Fodor's Non-Conceptual Representations and the Computational Theory of Mind*

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Fodor (2007; 2008) holds that the very early stages of perceptual processing operate upon non-conceptual representations. In my view, this position is incompatible with the main tenets that Fodor himself (1975; 1998a; 1998b; 2001a) has largely defended in his computational theory of mind (CTM). My aim in this paper is to present the problems CTM would face if the modules involved in perceptual processing computed non-conceptual representations. To achieve this, I will offer a trilemma whose first horn consists of the possibility that perceptual modules operate on both non-conceptual representations and representations of the language of thought (LOT). Since non-conceptual representations do not have the necessary properties to figure in a classical computational process, Fodor would have to accept that part of the perceptual modules is not explained in classical computational terms. The second horn of the trilemma is the possibility that perceptual modules may only compute non-conceptual representations. This would be a worst-case scenario, since CTM would then not explain how perceptual modules work. Finally, the last horn of the trilemma presents a third possibility in which perceptual modules operate on both non-conceptual representations and representations that are not full-blown LOT. I will argue that this position is inadequate in that it presents the same difficulties mentioned in the first and second horns of the trilemma.

Key words: *Language of Thought, Computational Theory of Mind, Non-Conceptual Representation, Iconic Representation, Perceptual Modules*

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1. Introduction

Fodor (2007; 2008) holds that the very early stages of perceptual processing operate upon non-conceptual representations.[1] In my view, this position is incompatible with the main tenets that Fodor himself (1975; 1998a; 1998b; 2001a) has largely defended in his computational theory of mind (CTM). According to CTM, a cognitive process is a computational process that involves the manipulation of semantically interpretable strings of symbols which are processed according to algorithms (Fodor, 1997; Pinker, 1999; Rey, 1997). My aim in this paper is to address the conflicting relationship between Fodor's notion of "non-conceptual representation" and his CTM. For this purpose, I will offer a trilemma in which I present some of the problems CTM would face if the modules involved in perceptual processing computed non-conceptual representations.

The first horn of the trilemma consists of the possibility that perceptual modules operate on both non-conceptual representations and representations of the language of thought (LOT).[2] According to Fodor (1975; 2008), LOT

[1] Notice that Fodor (2008) uses expressions such as "preconceptual," "unconceptualized," and "non-conceptual" representations. These expressions are not interchangeable, however. There are differences between a "preconceptual" representation and a "non-conceptual" one. While the former can become conceptual (in the sense of Prinz, 2002), the latter will never become a conceptual representation. I prefer to use "non-conceptual representation" because, as we will see, Fodor's iconic representations do not have the characteristics necessary to become conceptual representations.

[2] The expression "perceptual module" alludes to perceptual processing systems such as visual and auditory systems. As output, these modules produce perceptual representations used for a variety of cognitive purposes. Fodor (1983) describes nine properties of these perceptual module systems. Modular systems are localized, meaning that the modules are realized in dedicated neural architecture. Modular systems are subject to characteristic breakdowns, as modules can be selectively impaired. They are mandatory since modules operate in an automatic way. Modules are fast; they generate outputs quickly. They are also shallow; modules have relatively simple outputs (e.g., not judgments). In addition, modules are ontogenetically determined, developing at a characteristic pace and sequence.

is an internal language-like representational format in which the mind represents concepts. Since LOT representations have combinatorial syntax and semantics, they can be manipulated by the classical computational processes of the mind postulated by CTM. In contrast, non-conceptual representations do not have these properties and therefore cannot figure in a classical computational process. For this reason, Fodor would have to accept that part of the processing of the perceptual modules cannot be explained by CTM. The second horn of the trilemma represents the possibility that perceptual modules may only compute non-conceptual representations. This would be a worst-case scenario for Fodor, since CTM would then not explain how perceptual modules work. This conclusion is at odds with the main tenets of CTM, which attempts to provide a theory of modular processing. Finally, the last horn of the trilemma presents a third possibility in which perceptual modules operate on both non-conceptual representations and representations that are not full-blown LOT. I will argue that this position is inadequate in that it presents the same difficulties mentioned in the first and second horns of the trilemma.

This paper is organized as follows. In Section 2, I will present Fodor's position on the conceptualism/non-conceptualism debate. The way in which Fodor distinguishes between conceptual and non-conceptual representations determines how he conceives of non-conceptual ones. I will then discuss in some detail Fodor's notion of "non-conceptual representation" followed by his argument that the early stages of perceptual processing operate upon non-conceptual representations. The general purpose of this section is to analyze Fodor's defense of non-conceptualism which has emerged in his most recent works. With these preliminaries in place, in Section 3, I will introduce my trilemma against Fodor. This section will be divided into three subsections in order to develop each horn of the trilemma. I will conclude with some comments about the tension between Fodor's classical computa-

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Modular systems are also domain specific, coping with a restricted class of inputs. They are inaccessible, as higher levels of processing have limited access to the representations within a module. Finally, modular systems are informationally encapsulated, that is, modules cannot be guided by information at higher levels of processing.

tionalism and his non-conceptualism.

2. Fodor on Non-conceptualism

Conceptualist and non-conceptualist positions have emerged in the debate on how to characterize the differences between propositional attitudes (such as beliefs and desires) on the one hand and perceptual experiences and states of informational processing systems on the other (Speaks, 2005; Bermúdez, 1995a; 1998; 2003). This debate takes as its starting point Evans's influential idea that propositional attitudes have conceptual content, while perceptual experiences and the states of informational processing systems have non-conceptual content (Evans 1982).

Fodor (1998a; 2007; 2008) adopts the conceptual/non-conceptual distinction shaped by the *content view* (Heck, 2000; 2007).[3] According to the content view, the difference between states with non-conceptual content and states with conceptual content occurs exclusively at the content level (Bermúdez, 2007). Conceptual and non-conceptual content are different *types* of contents. Yet what does it mean, exactly, to say that conceptual and non-conceptual contents are different types of contents? Heck (2000; 2007) points out that what lies at the core of the debate between conceptualists and non-conceptualists is the structure of conceptual and non-conceptual content.

In Fodor's view, conceptual content has a characteristic structure constituted by concepts understood as physically instantiated representations, whereas non-conceptual content is constituted by non-conceptual repre-

[3] Within the conceptualism/non-conceptualism debate, there is also the *state view* (Heck, 2007). The state view is related to the conditions that a subject has to satisfy in order to be in a mental state with certain content (Skidelsky, 2010). What distinguishes conceptual states from non-conceptual states is that the former are concept-dependent while the latter are concept-independent (Bermúdez, 2007). A state is concept-dependent if it is impossible for a subject to be in a token mental state without possessing the concepts required to specify the content of that token state. In contrast, a state is concept-independent if the subject lacks all or some of the concepts required for an accurate specification of its content. See Laurier (2004) for more details.

sentations. In this sense, for example, the visual experience of a red table may have non-conceptual content since its content is not structured by concepts such as TABLE or RED.[4] In contrast, Fodor (1998a) believes that propositional attitudes and thoughts in general have conceptual content. For instance, *Helen is happy* is a thought whose structured content can be expressed as follows: *Fa* (where *a* is Helen, *F* is happy). This thought is constituted by the concepts HELEN and HAPPY.

Furthermore, according to Fodor (1998a), these concepts (e.g. HELEN and HAPPY) are mental particulars that constitute what Fodor (1975) calls LOT. In Fodor's account, LOT is explained to be the inner symbolic format in which the mind represents concepts (Schneider, 2008). LOT concepts are understood to be the "words" (referred to as "symbols") that are combined into mental sentences according to language-like principles (Schneider, 2011). In Section 3, I will present the LOT hypothesis in greater detail. However, for now I would like to note that, according to Fodor, LOT concepts can explain some properties of human thought. One of these properties is the productivity of thought. Over the course of their lifetime, normal humans seem to remain capable of entertaining an infinite number of new thoughts (Aizawa, 2003). It is a fact that any given human will entertain only a finite subset of all the possible thoughts she appears to be capable of entertaining (Fodor, 2004). However, this is a factual restriction, and in principle, humans have the ability to entertain innumerable thoughts. Human thought also has a structural property called "systematicity" according to which we do not encounter people capable of having certain thoughts (e.g. *The girl loves John*) without having other related thoughts (e.g. *John loves the girl*) (Fodor 1998a). Human thought is systematic because the ability to have certain thoughts is intrinsically connected to the ability to have other related thoughts.[5]

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[4] I will hereafter use capital letters to express concepts and italics to express propositional attitudes and thoughts in general.

[5] To some extent, Fodor's systematicity of thought describes the same property of thought presented by Evans (1982) in the Generality Constraint: "If a subject can be credited with the thought that *a* is *F*, then he must have the conceptual resources for entertaining the thought that *a* is *G*, for every property of being *G* of which he has conception" (104). Still, there are important differences between Evans's

Fodor's productivity and systematicity of thought were inspired by the productivity and systematicity of natural language.[6] Given that linguistic capacities are productive and systematic, and given that the function of natural language is to express our thoughts, Fodor (1987) concludes that human thought shares the same properties of language. He proposes compositionality as the best explanation for these properties of natural languages. There are an infinite number of utterable expressions and also certain symmetries of expressive power in natural languages due to the finite set of representational primitives and the finite system of constructive principles that organize these primitives (Fodor, 2004).

These representational primitives must make approximately the same semantic and syntactic contribution to each expression in which they occur (Fodor and Phylyshyn, 1988). For example, SAD is a representational primitive which makes the same semantic and syntactic contribution to "John is sad" and to "Mary is sad." Since these two expressions share the same primitive constituent (e.g. SAD), and since this primitive constituent makes the same semantic (refers to a certain property) and syntactic (it is an adjective) contribution, it can be said that these two expressions are systemati-

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generality constraint and Fodor's systematicity of thought. In Evans's view, the generality constraint is not only true, it is necessarily true. According to this author, there simply could not be a subject who believes that *Marie is happy* and *John is sad* without being able to entertain the thoughts, *Mary is sad* and *John is happy.* Fodor, for his part, endorses the generality constraint as a contingent truth about actual thinkers. It is conceptually possible that there could be a subject who believes that *Mary is happy* and *John is sad* without being able to think that *Mary is sad* or *John is happy.* Nevertheless, Fodor (1998a) maintains that it is exceedingly unlikely that an actual thinker violates the generality constraint. On the other hand, the differences in the ontological commitments of Evans and Fodor are well-known. While Evans considers that concepts are abilities, Fodor considers them to be mental particulars. These remarks would need to be further explored; however, this brief exploration suffices for my purposes here.

[6] Note that in Fodor's account, "The easiest way to understand what productivity and systematicity of cognitive capacities amount to is to focus on the productivity and systematicity of language comprehension and production" (Fodor and Phylyshyn, 1988, 119).

cally connected.[7]

The representational primitives that explain the systematicity of thought and its expressive powers are LOT concepts. Furthermore, the productivity and systematicity of thought depend on the compositionality of LOT symbols.[8] Concepts are LOT’s primitives and have the capacity to combine compositionally. As LOT’s concepts can be combined and recombined compositionally, LOT explains the systematicity of thought.

Based on Fodor’s proposal, what exactly are non-conceptual representations? When Fodor introduces the notion of “non-conceptual representation,” he is thinking of iconic representations.[9] He defines iconic representations following the picture principle: “If *P* is a picture of *X*, then parts of *P* are pictures of parts of *X*” (Fodor, 2008, 173; 2007, 108). The general idea appears to be that a representation *R* is iconic if every part of it represents a part of what *R* represents. As Balog (2009) illustrates, “a part of da Vinci’s Last Supper may represent a part of an apostle, or a table, or…etc.” (315). Notice that “part,” in this case, refers to a spatial part.

[7] Compositionality is conceived of both as a semantic and a syntactic property. A system of representations is semantically compositional if the semantic properties of the complex representation are fully determined by their structural descriptions together with the semantics of their primitive parts. On the other hand, a system of representations is syntactically compositional if the syntactic properties of the complex representation are fully determined by their structural descriptions together with the syntax of their primitive parts. See Fodor (2008).

[8] Fodor (2001b) comes to believe that natural languages are not compositional. Assuming a pragmatic view of natural languages, Fodor (2001b) argues that compositionality would be a feature exclusive to thought. In agreement with Clapp (2010) I believe that Fodor is not able to allow this possibility. If natural languages are not compositional, then Fodor would not have good reasons to believe that thought certainly is. However, I will not discuss this topic since what is important in this context is the fact that thought is compositional.

[9] In fact, Fodor (2008) considers that “it’s in the nature of iconic representations not to be conceptual” (170). He contrasts iconic representations with discursive representations, which he conceives of as conceptual representations. Paradigmatic examples of iconic representations are pictures, just as paradigmatic examples of discursive representations are the sentences of natural language. See Fodor (2007; 2008) for more details.

Fodor (2007; 2008) considers that the early stages of perceptual processing systems (such as visual and auditory systems) operate on this kind of iconic representation. According to Fodor's (1983) taxonomy, the mind is divided into systems, some of which are modular and others of which are not. The main purpose of the modular systems is to provide the required information to the non-modular central systems. These central systems integrate the output information already processed by the different modules for the purpose of belief fixation.

From Fodor's point of view, non-conceptual representations, which are called "iconic representations," are the representations upon which some of the components of perceptual modules operate. Unlike other defenders of non-conceptualism, Fodor considers that perceptual experiences require conceptual representations. He believes that inferring, thinking, and experiencing all go in the same basket: "they all presuppose conceptualization" (Fodor, 2008, 185). Back to iconic representations, two main characteristics should be stressed. The first is related to the place of iconic representations in the cognitive economy. Since they are manipulated by the early computations of the perceptual modules, iconic representations are supposed to be "entirely subpersonal" (Fodor, 2008, 191). This implies that they cannot be introspected by the subject. Rather, "it appears to be that what can be introspected is always the product of subpersonal and encapsulated inferences" (Fodor, 2008, 192). It has now become uncontroversial to say that subpersonal representations in general (and iconic representations in particular) are representations manipulated by the early stages of modular systems that cannot be accessed by the subject considered as a global system.

Take David Marr's theory of vision (1982). Marr's theory constitutes one of the most developed information-processing theories that analyze vision in terms of a series of operations on data structures. The components of the visual system deliver a 3-D representation of the distal scene, taking the information extracted from the retinal image as a starting point. The initial filtering of the retinal image corresponds to edge detection, which is the information processing task of extracting information such as object boundaries (Shagrir, 2010). The retinal image represents an array of light intensities in the visual field. The detection of changes in these light intensities is a crucial part of the task needed to extract the objects' boundaries.

Marr's representational zero-crossings correspond to the registers of sudden changes in light intensity (Bermúdez, 1995b). I would like to emphasize that the subject is not able to access the information about changes in light intensities represented in Marr's zero-crossing through introspection. These are primitive representations in the first stages of the visual system. What can be introspected is the representational output of the visual system, that is, the 3-D representation of a distal scene. This characterization of iconic representations has an epistemological consequence. According to Fodor (2008, 192), these representations are not available to justify one's perceptual belief. This is because justification of one's perceptual belief requires that the content of the iconic representations be introspected. Since this is not the case, due to its subpersonal nature, iconic representations are not available for perceptual beliefs.

The second characteristic of iconic representations refers to their content. Iconic representations register only "sensory" or "transducer" detectible properties (Fodor, 2008, 186). According to Fodor (2008), "a mind can register such properties as it has mechanisms for transducing." (186) Transduction can be considered a very preliminary mechanism that takes ambient energy into mental representations. In the case of auditory perception, the properties transduced and represented by the iconic representations are those specified in a spectrogram, i.e. "the frequency, amplitude and duration of a sound" (Fodor, 2008, 186). In the case of visual perception, iconic representations represent the kind of properties that photographs do, i.e. "two-dimensional shape, shading, color, and so forth" (Fodor, 2008, 185). Iconic representations represent these kinds of properties but without any commitment to principles of individuation. In the case of conceptual representations, the use of quantifiers, variables, singular terms, and sortal predicates helps to identify certain objects referred to by the representation. The use of these terms is related to the fact that conceptual representations have logical form.

I will develop this characteristic of conceptual representations in more detail in the next section. However, to offer a brief example, *John is blond* is a conceptual representation in which the concept JOHN (expressed by the singular term "John") reveals the ontological commitment with an individual named John. However, in the case of iconic representations, representation and individuation are dissociated. For example, Marr's representational zero-crossing which registers the sudden changes in light intensity does not individuate any object. Given that these representations are not constituted by quantifiers, variables, singular terms, etc. (necessary to pick up individuals and referential properties), they do not express an ontological commitment. In this sense, the properties represented by iconic representations are properties that require a subpersonal process which does not participate in perceptual inferences. Perceptual inferences involve conceptual representations (Fodor, 2008, 185), and conceptual representations refer to properties individuated by their concepts.

One might ask whether visual and auditory modules manipulate iconic representations in their early stages. As I reconstruct it, the argument offered by Fodor (2007, 2008) is as follows:[10]

> (i) If perceptual modules do not exhibit what psychologists call "the item effect," then they operate upon iconic representations.
> (ii) Perceptual modules do not exhibit what psychologists call "the item effect."
> (iii) Therefore, perceptual modules operate upon iconic representations.

Since this empirical argument for the existence of iconic representation in perceptual systems depends on the psychological phenomenon called "the item effect," it could be baptized the "item effect argument."[11] The item effect is produced when the information is conceptually represented. As I have already mentioned, conceptualization involves individuation (Fodor, 2008, 188). According to Fodor, "conceptualization is expensive" (2008, 188) due to the fact that conceptual representations can differ in the number of individuals and properties that they represent. For example, the conceptual representation *John, Mary, and Bill Clinton are happy* individuates

[10] To the best of my knowledge, this is the only argument that Fodor (2007; 2008) presents for the existence of iconic representations.

[11] Fodor (2008) remarks on the empirical nature of this argument: "The argument […] is empirical; it suggests that there is iconic representation in perception, but certainly doesn't demonstrate that there is" (189-90).

more individuals than the conceptual representation *John is happy*. However, what kind of computational effects are involved when conceptual representations differ in the number of individuals they represent? The number of individuals represented by a conceptual representation is expressed by the number of informational items that the representation contains. In this sense, *John, Mary, and Bill Clinton are happy* involves more items (such as names) than *John is happy*.

When the information is represented using conceptual resources, such as names and predicates, increased information will affect processing. The higher the number of informational items in a system, the longer the processes required to extract information from an array of representations. For example, imagine you have the list of the students enrolled in a given course. Such a list provides you with characteristics of these students (e.g. age, hair color, weight, interests, etc.). Consider the processing involved in answering when asked whether any student in the course has blue eyes. Certainly, the more students there are in the course, the longer the processing involved in answering the question because of the increase in the information. If the duration of processing depends on the quantity of informational items, then this constitutes evidence for the item effect, and such information is conceptually represented.

However, these considerations do not apply when the information is represented by iconic representations. If processing involves a system of iconic representations, there will be no item effect. Nothing about iconic representations depends on the number of individuals, objects, or properties they represent, simply because iconic representations do not involve individuation (Fodor, 2008, 183). These representations contain information that does not individuate objects, individuals, or properties in the world. For this reason, iconic representation are not “expensive;” they have no ontological commitment. In this sense, with respect to ontological commitments, the iconic representation of a size is no different from that of a colored shape. Although these iconic representations may present different quantities of information, the processes that operate upon this information may be insensitive to the amount of information. Imagine, in this case, that you take a picture of the students in the course mentioned above. You will be able to answer the question as to whether any student in the course has blue eyes almost instantaneously. As Balog (2009) states, “the result times will be the same irrespective of whether there are 5 or 25 members” (317). The reason may be that iconic representations do not represent these members, they only carry sensory information. This would thus be an example in which the processes upon iconic representations do not exhibit the item effect.[12]

Fodor uses empirical evidence (Sperling, 1960; Julesz, 1971) to justify the claim that the early stages of visual and auditory systems do not exhibit the item effect and manipulate iconic representations. For example, the evidence presented by Julesz is related to the perception of different arrays of positioned dots that are visually presented. In the cases in which subjects were presented with different arrays of dots, they considered them to be positioned identically. Nevertheless, Fodor suggests that the displacement of the dots must somehow be registered since the sensory representation is the only information available to the subject about the stimulus. If this information is not preserved, there can be no illusion (Balog, 2009). Fodor wants to emphasize that the number of dots presented to the subject does not affect the processing. The performance of the subject will be the same in cases in which more dots are presented. This would be a case where the item effect is disconfirmed and evidence is provided for the existence of iconic representations.

One way to debate Fodor’s iconic representation involves questioning his item effect argument. I maintain that Fodor’s processing load argument, presented in *Concepts* in favor of conceptual atomism, threatens his item effect argument. The processing load argument was introduced to counter the classical theory of concepts according to which concepts are structured

[12] Fodor (2008) considers that “the item effect is not the litmus for iconic representations” (184). In fact, he imagines a possible objection. A quick response to the argument for the existence of iconic representations would be to consider that the processes upon conceptual representations are parallel. In this case, the search for information extracted from the conceptual representations may not reveal the item effect because processes may not take longer when more information is encoded. Parallel processing avoids this kind of timing effects. To respond to this objection, Fodor (2008, 184) simply assumes that conceptual representations are computed serially. Serial processing is more likely to involve timing effects when it operates upon conceptual representations.

mental representations that encode a set of necessary and sufficient conditions for their application (Laurence and Margolis, 1999). Furthermore, Fodor (1998a) uses this argument to try to defend his conceptual atomism. The argument can be reconstructed as a *Reductio Ad Absurdum.* It begins by considering concepts to be complex representations. This is the untenable hypothesis from which the absurd result will follow. It is important to stress that the next step of the processing load argument is based on the assumption that the amount of information computed affects the processes. In this step, Fodor assumes, as in the item effect argument, that the more information that is conceptually encoded, the longer and heavier the processes. Following this idea, a further step would be to state that the processing of a more complex conceptual representation will take longer than the processing of a less complex conceptual representation. The reason is that a more complex representation carries more information. For example, the processes that operate on DIE are supposedly faster than those that operate on KILL. The reason may be that the structure of KILL is more complex than the structure of DIE, since KILL includes information such as CAUSE and DIE (Laurence and Margolis, 1999). However, Fodor argues that psychologists were not able to measure this timing difference in the processing of concepts such as KILL or DIE. This leads to the problematic situation in which the timing effects that were expected to happen never occur. This problematic situation brings Fodor to the conclusion that concepts are not structured representations.

However, the processing load argument can be interpreted as revealing something different: there is no reason to assume that the speed of computations is affected by the amount of information processed, even if the information is conceptually encoded (Jackendoff, 1983). Instead of positioning the processing load argument against the classical theory of concepts, it could be placed in opposition to the item effect argument. In this case, the conclusion of the argument would not be focused on the structure of conceptual representations. As Fodor (1998a) has presented it, the processing load argument can conclude that it is not true that the more information that is conceptually encoded, the longer and heavier the processes. As this idea leads to the conflicting scenario in which the expected timing effects never happen, it has to be abandoned. I suggest that this assumption would be the one that is denied in the *Reductio Ad Absurdum*.

Moreover, in which sense would the assumption that more information being conceptually encoded involves longer and heavier processes be false? It is relatively uncontroversial to claim that concepts are the representations needed for categorization tasks. Categorization is a complex cognitive capacity that involves classifying an object under a certain category (Machery, 2009). Psychologists usually organize categories on three levels: the superordinate level (e.g. animal), the subordinate level (e.g. Rottweiler), and the basic level (e.g. dog). The basic level of categorization is an intermediate level of abstraction in which objects are grouped together based on their form and function. This level of abstraction is of particular interest in psychological research. Any given object can fall under many different categories. For example, a single object can be an animal, a Rottweiler and a dog. What Rosch (1999) and her colleagues have discovered is that subjects identify an object as a dog (basic level) faster than they can identify it as an animal (superordinate level) or as a Rottweiler (subordinate level). This phenomenon is called the "basic level effect."

Deeper insight into the basic level effect reveals that a subject's reaction times in categorization tasks which involve the basic level are faster than a subject's reaction times in a categorization task which involves the other levels. To illustrate this point, we can consider the tasks in which the subject has to identify a category. Subjects are presented with a series of sentences (e.g. "Dogs are mammals," "Dogs are animals," etc.) and they have to answer with a categorization judgment (true/false). Bearing in mind that concepts are the mental representations needed for this kind of task, and assuming that the concepts are complex representations, this kind of experiment shows that the information in basic level concepts is used faster than that contained in superordinate and subordinate concepts. However, the conceptual representations of the basic level have, in fact, more information than the rest of the conceptual representations. When subjects are asked to list the features of each of these conceptual representations, they generally give more information about the basic level concepts.[13] As Rosch (1999) has

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[13] Could self-report count as evidence to support that basic level category representations carry more information? Someone who does not trust the evidence

asserted, the superordinate and subordinate concepts include less information in their structures because they refer to few properties that objects have in common. This difference in information is due to a difference on the ontological commitments of these concepts. Concepts like DOG individuate more in the world than concepts like ANIMAL. Certainly, I am not claiming that DOG represents more individuals than ANIMAL. Individuation is a complex metaphysical relation which involves the reference to individuals, objects, or properties in the world. In this sense, concepts like DOG track more properties in the world (e.g. having a tail, being four-legged, etc.) than concepts like ANIMAL. The lesson is that even if we agree that there are (conceptual) representations that have a great deal of information in their structure (basic level concepts), their processing does not take longer. Instead, these representations are processed faster than other kinds of representations with less information (superordinate and subordinate concepts). The example about categorization considered above contradicts Fodor's idea presented in the item effect argument, revealing that the timing of cognitive processes on conceptual representations is not always affected by the amount of information.[14]

3. The Trilemma

Although I have presented a reason for questioning the soundness of the item effect argument in Section 2, in this section I will assume that it does, in fact, hold true. I will then proceed to show the strong tension between the notion of "non-conceptual representation" and CTM. This tension is presented in the form of a trilemma. I will explore the following options: first, that perceptual modules operate on non-conceptual representations and on LOT conceptual representations; second, that the only representations manipulated by the perceptual modules are non-conceptual ones; and third,

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delivered by self-reports would question this assertion. Nevertheless, this exceeds the present argument. For my present purpose, it is enough to consider what cognitive psychologists usually do in their field, and they generally use self-report to obtain psychological evidence.

[14] Processes may be affected by the *organization* of the conceptual information. For more details, see Destéfano (2012) and Jackendoff (1983).

that perceptual modules include both non-conceptual representations and other representations that are not full-blown LOT. Below, I will explore the problems of each of these options.

3.1. Non-conceptual Representations and LOT

In the first horn of the trilemma, I propose considering that perceptual modules compute non-conceptual representation and LOT conceptual representations. I believe that perceptual modules can operate on these kinds of representations in two different ways. First, it is possible to speculate that the early stages of perceptual processing operate on non-conceptual representations, whereas the final stages of perceptual processing operate on LOT representations. For instance, Marr's theory of vision (1982) includes three different levels of representations: the primal sketch, which represents light intensities of the image; the 2½-D sketch, which contains information related to the viewer; and the 3-D sketch, which has visual information related to the object. To say that perceptual modules operate on non-conceptual and LOT representations could be interpreted as the idea that the primal sketch, in Marr's account, includes non-conceptual representations, while 2½-D and 3-D sketches include LOT representations. Another option would be to consider that there are non-conceptual and LOT representations in the different stages of perceptual processing. In this case, to say that perceptual modules compute non-conceptual representations and LOT conceptual representations would mean that the primal sketch, the 2½-D sketch, and the 3-D sketch all operate both on non-conceptual and LOT representations. The aforementioned options do not affect the development of this horn of the trilemma.

Fodor (1975) introduced the LOT hypothesis as a proposal concerning the vehicle of propositional attitudes. Propositional attitudes are usually expressed with the formula "*X* believes (desires, etc.) that…" which can be completed with a declarative sentence. Bertrand Russell (1921) called these mental states "propositional attitudes" due to the fact that they can be described as the attitudes of a subject (e.g. belief, desire, etc.) toward a proposition. To illustrate this point, the sentence "John believes that Ken Loach is a good director" expresses John's mental state, which consists of his belief that Ken Loach is a good director. This sentence can be analyzed as follows: there is a subject (John, in this case) who has an attitude (here, of belief) toward a content propositionally expressed (Ken Loach is a good director).

As I explained in Section 2, Fodor considers that propositional attitudes have conceptual content, and he endorses the idea that conceptual content is constituted by LOT representations. LOT is supposed to be a symbolic format in which the mind represents concepts that are different from the natural language words used to express these concepts. It is true that LOT is not primarily concerned with the nature of modular processes. Originally, the LOT hypothesis was formulated for the domain of thinking. However, Fodor himself suggests that "modular input systems have their own LOT" (Schneider, 2008,7). Moreover, he suggests that perceptual modules compute LOT representations:

> This emphasis upon the syntactical character of the thought suggests a view of cognitive processes in general- including, for example perception, […]- as occurring in a language-like medium, a sort of "language of thought". This too is a thesis for which I am enthusiastic. (1997, 9)

LOT representations have combinatorial syntax and semantics (Fodor and Phylyshyn, 1988, 98). This means that (i) there is a distinction between atomic and molecular representations; (ii) the structurally molecular representations have syntactic constituents that are themselves either atomic or molecular; and (iii) the semantic content of a molecular representation is a function of the semantic contents of its syntactic constituents. It is these properties which give LOT representations their logical form. The notion of "logical form" has been developed both from a philosophical and a linguistic point of view (Carruthers, 2003). From the philosophical perspective, the logical form of a sentence consists of a syntactic construction with logical constants, quantifiers, variables, and singular terms. From the linguistic point of view, the logical form is a syntactically structured representation that constitutes the output of the linguistic computational system. The logical form together with the phonetic form provide the instructions to the performance systems (Chomsky, 1995).

Beyond the question of how the logical form is described, it is important to note that it can only be extracted from representations which have canonical decomposition. If *Helen is happy* has the logical form *Fa*, this is because this representation has a canonical description of its symbols. The canonical description of *Helen is happy* would be ((Helen)$_{NP}$ ((is)$_{V}$ (happy)$_{P}$)$_{VP}$)$_{S}$. This description establishes the canonical constituents of *Helen is happy*. It is decomposed into singular terms and predicates, such as *Helen* and *is happy*. Each decomposition of the representation reveals the same singular terms and predicates, and these components are therefore called "canonical constituents." This description also discards constituents that are not canonical, such as *Helen is*. In addition, the canonical description reveals the hierarchical relations between the canonical constituents of *Helen is happy*. Since the representation is constituted by canonical components, they are combined according to each of the components' canonical roles. Each of these constituents makes a different syntactic contribution to the whole representation. For instance, the contribution of *Helen*, conceived as the head of the Noun Phrase, is different from the contribution of *is*, understood as the head of the Verbal Phrase. To summarize, the logical form reveals the hierarchical relations between the canonical components of a representation.

Now, Fodor's defense of CTM is well-known. As the author himself points out, CTM is part of the truth about cognition (Fodor, 2001a). Generally speaking, CTM holds that minds can be conceived of as computing systems. The view that cognition has something to do with computation was developed by different research traditions (Piccinini, 2012). All of them have a common feature: they attempt to explain mental phenomena by recurring to mental computations (Piccinini, 2007). CTM claims that computation is a special kind of process with characteristics that are relevant in the explanation of mental phenomena (Piccinini, 2007). Moreover, computational explanations of cognitive capacities take the form of computer programs to produce the capacity in question (Piccinini, 2012).

Fodor's CTM was inspired by Alan Turing (1950), who defined computation in terms of the formal manipulation of uninterpreted symbols according to algorithms. These algorithms constitute the instructions needed to generate a result within a finite number of steps. Beyond Turing's original ideas, Fodor maintains a semantic view of computation (Piccinini, 2012).

Fodor’s CTM, when supplemented with the LOT hypothesis, holds that a cognitive process is a computational process involving the manipulation of semantically interpretable strings of symbols which are processed according to algorithms. In other words, a computational process consists of the processing of representations (Fodor, 1975; 1997; Fodor and Phylyshyn, 1988; Schneider, 2008). Fodor (2008) asserts:

> Tokens of mental processes are “computations”, that is, causal chains of […] operations on mental representations. There is no tokening of a (cognitive) mental state or process (by a creature, at a time) unless there is a corresponding tokening of a mental representation (by a creature, at a time). (5-6)

In addition, these syntactic operations preserve the semantic properties of the representations. Nevertheless, classical computational processes are exclusively defined over the syntactic structure of the representations in the sense that they are causally sensitive only to the constituent structure of the symbols. Mental operations compute a symbol string, transforming it into another symbol string based on its structural or canonical description. Consider the logical operation in which you infer *P* from (*P.Q*). The transformation of (*P.Q*) into *P* is based on the form of these symbols. These same considerations apply to mental operations. The mental processes that transform (*P.Q*) into *P* operate on the structural description of the computed representations. Thus, computational processes transform the representations according to the logical form that expresses the structural or canonical description of these representations:

> The logical form of a thought supervenes on the syntax of the corresponding mental representation, and the logical form of a thought determines its causal powers because the syntax of a mental representation determines its computational role. (Fodor, 2001a, 19)

In this view, CTM requires language-like representations because “only something that is language-like can have logical form” (Fodor, 2008, 21). In classical computationalism, only something that is syntactically structured in logical form can be computed. This means that CTM requires LOT language-like representations. The problem with non-conceptual representations is that they do not have the properties of language-like representations. One of the most important characteristics of non-conceptual representations is the fact that they do not have logical form because they decompose into syntactically and semantically homogeneous parts. In other words, these representations do not possess canonical decomposition into names, singular terms, etc. Pictures and graphs can decompose in many different ways, creating new components each time. A picture, for example, can be cut up in endless ways, none more canonical than another. This means that neither pictures (in particular) nor non-conceptual representations (in general) have canonical constituents. Due to the fact that any new decomposition gives rise to a new set of components, these components cannot be canonical constituents. On the contrary, these components would merely be parts of the representation. Indeed, the parts of a non-conceptual representation can be combined. For example, the parts of a picture can be combined in order to represent someone's face. Nevertheless, these combinations are only established between mere parts of the representations. Since the components combined are not canonical constituents, non-conceptual representations cannot be canonically combined, and thus, the compositionality that they present is not enough to consider them language-like representations.

In summary, non-conceptual representations do not have the syntactic properties needed by the computational processes of the mind. As CTM requires LOT language-like representations, and non-conceptual representations are not language-like, CTM does not apply to non-conceptual representations. If non-conceptual representations do not have logical form, then part of the processes and representations that figure in the perceptual modules cannot be explained with Fodor's CTM. Of course, the processes that operate on LOT representations would satisfy CTM's constraints, but this consideration does not apply to the non-conceptual representations included in perceptual modules. These representations do not satisfy CTM's constraints. This imposes a limitation on CTM which, to the best of my knowledge, Fodor has not considered. The presence of non-conceptual representations weakens the explanatory power of CTM related to the working of the modules. I will return to this idea in Section 3.2. Furthermore, Fodor undermines his personal goal of developing a cognitive science focused on CTM. He would be forced to turn to a non-classical computational explanation or to a non-computational explanation related to the operations that manipulate non-conceptual representations. Thus, if perceptual modules operate on both non-conceptual and LOT representations, Fodor would have to accept that part of the perceptual modules is not explained in classical computational terms.

3.2. Non-conceptual Representations without LOT

According to the second horn of the trilemma, there is an option by which the very early, middle, and advanced stages of perceptual processing operate solely on non-conceptual representations. Since Fodor generally rejects "hybrid models" of representations (Schneider, 2008, 7), it is possible to think that perceptual modules compute non-conceptual representations without any presence of LOT representations. However, this scenario would exacerbate the problem presented on the previous horn of the trilemma. The perceptual information processing systems would manipulate representations whose characteristics are not compatible with the representations needed by the computational processes postulated by CTM.

It is important to remember that non-conceptual representations do not have a logical form to express the syntactic structure needed in order for a representation to be computed. In this case, CTM would be absolutely useless in explaining how the perceptual modules work. Indeed, this is an undesirable consequence because Fodor (2001a) considers that the explanatory success of CTM lies in the modules. Fodor ascribes both an optimistic and a pessimistic aspect to CTM. The pessimistic aspect consists of the idea that CTM does not apply to the central systems that operate for the purpose of belief fixation:

> So, then, when I wrote books about what a fine thing CTM is, I generally made it a point to include a section saying that I don't suppose that it could comprise more than a fragment of a full and satisfactory cognitive psychology; and that the most interesting- certainly the hardest-problem about thinking is unlikely to be much illuminated by any kind of computational theory we are able now to imagine. (Fodor, 2001a, 1)

However, CTM also has a positive aspect that makes it the best cognitive perspective to study Fodorian modules:

> It's a central theme in *The Language of Thought* (1975) that modular cognition is where Turing's computational story about mental processes is most likely to be true. (Fodor, 2001a, 7)

Why does Fodor insist that "there's more to thinking than computing" (2008, 22)? Why does he believe that CTM is not the correct approach to explain the overall working of central systems? It is important to bear in mind that the central systems operate for the purpose of belief fixation. Belief fixation involves all the non-demonstrative inferences needed to establish the simplicity, coherence, and conservatism of a belief system. Let's take the non-demonstrative inferences for simplicity. Suppose that you have a punctuate system of belief constituted by *P*, and you are considering also endorsing either the belief that *Q* or the belief that *R*. The question is, then, which is the simpler belief system? *P.Q* or *P.R*?

Certainly, the central systems have the processes required to answer this question. To evaluate the simplicity of these two belief systems, the processes must be global, that is, they must be "defined over more or less the whole system of background beliefs" (Fodor, 2008, 121). The processes for simplicity are global because they are sensitive to the global properties of the beliefs, where these global properties of beliefs are supposed to be determined by the nature of the larger group of beliefs with which the belief is entertained (Schneider, 2011). For instance, the computation required to evaluate simplicity between *P.Q* and *P.R* must be sensitive to the properties that *P.Q* or *P.R* possess as such. The overall simplicity cannot be evaluated by simply analyzing the intrinsic simplicities of each belief that belongs to the system. Whether *P.Q* is simpler than *P.R* is not a function of the simplicity of *P*, the simplicity of *Q*, and the simplicity of *R* considered individually. In fact, as Fodor (2008) states, "there is no such thing as the intrinsic simplicity of a belief" (121). This is a property of the belief system that must be evaluated considering the constituents of the system relationally in tandem.

The limit of CTM is that "Computation is, by stipulation, a process that is sensitive to the syntax of the representation and nothing else" (Fodor, 2008, 124). Fodor claims that:

> Computation as our current cognitive science understands it, is an intrinsically local process, when a computation "looks at" a representation in its domain, what it is able to "see", or to operate upon, is the identity and arrangement of its constituents. (2008, 107)

Fodor's remark reveals that CTM proposes cognitive processes which are sensitive to the local properties of a representation *X*, properties which are "*ipso facto* independent of the properties of anything except *X*" (Fodor, 2008, 107-108). As the constitutive structure of the representation is one of its local properties, the process that computes it is only sensitive to the constitutive structure of this representation. However, as we have already seen, the central processes that determine simplicity, coherence, etc., are sensitive to something other than the syntax of the representation. They are sensitive to global properties, and global properties do not supervene on syntactic properties, which are intrinsic properties. As I mentioned above, the global properties of beliefs depend exclusively on the relations between the different beliefs of a system.[15]

Fodor maintains that modular systems do not share this problem with central systems. The reason is that modules are supposed to compute representations through processes sensitive to the syntax of the representation. However, if there are non-conceptual representations in the perceptual modules, then the perceptual modules share the following difficulty presented in the case of central systems: *neither of them (perceptual modules and central systems) can be explained by CTM*. For different reasons, the processes of both the central and the modular systems are sensitive to something that is not the syntax of the representation, "which is to say that they aren't

[15] I have introduced some aspects of the globality argument, but left aside the relevance argument. I concentrate on the former because I believe that this brief exploration suffices for my present purposes. For a detailed presentation of the relevance argument, which is another refutation of a computational approach to central systems, see Fodor (2001a; 2008), Schneider (2011), and Samuels (in press).

computations in the sense of the term that CTM endorses" (Fodor, 2008, 112). It is important to bear in mind that perceptual modules include non-conceptual representations, which do not have the constitutive structure of LOT representations. Of course, these representations are processed somehow, but they are not computed in the sense of CTM.

If we delve deeper into this issue, the problem of globality does not seem to be connected to the workings of perceptual modules. I hold that processes which operate upon non-conceptual representations are not sensitive to the global properties of these representations, but are instead defined over some of the local properties of these representations. As Fodor (2008) claims, the part-whole relation is a paradigmatic local property that something can exhibit. For example, the right hand of John is a local property owned by this individual and this property is "independent of how the things in the rest of the world are" (Fodor, 2008, 108). The fact that local properties have a mereological characterization makes me think that non-conceptual representations have local properties and that processes operate upon these properties. Non-conceptual representations are characterized through the notion of "iconic representation," and iconic representations are constituted by parts.

Generally speaking, the visual system cannot register the properties of a certain image without registering parts of the image. In Section 2, I introduced a few aspects of Marr's vision theory (1982). I mentioned that, according to Marr, visual analysis takes the retinal image as its starting point; the retinal image is an array of light intensities in the visual field produced by the activity of the photoreceptors (Shagrir, 2010). It is necessary to detect the changes of these light intensities in order to extract the information of the retinal image, such as the structure of the image, object boundaries, etc. The processes that underlie the detection of changes in light intensities operate on the local geometry of the image (Marr, 1982). They process each intensity value of the array of lights locally conceived. For this reason, these processes can be said to be sensitive to the local properties of the image.

However, these processes share one aspect with the central system's processes: they do not operate upon the syntactic properties proposed by CTM. Perceptual processes are sensitive to a mereological property that is absent in the case of conceptual representations. To be sure, conceptual representations have a mereological characterization because they have constituents. Yet, "Constituents aren't just any parts of a representation, they're its canonical parts" (Fodor, 2008, 109). The local properties of non-conceptual representations are therefore not enough to consider them under the domain of CTM. This would be an absolutely pessimistic scenario for classical computationalism. It would further exacerbate the explanatory limitations of CTM. In fact, it would cancel the explanatory need of CTM, since it would not explain how perceptual modules work. Therefore, if perceptual modules only compute non-conceptual representations, CTM would then not explain how the perceptual modules work. This poses a serious challenge to Fodor's explanation of modular processes with CTM.

3.3. Non-conceptual Representations and Deflated LOT

The third horn of the trilemma refers to the possibility that perceptual modules compute non-conceptual representations jointly with other representations that are not full-blown LOT. As in the case of the first horn, two possibilities are conceivable. First, the early stages of perceptual processing may compute non-conceptual representations while the rest of the perceptual processes compute representations that are not full-blown LOT. Second, every stage of the perceptual modules could compute both non-conceptual representations and representations that are not full-blown LOT.

In this scenario, propositional attitudes would have a full-blown LOT, whereas perceptual modules would have representations that are not full-blown LOT (Aydede 2010). This difference would be a matter of degree (Schneider, 2008). The idea that certain representations do not constitute full-blown LOT could be interpreted in several ways. According to the first sense, a representation that is not a full blown LOT fails to present logical form. As a result, neither of the representations upon which the early stages of perceptual processing operate would have logical form. The reason for this is that neither non-conceptual representations nor representations that are not full-blown LOT would have the syntactic characteristics required for the logical form. They do not decompose into singular terms, predicates, etc. This hypothetical scenario would present the same difficulties found in the second horn of the trilemma, according to which perceptual modules would not fulfill the requirements of CTM. This would be an undesirable end for the classical computational explanation supported by Fodor in order to explain how the modules work.

Still, let's imagine another way to deflate the notion of "LOT." In this second sense, a representation that is not a full-blown LOT would present an incomplete combinatorial syntax and incomplete compositional semantics. First, the existence of an incomplete combinatorial syntax means that the items of this not full-blown LOT cannot be combined with certain other items. For instance, it is well established that a full-blown LOT item like HELEN, which has the syntactic function of being the head of a Noun Phrase, can be combined with another item like IS, which can serve as the head in a Verbal Phrase. However, let's imagine that the not full-blown item HELEN* does not allow this combination. Second, incomplete compositional semantics mean that there are instances in which an atomic item contributes a different meaning to the content of the complex representation. For example, a case could be conceived of in which the not full-blown LOT item HAPPY* makes a different semantic contribution in *John is happy* and in *Helen is happy*. This would not occur with the full-blown LOT item HAPPY. In spite of this, these LOT representations would have some kind of syntactic and semantic structure. Nevertheless, perceptual modules still compute non-conceptual representations, and this causes the problems of the first horn of the trilemma. A part of the perceptual modules would not be explainable in classical computational terms. Regarding this first horn of the trilemma, one might object that, contrary to what I argue, it seems that Fodor is completely aware of CTM limitations in this respect. This objector could imagine that Fodor (2008) affords the first horn of the trilemma when he states that:

> The question how (for example, by what computational processes) unconceptualized iconic representation might get 'collected under a concept' is of course, very hard; and the answer is unknown for practically any of the interesting cases. (194)

However, this quotation shows that Fodor is aware of a different limitation of non-conceptual representations. The problem of how the information of non-conceptual representations might fall under a certain concept is not intrinsically connected with the problem that, accepting non-conceptual representations, part of the perceptual modules is not explainable with CTM. How to relate conceptual and non-conceptual representations is a question that is shared by all non-conceptualists. This includes both the non-conceptualists from the computational research tradition, such as Fodor, and the non-conceptualists that do not belong to this tradition. My concern in the first horn of the trilemma is to show a specific limitation that Fodor has when we try to match his non-conceptualism with his CTM.

Thus, to conclude, if perceptual modules compute non-conceptual representations and representations that are not full-blown LOT, then this implies the same difficulties presented for the first and the second horns of the trilemma.

4. Conclusion: You Can't Have Them Both, But You Refuse to Give Them up.

In his most recent publications, Fodor (2007; 2008) seems to accept that the very early stages of perceptual processing operate upon non-conceptual representations, particularly iconic representations. The main purpose of this paper has been to show the tension between his defense of non-conceptual representations and his traditional adscription to CTM. If Fodor supports CTM and states, as he has in the past, that the explanatory success of CTM is related to the modules, then he has to abandon the notion of "non-conceptual representation" in the case of modular perceptual processing. These representations cannot be used for a classical computational explanation. His computational approach requires representations with properties that he believes non-conceptual representations do not possess. At the same time, if Fodor defends the existence of non-conceptual representations, he would be forced to reject CTM.

Some may think that the tension between the notion of "non-conceptual representation" and CTM only appears when we consider iconic representations to be pictures. As I stated in note 9, Fodor (2008) assumes that pictures are paradigmatic examples of iconic representations. My reading of what iconic representations are follows Fodor's assumption very closely.

However, pictures are not the only examples of iconic representations. For instance, Fodor (2008) also admits that "graphs are icons according to [his] usage" (174). As there exists literature on whether non-conceptual representations can have the structure of maps (Camp, 2007), it is worth considering whether Fodor's iconic representations could be conceived as maps. Is the appeal to some such notion of "iconic representation" compatible with the possibility of CTM?[16] I believe that if Fodor considers iconic representations to be maps he is not in a better position. My opinion is that maps present the same difficulties as pictures for explanation in classical computational terms. In what follows, I want to briefly present my reasons.

According to Camp (2007), cartographic representational systems (e.g. maps) are constructed from discrete formal elements that are combined according to combinatorial principles. The formal elements used in maps are "quite indirect and arbitrary" (Camp, 2007, 158). For example:

> On many maps any solid line of a certain width signifies a street, any blue line or blob signifies a river or lake, any cross signifies a church […], four-lane highways [are represented] with a red line, state capitals with a star, and cities by their names. (Camp, 2007, 154-158)

Since maps exploit an isomorphism of spatial structure with their represented domain, their formal elements are combined following "principles of spatial isomorphism" (Camp, 2007, 158). Further, the representational importance of the entire map is a function of the way in which those elements are spatially combined. For example:

> If two lines intersect, with a blob in one quadrant and a cross in the other […] then this represents two intersecting streets with a church across from a pond. By contrast, if the two lines are drawn in parallel, with the cross above the blob […] then these same elements represent a different but related situation, in which a church is north of a pond and between two parallel roads. (Camp, 2007, 154)

[16] Thanks to one of my referees for pressing this worry.

This leads us to the idea that maps do not have the properties of LOT language-like representations required by CTM. It is true that the fact that the formal elements of maps are combined following principles of spatial isomorphism means that maps have a mereological characterization in which parts of the representation can be found. However, this mereological characterization is not enough to consider maps as having the constitutive structure of LOT representations. Just like pictures, cartographic representational systems show a kind of part-whole relation that is absent in the case of LOT language-like representations. They show a part-whole relation in which it is relevant to relate the elements with a spatial criteria (e.g. *X* is north of *Y*, *X* crosses *Y*, *X* is in parallel to *Y*). In this part-whole relation, it would be difficult to consider the formal elements as canonical constituents. If formal elements of maps were canonical constituents, there would be hierarchical relations between them that would permit predication. Nevertheless, talking about maps' icons, Camp (2007) states that "one couldn't legitimately introduce icons with predicative force, to represent properties like *being happy, being bald, or loving*" (166). This means that the icons used in maps are not canonical constituents that enable the maps to express predicative relations. Without canonical constituents, cartographic representational systems are far from replicating the property of having logical form presented in LOT language-like representations. It is important to remember that the logical form of LOT representations expresses the hierarchical relations between the canonical constituent of that representation. Without such characterization, maps, like pictures, would not be explainable in classical computational terms. In summary, even if we interpret iconic representations as maps, there would still be tension between this kind of representation and CTM.

The problem is that Fodor would like to keep both the notion of "non-conceptual representation" and CTM. He would like to keep CTM because he considers that classical computationalism is the best option for a psychological explanation (Fodor, 1968). On the other hand, he would like to keep iconic representations because he believes they fit with the empirical data concerning the workings of the early stages of perceptual modules (Fodor 2007; 2008). However, to keep both of these notions, Fodor is forced to impose some change on his theorization. One option would involve modifying his notion of "computation" to accept that algorithms can operate on representations which are not language-like. This is perfectly true when we focus on the notion of "algorithm." As Piccinini (2012) defines it, "An algorithm is an effective, step-by-step procedure that manipulates strings of symbols and generates a result within finitely many steps" (20). According to Piccinini (2012), an "algorithm" is an inclusive notion that does not require that the vehicles being manipulated be language-like. Another option would be to rework Fodor's notion of "non-conceptual representation" assuming that these kinds of representations have the characteristics of the language-like representations. Neither of these possibilities is an easy fix. Fodor (2001a) admits that coherence is not a real virtue. Still, I believe that Fodor would be hard-pressed to respond to the difficulties evidenced by the trilemma.

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