premise is definitely not plausible.

In the next section we will introduce and discuss the features of analogical reasoning.

3. Comparisons and Analogical Reasoning

Comparisons are very frequent in everyday language, and play an important role in our reasoning. Analogical reasoning is based on comparisons, in particular on statements such as: "A is *like* B", "A is *analogous* to B", or "A *is to* B as C *is to* D" etc.[5]

Epstein and Kernberger propose the following definition of analogical reasoning:

[4] Epstein and Kernberger 2006: 37. We refer the interested readers also to Turner 1984, Bonissone 1987, and Borwein and Bailey 2008.

[5] However, in recent years there has been a debate about whether similes and/or metaphors are best defined in terms of *comparisons* or *categorisations* (see, e.g., Bowdle and Gentner 2005, Glucksberg 2001, 2008). The debate has especially focussed on similes and metaphors of the form "T *is*/*are like* S", and "T *is/are* S".

> A comparison becomes reasoning by analogy when it is part of an argument: on one side of the comparison we draw a conclusion, so on the other side we should conclude the same (Epstein and Kernberger 2006: 37).

Let us briefly consider an example. Let us assume that

(P_1) Yesterday was very cold and today is very cold too

and

(P_2) Since yesterday was very cold, I came home with a headache

hold.

Given the premises (P1) and (P2), we derive the conclusion:

(C) *Chances are that* also today I will come home with a headache

This is an example of analogical reasoning. It should be noticed that the argument is *strong*. Furthermore, according to our *personal experience*, the statements (P_1) and (P_2) are plausible, hence, the aforementioned argument can also be considered *good*. However, the argument is far from being *valid*. If (P_1) and (P_2) are true, it does not follow that (C) is necessarily true. This shows that *strength* and *goodness* are particularly suitable for assessing the *legitimacy* of analogical arguments.[6]

Analogical arguments may have different forms, each corresponding to a particular way of creating analogies. However, all analogical deductions have the same structure: the comparison of two cases, A and B, that yields an argument with two premises, the *similarity*, and the *base premise*, respectively, and a conclusion containing an inference from the premises (Walton 2005: 96). More precisely:

- the *similarity premise* asserts that A and B share certain features *a, b, c...*;
- the *base premise* asserts that A presents an additional characteristic *x*;

[6] For the sake of precision, following the terminology of Govier (Govier 1987: § 4, Govier 1999: § 9), one may say that the argument is an instance of *inductive analogical reasoning*, i.e. an argument containing a prediction based on our knowledge of an analogous situation which has previously occurred.

- the *conclusion* states that, by virtue of the similarity established by the premise 1, B also possesses the quality *x*.

In the previously mentioned argument, A and B are, respectively, "today" and "yesterday"; the feature *a* which A (today) and B (yesterday) have in common is "to be cold", and the additional characteristic *x* is "to come home with a headache". The *similarity premise* is (P_1); the *base premise* is (P_2); the statement "Today I will come home with a headache", in which the additional characteristic *x* is transferred by the argument from A to B, is the *conclusion* drawn by analogy.

In order to understand what a *weak* or *fallacious* argument consists in, we now proceed to introduce a formalisation of analogical reasoning which will help us elucidate these two notions.

As said, analogical reasoning is based on the use of comparisons. Although comparisons resemble standard declarative sentences, they are not declarative sentences. When we assert that "A is *like* B", we are not committing ourselves to stating that all the features of A are *also* features of B. A comparison only implies that *some* features of A are also features of B.

In other terms, whereas "A is B" implies that whatever is predicated of A is also predicated of B, "A is like B" implies that there exist some features of A which can also be predicated of B. A comparison, therefore, is not a *class-inclusion statement* of the form: $(\forall x)\,(x \in A \rightarrow x \in B)$, but rather a *class-intersection statement* of the form: $(\exists x)\,(x \in A \wedge x \in B)$. By asserting that "A is like B", we, thus, take it for granted that the intersection of A and B is non-empty. Now, *what* and *how many* properties are shared by A and B, whenever we assert that they are analogous?

Unfortunately, there is no other way to respond to this the question but to check, each time a property of A is taken into account, that also B has it.

Let $|A|=i$ and $|B|=j$ be the cardinality of the sets *A* and *B*, whose members are, respectively, the properties of 'A' and 'B'. We claim that, when we assert "A is like B", intuitively we are fixing a threshold *T* such that the sentence "A is like B" is true iff $T \quad |A \quad B| < i, j$.[7]

Let us, now, resume the model of analogical reasoning which we have described above, which consists of a base premise, a similarity premise and a conclusion. Let us suppose that the similarity premise asserts that "A is

[7] $T = \min(n)$, where $n \geq 1$, is the smallest number of properties shared by A and B, such that "A is like B" is true. The existence of a *threshold* is a necessary condition in order for the *truth-functionality* of analogical statements to be defined. It turns out that, in most cases, $T = 1$ and $|A \cap B| = T$.

like B", that is, $A \cap B \neq \emptyset$. This means that there are at least as many features as posited by *T*, which A and B share. However, as said, we do not know *what* these features are, and, at some point, we may stumble across features which are not shared by both sets. In other terms, the *similarity premise* does not guarantee that, if we find any additional characteristic of A, say *x*, *x* also always belongs to B. In this latter case, the analogical argument is *weak* (that is, *non-strong*).

We are, therefore, ready to give the following definition of *weak* analogical argument:

Weak Analogical Argument. An analogical argument is weak iff the *similarity premise* does not guarantee, for a particular *x* in A, that the conclusion: "*x* is in A implies that *x* is also on B" is true (or, in other terms, that $x \in A \cap B$).

In the argument examined above, the additional characteristic = "I came home with a headache" is likely to belong to both A = "cold day_1 (yesterday)" and B = "cold day_2 (today)". This is the reason why the argument is strong. As we said, in many cases the set of *properties* which account for the truth of "A is like B" has cardinality equal to 1. Any argument whose similarity premise implies that $|A \cap B| = 1$ will, of necessity, be *weak*. The reason is, no additional characteristic will be shared by the two sets.

Let us now proceed to examine *fallacious* analogical reasoning. It is generally assumed that

> a fallacious argument, as almost every account from Aristotle onwards tells you, is one that seems to be valid but is not so (Hamblin 1970: 12).

Hamblin's definition, although very appropriate, is unsuited for our purposes, as we do not care about the validity, but rather about the strength of analogical arguments. The following one seems more adequate:

> A "fallacy" is a particular kind of egregious error, one that seriously undermines the power of reason in an argument by diverting it or screening it in some way. But a more precise definition is difficult to give and depends on a range of considerations (Tindale 2006: § 3).[8]

[8] Tindale also distinguishes between *structure* fallacies (which fall under Hamblin's definition) and fallacies related to *language problems* (Tindale 2006: § 4), such as fallacies of equivocation and vagueness (also known as *informal fallacies*).

In what follows, we have tried to summarise "the range of considerations" Tindale mentions in the quoted passage. Basically, we claim that, since we do not know much about $A \cap B$, we may be *deceitfully* led by the analogies used in the argument to ascribe to it a certain *x* that, for instance, could be in A, but not in B, and *vice versa*. In that case, we may say that the argument is fallacious: it is *prima facie* strong, but, in fact, it is weak. A fallacious analogical argument is, therefore, one which is made in such a way as to lead us astray in evaluating the *strength* of the argument.

We can summarise this through the following definition:

Fallacious Analogical Argument. An analogical argument is said to be *fallacious* if and only if it *seems* strong, but *is*, in fact, weak. Any such argument is fallacious, inasmuch as it leads us to ascribe to $A \cap B$ a property which is not in A, but is in B and *vice versa*.

A fallacious analogical argument can also be described as one which establishes a *faulty analogy* as its conclusion. Fearnside and Holther explain the notion along the same lines as ours:

> Faulty analogy consists either in assuming that shared properties will continue indefinitely to be found in new members, or in assuming that it is highly probable there will be some other shared property in a class so wide that there is only a low initial probability of finding any other shared properties relevant to the purpose at hand (Fearnside and Holther 1959: 4).

In our opinion, the formalisation we have presented helps clarify some crucial points concerning analogical reasoning and we will use it in what follows to elucidate further aspects of the question.

Before examining in depth Lightbody and Berman's arguments, let us briefly review the fallacy named *quaternio terminorum* and its features.

4. A fallacy of equivocation: quaternio terminorum[9]

Ambiguity may affect single words, statements, or even entire arguments (see, for instance, Kroeger 2005: Subsection 3.1 and Quine 1960: §§ 27-31). Statements or arguments can be ambiguous in two main different ways. A sentence (argument) will be:

[9] Readers with some training in logic may skip also this section.

- *lexically ambiguous*: if it contains terms whose usage is ambiguous;
- *structurally ambiguous*: if it is the structure of the sentence (argument) itself that yields ambiguous interpretations.

In other words, lexically ambiguous statements and arguments are ambiguous in virtue of the terms that they contain, whereas structurally ambiguous arguments "create" their own ambiguity.

As an example, the ambiguity of the sentence:

"The Rabbi *married* my sister"

depends on the double meaning of the single word 'married' (which means both 'celebrating a marriage', or 'getting married').

On the other hand, the ambiguity of the statement:

"The man saw the boy *with the binoculars*"

is due to the fact that the expression 'with the binoculars' may be interpreted as referring either to the man's or the boy's using the binoculars.

In the former case, ambiguity is a property of a term in the statement; in the latter, ambiguity is a global (*holistic*) property.

Arguments affected by equivocation fallacies may appear *prima facie* strong. Quite often, deductions of this sort also seem *formally valid*. Closer inspection reveals their concealed weakness, in that they are based upon either form of ambiguity (lexical, or structural).

Quaternio terminorum is based on lexical ambiguity. Here follows a simple example of an argument containing the fallacy:

(P_1) A star is a massive luminous ball composed of plasma in hydrostatic equilibrium

(P_2) George Clooney is a star

hence

(C) George Clooney is a massive luminous ball composed of plasma in hydrostatic equilibrium

As one quickly realises, the reasoning involved in this argument hides a trap. The term 'star' has different meanings in the premises. While in the first premise it is assumed to refer to the *celestial body*, in the second one it means *movie celebrity*.

Historically, the name of this fallacy, *quaternio terminorum*, was coined in the context of the Aristotelian syllogistic theory (see Smiley 1973: 136-154). More precisely, as is widely known, according to Aristotle, the basic syllogism consists of three sentences: two premises (*major* and *minor*, respectively) and a conclusion, which, in turn, contains three terms: the subject, the predicate of the conclusion, and a third term (*the middle term*), which connects the subject of the first premise to the predicate of the second premise. If the third term assumes different meanings in the premises (like 'star' in the aforementioned argument), then the syllogism contains a fourth, hidden term: this fact gives rise to the fallacy.

To summarise:

> A valid standard-form categorical syllogism must contain exactly three terms, each of which is used in the same sense throughout the argument. [...] If a term is used in different senses in the argument, it is being used equivocally, and the fallacy committed is that of equivocation [*quaternio terminorum*] (Copi - Cohen 1990: 206).

However, it should be noted that, although historically this fallacy is related to Aristotle's theory of syllogism, it is by no means necessary that the argument containing the fallacy actually be a syllogism.

5. The Metaphoric Fallacy to a Deductive Inference

We finally proceed to discuss the *Metaphoric Fallacy to a Deductive Inference* (MFDI) proposed by Lightbody and Berman. In their article, the authors define the MFDI as follows:

> The MFDI is [...] committed when the following two conditions are fulfilled: (i) a faulty comparison is made between two things (false analogy); and (ii) this faulty comparison is then used as premise in a sub-argument that is supposed to prove some conclusion which is believed to follow deductively (Lightbody and Berman 2010: 191).

The MFDI would be a special case of the *false analogy fallacy*. The authors' treatment of this notion is fairly similar to ours, except that we call

it *fallacious analogical reasoning*. Let us consider the argument presented by Lightbody and Berman in order to illustrate it:

(P_1) Human communities are analogous to beehives
(P_2) All beehives need a queen

hence

(C) All human communities need a queen

The argument can be re-translated in the following way, according to our formal template:

(P_1) Human communities (A) are like beehives (B) [*similarity premise*]
(P_2) Beehives need a queen (the additional characteristic x is 'to need a queen') [*base premise*]
(C) Human communities need a queen (also B has x)

The authors say that (C) is a *faulty analogy*, as the fact that $x \in A$ is not sufficient to guarantee that $x \in B$. All this is in accordance with the results of our examination of fallacious analogical reasoning.[21]

Now, the MFDI would be a variant of the false analogy fallacy and would occur in a wider and more articulated reasoning context. In order for the fallacy to take place, one does not only require that a *faulty analogy* is created, but also that 1) the analogy be used as a premise in a further sub-argument, and that 2) the faulty analogy derives from relating *metaphors*. According to the authors, the invalidity of the whole argument would, then, be specifically *dependent upon* the use of *metaphors*, a fact which would warrant the use of the label 'metaphoric fallacy'.

In order to illustrate the MFDI, the authors use the following example (Lightbody and Berman 2010: 189-190):

(P_1) The *heart* is like a *mechanical pump*

[21]However, it would seem that Lightbody and Berman are not keen on distinguishing, as we have done, between *weak* and *fallacious* arguments. In view of our definitions, the argument proposed above may simply be viewed as *weak*. However, given the patent blurredness of the notion of *fallacy*, one can still say, as the authors do, that it is, in fact, fallacious. Note that the authors define fallacious analogical arguments as "*those wherein the similarity between the two components being compared is questionable or irrelevant*" (Lightbody and Berman 2010: 187).

(P_2) The *heart* is like a *red*, *red rose*

From (P_1) and (P_2), we conclude that

(C_1) A *mechanical pump* is like a *red*, *red rose*

Then, we use (C_1) in a sub-argument, whose other premise is:

(P_3) A *mechanical pump can be fixed*

Hence, from (P_2) and (P_3), we infer that

(C_2) A *red, red rose can be fixed*.[23]

The argument above is also formally translated by the authors as follows

(P_1) *Hx* is analogous to *Px*
(P_2) *Hx* is analogous to *Rx*
(C_1) *Px* is analogous to *Rx* (Inferred from 1 and 2)
(P_3) $(x)(Px \rightarrow Fx)$
(C_2) $(x)(Rx \rightarrow Fx)$ (MFDI)

where: the domain is unrestricted, and *Hx*= "*x* is a heart"; *Px*= "*x* is a mechanical pump"; *R*x= "*x* is a symbol of love"; and *Fx*= "*x* is a fixable entity".

Let us pause a moment to examine the argument and the authors' claim that it represents an example of a new fallacy.

First, let us see what the authors themeselves say about the first bit (P_1-C_1) of the aforementioned argument:

> The structure of MFDI proceeds from analogously relating two metaphors and then claiming that a property (quality or function) from one compared predicate of the analogy is contained by the other predicate. That is, the predication is treated as being transitive across an analogy between metaphors (Lightbody and Berman 2010: 185).

We agree with the authors that incorrect analogical reasoning is at work in (P_1-C_1). However, it is far from clear that the reason is that some sort of

[23] The italics throughout are all ours.

'analogical transitivity' across the terms in P_1, P_2 and C_1 is fallaciously assumed.

To begin with, if P_1, P_2 and C_1 were not analogical statements, the whole argument would simply be an *invalid syllogism*, and it is precisely because there would be no transitivity across the terms in the three statements that the syllogism could not possibily work. 'The heart is a red rose' and 'The heart is a mechanical pump' obviously do not imply that 'A red rose is a mechanical pump'. However, the authors think that P_1, P_2 and C_1 would deceive us into thinking that there might be some sort of 'analogical transitivity' across the terms involved. In particular, some property, let us say *x*, belonging to 'red rose' would also be predicated of 'mechanical pump' as a consequence of relating the metaphors contained in P_1 and P_2. But it seems to us that, in the example proposed, there is no necessity to view the faulty analogy as the product of an invalidly assumed 'analogical transitivity'. One could simply relate the weakness of the analogy to the invalid syllogistic structure of (P_1-C_1).

Coming to the second part, (C_1-C_2), this bit is clearly an instance of *fallacious analogical reasoning*, and our formalisation helps us establish this fact very easily.

Let us assume that:

A = the set of properties of mechanical pumps
B = the set of properties of red roses

Similarity premise: 'Mechanical pumps are like red roses'
Base premise: 'Mechanical pumps can be fixed'
Conclusion: 'Red roses can be fixed'.

The argument is fallacious according to our very definition, since, although it does not seem that there is any $T \geq 1$, shared by 'mechanical pumps' and 'roses', which satisfies $|A \cap B| \geq T$, the analogy drawn in (C_1) would deceive us into inferring the opposite.

Therefore, as far as (C_1 - C_2) is concerned, we agree with the authors that this bit is affected by faulty analogical reasoning. However, there is no *special analogical fallaciousness* at work here. It is irrelevant for the fallaciousness of the argument whether C_1 is a faulty analogy derived from relating metaphors. Any analogy may lead to a *fallacious* argument, since the requirements for the *strength* of an analogical argument can be very easily violated.

These considerations lead us to view the introduction of the MDFI as dubious.

However, let us concede that the authors are right and that the fallacy in the invalid analogical syllogism (P_1-C_1) is specifically related to assuming an 'analogical transitivity' across P_1, P_2 and C_1 induced by metaphors.

The crux of the authors' argument is that (C_1) is a peculiar faulty analogy, inasmuch as it results from relating two *metaphors* ('the heart is like a red rose' and 'the heart is like a mechanical pump'). We wish to argue, instead, that the kind of fallacy committed in the example proposed would be *quaternio terminorum*.

In other terms, what would happen is that one of the terms involved in the statements has two different meanings.

Let us resume for a moment steps (P_1-C_1). In particular, let us examine the two premises:

(P_1) The heart is like a mechanical pump.
(P_2) The heart is like a red rose.

The 'heart' to which the two premises refer seems to be the same object. However, the two hearts ($heart_1$ and $heart_2$) are clearly different *denotata*. $Heart_1$ is the 'muscular organ that pumps the blood through the circulatory system', whereas $heart_2$ is 'the center of a person's thoughts and emotions'.[25]

$Heart_2$ is already the result of a process of *metaphorisation*, which has been so strong and successful as to create, as it were, a *new entity*: a metaphorical heart, which does not share any feature with the physical heart. In our interpretation, the speakers who use 'heart' in the aforementioned argument, are clearly aware of the differences between $heart_1$ and $heart_2$, and, are, in principle, able to tell them apart. Thus, if they use 'heart' in its two different meanings but, at the same time, assume 'analogical transitivity' across the terms in P_1, P_2 and C_1, they might inadvertently fall upon an equivocation fallacy, that is, *quaternio terminorum*.

However, even accepting our interpretation, there would still be cases where metaphors are mutually related in such a way as to produce *faulty analogies* wherein there is not even the least hint of equivocation. For instance, consider the following argument:

(P_1) The swordfish is like a fencer

[25] Oxford English Dictionary, s.v. 'heart'.

(P_2) The swordfish is like a serial killer

hence

(C) A fencer is like a serial killer[26]

In the argument above, the term 'swordfish' is totally unambiguous and, thus, cannot engender equivocation. If we use (C) in a sub-argument with one more premise, we might now commit the MFDI in the following way. Assume:

(P_3) Fencers can win or lose games.

hence

(C_2) Serial killers can win or lose games

What was, maybe, lacking in the authors' discussion of metaphors is a distinction between two relevant kinds of metaphors. The distinction has been crucial for us. The authors say:

> [...] a metaphor can indicate a transferring of information from one particular (predicate) to another particular (subject), that is, the ascription of some property, quality or function to the target occurs. [...] The MFDI also assumes that a metaphor is the description of one thing as something else. It need not be taken as a factual claim insofar as such is subject to truth conditions. Rather, a metaphor can provide an expression of insight which elicits or prompts thought in new directions (Lightbody and Berman 2010: 188-189).

We agree with the opinion expressed above, but we also distinguish between metaphors that are so strongly lexicalised as to give rise to different *denotata* and, thus, to ambiguities which lead to *quaternio terminorum*, and *live* metaphors that really provide new insights concerning the relationships between two different items (see Ervas and Ledda 2014, in this volume). Whether or not words like 'heart' or 'swordfish' give rise to live metaphors depends upon their *degree of lexicalisation*. In the authors' example, the degree of lexicalisation of 'heart' is so high that the equivocation is unavoidable. In the argument about the 'swordfish', on the contrary, live

[26] The objection above, that this is simply an invalid syllogism, may also apply to this argument, but can be ignored for our purposes.

metaphors are created and, therefore, fallacious analogical reasoning may really be at work.

To conclude, we claim that, even conceding that certain analogical arguments are specifically fallacious in virtue of: 1) relating two metaphors via the assumption of a sort of 'analogical transitivity' which creates a *faulty comparison*; 2) using the faulty comparison in a fallacious sub-argument, that is, even conceding that there is a point in the introduction of the MFDI, we would encourage a re-consideration of its range of application: it seems to us that the MFDI would only be at work whenever metaphors really induce a *faulty comparison*. Whether or not this happens depends upon their satisfaction of the following principle:

Principle of Lexicality A metaphor is a *live metaphor* iff it is not an already established *lexical item*. In simpler terms, it is live iff it is not listed among the different meanings of a dictionary item.

All metaphors satisfying the Principle of Lexicality may, therefore, be good candidates to give rise to *faulty analogies*. Metaphors which do no satisfy the Principle of Lexicality would, instead, engender equivocation and, in particular, fallacies such as *quaternio terminorum*.

6. Concluding Remarks

In this paper, we have tried to examine whether fallacious analogical reasoning based on metaphors can lead to what Lightbody and Berman have identified and described as the Metaphoric Fallacy to a Deductive Inference (MFDI). We have presented three main objections. The first two concern the relationship between *standard* and *analogical reasoning*, and the last one aims to bring to light that some arguments based on metaphors which seemingly lead to faulty analogies are, in fact, affected by *quaternio terminorum*. We have also presented a formalisation of fallacious analogical reasoning which, in our opinion, helps elucidate the topic significantly.

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