# THE MEGARA AND ATHENS SOPHISM: SYNTAX IS NOT ENOUGH

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**Abstract**: In this paper, a sophism attributed to Chrysippus of Soli by Diogenes Laërtius is reviewed. To do that, the general framework of the mental models theory is assumed, and the conclusion is that the sophism is a problem only if just its logical form is considered. If the semantic and pragmatic aspects involved in it are also taken into account, the difficulties disappear and it can be easily understood why people tend to reject the conclusion of sophisms such as the aforementioned one. In this way, another point in which the paper insists is that, probably, syntax and logical form are not the main elements in reasoning and language.

**Keywords**: Logical Form; Mental Models; Sophism; Standard Logic; Syntax.

## O SOFISMA DA MEGARA E A ATENAS: A SINTAXE NÃO É SUFICIENTE

**Resumo**: Neste artigo, um sofisma atribuído a Crisipo de Soli por Diógenes Laércio é revisado. Fazer isso, pressupõe-se o arcabouço geral da teoria dos modelos mentais, e a conclusão é que o sofisma é um problema apenas se só sua forma lógica é considerada. Se os aspectos semânticos e pragmáticos envolvidos nele também são levados em conta, as dificuldades desaparecem e pode ser facilmente entendido por que as pessoas tendem a rejeitar a conclusão de sofismas como o acima mencionado. Desse modo, outro ponto em que o artigo insiste é que, provavelmente, a sintaxe e a forma lógica não são os principais elementos do raciocínio e da linguagem.

**Palavras-chave**: Forma Lógica; Modelos Mentais; Sofisma; Lógica Padrão; Sintaxe.

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**Introduction**

The experimental evidence recently reported in the cognitive science literature seems to suggest that reasoning has nothing to do with logical forms. This is an idea mainly claimed by the proponents of an important cognitive theory nowadays: the mental models theory (e.g., JOHNSON-LAIRD, 2004, 2006, 2010, 2012, 2015; JOHNSON-LAIRD, KHEMLANI, & GOODWIN, 2015; KHEMLANI, LOTSTEIN, TRAFTON, & JOHNSON-LAIRD, 2015; RAGNI, SONNTAG, & JOHNSON-LAIRD, 2016; QUELHAS, RASGA, & JOHNSON-LAIRD, 2017). According to it, what is truly important in the inferential activity is the set of possibilities that can be assigned to each sentence, since inferring a conclusion is basically comparing and combining such possibilities.

In this way, the literature shows that frameworks such as this one are able to explain many cognitive facts that approaches essentially based on logic and logical forms cannot. Some of those facts are related to the problems linked to some sophisms provided in Ancient Greece. As it is well known, those sophisms often have a logical form such that, following standard logic, their conclusion is necessarily derived from their premises. However, they are unacceptable for most of the people. Thus, it can be thought that the mental models theory (from now on, MMT) has the machinery that is needed to account for such problems, and, in fact, it has already been argued that this is precisely the case with regard to a particular sophism that it is not clear whether it was proposed by Chrysippus of Soli or Eubulides: the horns sophism (LÓPEZ-ASTORGA, 2016a).

In this paper, I try to go a step further in this direction and show that MMT can also explain what happens in the case of sophisms of other kind, that is, of sophisms such as that attributed to Chrysippus of Soli by Diogenes Laërtius and that refers to the cities of Megara and Athens, and to the concept of human being. To do that, I will firstly describe this sophism and indicate why can be considered to be a problem if it is assumed that human language is about logical forms and reasoning is led by first-order

predicate calculus. Then I will also argue that MMT can deal with that very sophism and provide an account of the reasons why people usually reject its conclusion. So, I begin by commenting on the sophism.

**The Megara and Athens sophism and standard logic**

The place in which the sophism is to be found is a work authored by Diogenes Laërtius, *Vitae Philosophorum*, and it is exactly in 7.187. It is originally expressed in Ancient Greek as follows:

εἰ τις ἐστιν ἐν Μεγάροις, οὐκ ἐστιν ἐν Ἀθήναις· ἄνθρωπος δ' ἐστιν ἐν Μεγάροις· οὐκ ἄρ' ἐστιν ἄνθρωπος ἐν Ἀθήναις (see also, e.g., BOERI & SALLES, 2014, p. 247).

Thus, a possible translation of it can be 'If something is in Megara, it is not in Athens; human being is in Megara; so human being is not in Athens'.

In principle, one might think that this argument is wrong and that its conclusion cannot be accepted. Nevertheless, the problem is that it seems to be absolutely correct in first-order predicate logic. This can be clearly noted if we identify the logical forms of the premises, since it in turn will enable to check that, indeed, the conclusion can be drawn from them in that logic. Let us assume the following equivalences:

$\forall$: universal quantifier

M: being in Megara

$\rightarrow$: conditional relationship

$\neg$: logical negation

A: being in Athens

h: human being

If this is so, the logical forms of the premises are these ones:

$\forall x\ (Mx \rightarrow \neg Ax)$

Mh

And it is almost trivial to explain the way the conclusion [¬Ah] can be deduced from the premises [$\forall x\ (Mx \rightarrow \neg Ax)$] and [Mh] in standard calculus. True, in this calculus, this derivation is undoubtedly valid:

| | |
|---|---|
| [1] $\forall x\ (Mx \rightarrow \neg Ax)$ | (premise) |
| [2] Mh | (premise) |
| [3] $Mh \rightarrow \neg Ah$ | (UQE 1) |
| [4] ¬Ah | (MP 2, 3) |

Where 'UQE' represents the universal quantifier elimination rule, that this, the rule that allows deriving a formula such as [Pa] from a formula such as [$\forall x\ Px$], and 'MP' refers to the *Modus Ponendo Ponens* rule, that is, the rule that allows deriving a formula such as [q] from formulae such as [$p \rightarrow q$] and [p].

But, if it is so and the conclusion can be formally inferred from the premises in first-order predicate logic, it is necessary to explain why people tend not to accept this kind of inference. As said, MMT can give such an explanation.

**The Megara and Athens sophism and MMT**

As mentioned, MMT considers logical form not to be important in the deductive mental processes (JOHNSON-LAIRD, 2010). In fact, in its view, given that, in many cases, it is very hard to find the actual logical forms corresponding to the sentences, it does not appear to be justified to suppose that the human mind works applying formal schemata

to logical structures recovered from sentences in natural language (see also, e.g., JOHNSON-LAIRD ET AL., 2015, p. 202). What happens is that the conclusions deduced by individuals sometimes match those expected in standard logic, and this is what causes us to think that human reasoning follows standard logic, when this is not really so.

For the theory, what is important is meaning, context, and pragmatics, as, from semantic contents and taking pragmatic factors into account, people build models referring to the different possibilities implied by the sentences. Nevertheless, such models have a number of characteristics that come from the basic principles of MMT. For this paper, two of those principles are more relevant: 'the principle of iconicity' and 'the principle of possibilities'. According to the first one, "A mental model has a structure that corresponds to the known structure of what it represents" (JOHNSON-LAIRD, 2012, p. 136). The connections between MMT and Peirce (1931-1958) in this regard are obvious and the adherents of the theory often make them explicit (see, e.g., JOHNSON-LAIRD, 2012, p. 137; JOHNSON-LAIRD ET AL., 2015, p. 207). The other principle provides that "Each mental model represents a distinct possibility, that is, it captures what is common to all the different ways in which the possibility might occur" (JOHNSON-LAIRD, 2012, p. 137).

Thus, based on all of this, it is clear that, as said, the human intellectual activity is not about the recovery of logical forms, and that the models corresponding to the first premise of the Megara and Athens sophism can be, in principle, akin to these ones:

| | | |
|---|---|---|
| [I]: | M | ¬A |
| [II]: | ¬M | ¬A |
| [III]: | ¬M | A |

These are, according to MMT, the models that can be usually linked to conditional sentences such as the aforementioned premise, but one important point needs to be

clarified here. Although these three possible scenarios can remember the cases in which a conditional is true in a truth table of standard logic, this is only a coincidence. As indicated, the models are mental representations that are iconic and, therefore, they represent, by virtue of the two principles mentioned above, complete situations in which, everything else being the same, being in Megara and being in Athens are the only facts that change. The use of the letters 'M' and 'A' hence is only a resource to simplify the expression of models that are far more complex. In this way, what [I] stands for is a general situation in which something is in Megara but not in Athens. Likewise, [II] refers to a global scenario in which something is neither in Megara nor in Athens. Finally, [III] represents the complete circumstance in which something is not in Megara but it does be in Athens.

It is true that MMT assumes that people do not always identify all the possibilities of a sentence, since it can depend, for example, on individuals' attention or reflection level. However, what is important now is that, even in the case in which all the models of the first premise of the Megara and Athens sophism are detected, following MMT, that does not lead to its conclusion. The reason is evident if we pay attention to what the second premise really provides. The point is that this last premise does not mean that a particular element or individual is in Megara, but it refers to 'human being', that is, a concept or set consisting of different elements. So, that all the human beings are in Megara does not seem to be the best interpretation for an asseveration such as 'human being is in Megara'. A more suitable interpretation is clearly that at least some of them are in that city. In fact, this last meaning is, predictably, the one that all of us would give the premise if it were said that 'human being is in Megara', since, obviously, this is similar to the situation in which we are said that human being has been in the Moon. We do not interpret that all the human beings have been there, but at least some of them.

Therefore, the question would be now the number of human beings that are in Megara. MMT also assumes that working memory is limited and, as it can be noted in papers such as that of Khemlani et al. (2015), when it reviews quantified sentences, it often considers only 3 to 5 elements. For simplicity, I will work here with just 3 elements, as it is not hard to check that all I will argue below can be easily applied to universes with

more and less elements. In this way, it can be thought that, for example, [a], [b], and [c] are three human beings, that is, three elements in the general set of human beings, and that the second premise enables to imagine that they are in Megara, i.e., imagine these models:

Ma

Mb

Mc

Clearly, these three models are incompatible with both [II] and [III], and the reason is evident: in these two last models a clause is [¬M], which means that the particular element, in this case, the particular human being, is not in Megara. Accordingly, the only remaining possibility is [I], that is, the model in which [M] is true and [¬A] is true too, or, if preferred, [A] is false. And this allows us to complete the models [Ma], [Mb], and [Mc] in this way:

| | |
|---|---|
| Ma | ¬Aa |
| Mb | ¬Ab |
| Mc | ¬Ac |

Maybe it is trivial to describe what these last three models represent, but, for clarity, I will do that. The first one means that the human being [a] is in Megara and is not in Athens. The second one denotes the same situation for [b]. And, likewise, the last one describes exactly the same scenario in the case of [c]. Nonetheless, what is truly interesting here is that these are the only conclusions that can actually be drawn from the premises, and, as shown, none of them indicates that ‘human being is not in Athens’. The only conclusions that can be derived are that certain particular individuals, in my

example, [a], [b], and [c], are in Megara and, therefore, they cannot be in Athens. And it is the reason why people tend to reject the sophism: their real mental representations do not lead to its conclusion, but to other ones that are simpler and not so general.

**Conclusions**

It hence seems that, as argued by López-Astorga (2016a) in the case of the horns sophism, logical form is not the main aspect in the processes of human communication, language, and inferential activity. This paper appears to be one more proof in this direction and reveal, again, that semantics, contexts, meanings, and pragmatics can be more important.

These results have been achieved by virtue of an analysis methodology based on the main theses of MMT, and there is no doubt that such a methodology can also be very useful in other tasks, for example, to interpret from another perspective ancient theories, logics, or arguments that, by the fact that they are inconsistent with standard logic, can be considered to be wrong. MMT can allow reviewing such theories, logics, or arguments from a different point of view and so show their real sense, which can have been ignored for a long time because of the primacy of standard logic. In fact, there are already attempts in this way addressing several ancient frameworks and theses (see, e.g., LÓPEZ-ASTORGA, 2016b).

On the other hand, a study of the real possibilities of the sentences such as that of MMT can also be relevant in fields such as the one of translation. It is evident that knowing such possibilities can be a big help with the activities of that field. And this is so because they can show what the sentences truly mean and how to translate them into other languages as closely as possible. Clearly, this is another research line that deserves to be explored.

In any case, perhaps the most important conclusion provided by this paper is that, as far as certain human linguistic and intellectual processes are concerned, researching only logical forms (and, therefore, syntactic aspects) can be a clear simplification and to adopt a very poor perspective. It is clear that inferences are not purely formal, and the

reason is that syntax determines neither the meaning of the sentences nor the possibilities to which they refer. In fact, the role played by semantics and pragmatics appear to be much more critical. And this what explains problems such as, for example, the fact that, as said, it is hard to find the true logical forms of the sentences for the logicians, and the fact that the automatic translators that review the forms of the sentences and translate literally each of their words are not very exact. So, MMT is an approach that one might assume or not, but, undoubtedly, it appears to offer certain study lines that it is worth at least taking into account.

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