How do metaphors shape thought in the wild?

Como as metáforas influenciam o pensamento na sociedade?

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Abstract: This paper examines the theoretical and empirical claims, as put forth by Lakoff and Johnson (1980) and extended by others, that metaphor shapes thought. We discuss how Lakoff and Johnson's original claims about metaphor and thought, particularly characteristics of experimental studies, and the lack of a general theoretical model to make sense of empirical findings, all contribute to misconceptions about how metaphor affects thought. We review key experimental results, explore different interpretations, and present a dynamical model to illustrate how metaphor may affect reasoning. We assume that (i) reasoning is susceptible to multivariate (nonlinear) constraints, including those of metaphors, (ii) metaphors are a variate group, and that (iii) meaning is always contextual, as opposed to being instantiated as abstract conceptual mappings. In this context, we emphasize the need for caution about any generalization involving metaphor theory and experimental evidence to society at large.

Keywords: Metaphors; Cognition; Framing; Psycholinguistics; Society.

Resumo: Este artigo examina as afirmações teóricas e empíricas, apresentadas por Lakoff e Johnson (1980) e estendidas por outros, de que a metáfora molda o pensamento. Discutimos como as afirmações originais de Lakoff e Johnson sobre metáforas e pensamento, características particulares dos experimentos e a falta de um modelo geral para dar sentido às descobertas contribuem para mal-entendidos sobre como as metáforas afetam o pensamento. Além disso, revisamos importantes experimentos, explorando interpretações alternativas, e apresentamos um modelo dinâmico para ilustrar como as metáforas afetam o raciocínio. Ao tomar a posição de que (i) o raciocínio é suscetível a restrições multivariadas (e não-lineares) e as metáforas são uma delas, (ii) as metáforas são um grupo variável, (iii) o significado é sempre contextual, em oposição a ser instanciado em algum mapeamento conceptual abstrato, queremos enfatizar a necessidade de ter cuidado com qualquer generalização a respeito de metáforas a partir de teorias e experimentos para a sociedade em geral.

Palavras-chave: Metáforas; Cognição; Enquadramentos; Psicolinguística; Sociedade.

1. Introduction

In 2013, Al Vernacchio presented a Ted talk[2] pointing out how American metaphors about sex are based on analogies with baseball that highlight competition, where winners are generally men, and losers are generally women. Al Vernacchio proposed that we need a healthier way to think about sex and suggested we conceptualize it through the lenses of a novel metaphor, i.e. sharing pizza, whereby the competition frame is exchanged for that of mutual satisfaction. There are, in fact, at least ten Ted talks in which speakers urge us to change the

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[2] Available at: https://www.youtube.com/watch?v=xF-CX9mAHPo&t=1s (access in June, 2021).

metaphors we use to talk about important social issues. The academic literature is also filled with papers that cover the potential negative effects of metaphors in reasoning and behavior. Some go so far as to suggest that switching metaphors may help remedy social problems (LANE *et al.*, 2013; BEHUNIAK, 2011; GEORGE; WHITEHOUSE, 2014; NGATCHA-RIBERT, 2004). A recent example of the urge to change metaphors has been captured by the project "reframing covid[3]", in which authors propose we stop using War metaphors to communicate about the pandemic.

The idea that metaphors shape thought is controversial. It was famously suggested by Lakoff and Johnson (1980) and Lakoff (2004) and criticized by different scholars (PINKER, 2006; SCOVEL, 1991; WALKER, 2012). Regardless of its critics, metaphor effects on thought remains a major topic in Cognitive Linguistics and Psychology, as well as in the social sciences in general, because it raises the questions: when do metaphors affect our thoughts without our being aware of them? What are the consequences (to individuals or societies)? Should we change our metaphors? We believe that the admiration, skepticism, and puzzlement regarding metaphors and its role in reasoning derives from the fact that we do not (as far as we know) have an academically shared model of what metaphoric framing effects are and of how it relates to the literature, particularly, to Lakoff and Johnson's theory. Thus, our main goal in this paper is to suggest a model and discussion of how metaphors shape thought.

In this paper, we: (i) review some key aspects of the history behind the claim that metaphor shapes thought; (ii) discuss key psycholinguistic experimental evidence that metaphors shape reasoning; (iii) present two models of reasoning to help make sense of metaphor's role in reasoning; and, lastly, (iv) discuss some controversial questions that permeate the social sciences literature.

2. What theories predicted

Conceptual Metaphors (CMs) are metaphors that are entrenched in culture and, as claimed by Lakoff and Johnson, in our cognitive unconscious. CMs are systems of cross-domain mappings that are assumed to be automatically and unconsciously activated when we process metaphors that are based on (or consistent with) these systems (Lakoff 1993). There are thousands of systematic schemas ("in the conceptual system") that underlie everyday metaphoric expressions ("in linguistic outputs"). For example, the expressions "This

[3] Available at: https://sites.google.com/view/reframecovid/. Access in: June, 2021.

relationship is going nowhere", "We are spinning our wheels", "Our marriage is on the rocks" are all instantiations of the conceptual metaphor LOVE IS A JOURNEY, which comprises cross-domain mappings whereby LOVERS ARE TRAVELLERS, RELATIONSHIP IS A VEHICLE, DIFFICULTIES (IN THE RELATIONSHIP) ARE OBSTACLES (IN THE JOURNEY) and so on (cf. LAKOFF, 2008).

When Lakoff and Johnson (1980) proposed that metaphors structured thought and influenced behavior, it was a controversial claim (GIBBS, 2011; 2017). At the time, the core discussions centered around whether conceptual metaphor provided structure to abstract concepts that would not otherwise have much content. It was assumed that abstract concepts were almost entirely composed of conceptual metaphors, i.e., fixed and enduring projections from more familiar, structured, and concrete domains of knowledge to less familiar, less structured, and more abstract domains[4]. As Sauciuc (2013, p. 244) synthesized:

> CMT posits that only a few basic domains and concrete concepts emerge directly from bodily experience: e.g., spatial orientation, containment, force, and temperature. All abstract concepts – including emotion concepts – are indirectly grounded in these basic domains by sets of enduring metaphorical mappings, whose purpose is to assist understanding the more abstract concepts in terms of the more concrete ones. (KÖVECSES, 2000, p. 4)

Lakoff and Johnson's (1980) claim that metaphors shaped (or "determined") thought was predicated on the idea that metaphors were a large part of what our concepts were, thus metaphors were the lenses through which we saw the world. Metaphors shaped thought because they were believed to be the very structure that supported our thoughts about abstract issues:

> Since much of our social reality is understood in metaphorical terms, and since our conception of the physical world is partly metaphorical, metaphor plays a very significant role in *determining* what is real for us (Lakoff & Johnson 1980 p. 147 italics ours).

This idea is also mentioned by Goatly (2007, p. 4), even though the author later explains that he believes that language predisposes thought (i.e., does not determine it):

> [...] language is not some transparent medium through which we think, but that it shapes our thoughts and practices. So the conventional metaphors in the discourses of race, sex, politics, defence, economics, environment, and so on, tend to determine our ways of thinking/ consciousness and acting/practice in these social spheres.

[4] The definitions of metaphors changed with time (see LAKOFF, 2008; GIBBS, 2017).

The strong view that metaphors were almost entirely responsible for our abstract concepts has been extensively criticized (MURPHY, 1996; SAUCIUC, 2013; BUNDGAARD, 2013, 2019). Today, research in abstract and concrete concepts abound, and we know that these concepts comprise much other rich knowledge beyond metaphors (DESAI *et al.*, 2018; BORGHI *et al.*, 2018; DAVIS et al., 2020; SIMAN; FIGUEIREDO, in press). Moreover, the idea that metaphors shape thought is often speculative and biased by the author's own ideology. For example, Goatly suggests that the metaphor "I don't buy that idea" conveys a latent ideology that ideas are things that we can buy according to our needs and desires. A different analysis would suggest that people use this metaphor because they have gone through the experience of being deceived by a salesperson who tried to make them buy a useless product as if it were good, thus, when people see that an idea seems suspicious, they may choose to not "give credit" to it, in order not to be deceived.

Metaphors probably do not determine what is real for us, although the claim that metaphors play a significant role in cognition is well supported by the empirical literature (GIBBS, 2017). Arguably the most important claims in Lakoff and Johnson's theory are: (i) that our embodied experiences bias the way we understand some aspects of abstract (and concrete) experiences (e.g. part of our understanding of TIME recruits the conceptual metaphor TIME IS A MOVING ENTITY, e.g. BORODITSKY; IMAI; GENTNER, 2002); (ii) some metaphors are systematically related (e.g. "She **attacked** my argument", "I **defended** my argument); (iii) metaphors are not merely rhetorical or poetic figures; they comprise a cognitive phenomenon that likely affects reasoning.

According to Conceptual Metaphor Theory (LAKOFF; JOHNSON, 1980), conceptual metaphors were expected to shape thought because they were fixed and determinant systems. Today, some authors endorse the claim that: "Conceptual metaphors should probably be seen as cognitive tendencies, rather than systematic and coherent structures that fully govern the semantics of a group of lexical items" (SVANLUND, 2007; GIBBS, 2017). Variations in the construct of conceptual metaphors are also emphasized:

> The generality at which implicit metaphors can be identified, and the family of metaphors to which a particular expression belongs, may therefore be indeterminate. Different individuals may interpret the same expression according to different implicit metaphors and derive different entailments. This possibility does not imply that conceptual metaphor theory (CMT) is circular or untestable. Nonetheless, there may not always be singular correspondences between specific verbal metaphors and particular underlying conceptual metaphors. (GIBBS, 2017, p. 115)

Another influential idea is that metaphoric framing (LAKOFF, 2004) - which is the choice of metaphor in the ongoing discourse, as opposed to fixed metaphors in the mind determining thought - can significatively and unconsciously shape people's thoughts, affecting, among other domains of experience, the course of politics. Both conventional and novel metaphors are expected to influence how people reason about political issues (i.e., the scope of analysis is not merely the "metaphors we live by", which are engrained in our thoughts and cultures, but all metaphors). In *Don't think of an Elephant*, Lakoff (2004) suggested that a metaphor used by right-wing politicians, such as "Tax Relief", could sway public opinion. The reasoning was that the public would make the inference that anyone who advocates for taxes is evil, and those who propose to decrease taxes are heroes, for unloading the "burden" of taxes from the taxpayer (i.e., "tax relief"). Lakoff goes as far as to suggest that left-wing politicians should reframe the debate and use an alternative metaphor: taxes are membership fees, which we must pay to use the amenities of our country, such as good roads, public spaces, etc.

Pinker (2006), among others, has criticized Lakoff's claims:

> The upshot is that people can evaluate their metaphors. In everyday conversation they can call attention to them, such as the deconstruction of the "time is space" metaphor in the African American snap "Your mama's so dumb, she put a ruler on the side of the bed to see how long she slept." And in science, practitioners scrutinize and debate whether a given metaphor (heat as fluid, atom as solar system, gene as coded message) accurately captures the causal structure of the world, and if so, in which ways […] Finally, even if the intelligence of a single person can be buffeted by framing and other bounds on rationality, this does not mean that we cannot hope for something better from the fruits of many people thinking together—that is, from the collective intelligence in institutions such as history, journalism, and science, which have been explicitly designed to overcome those limitations through open debate and the testing of hypotheses with data.

There are many reasons why Lakoff's claims elicit skepticism. For example, given the notable complexity and dynamism of the political and social spheres (CHOMSKY, 2013), it is difficult to see how metaphors can have an impact on the multivariate course that stretches through time leading to a political outcome. Lakoff's claim (2004) seemed to imply that the reason right-wing politicians were popular was (in significant part) explained by the fact that they used metaphors to sway public opinion, and that a change of metaphors could help left-wing politicians. Could metaphors help shape the course of politics? How do metaphors interact with previous beliefs, knowledge, and ideologies? If we consider all the factors that may interact with metaphors in the wild, would metaphor still be relevant enough? Conceptual Metaphor Theory has never predicted anything about the conditions under which metaphors are likely to

shape thought as opposed to being resisted (GIBBS; SIMAN, in press) or ignored. Before we offer some considerations on those questions, let us first consider some evidence that metaphors, indeed, shape thought.

3. What experiments show

There are many experiments that support Lakoff and Johnson's Conceptual Metaphor Theory (see GIBBS, 2017 for a review). Experimental evidence suggest that it is plausible that (i) conceptual metaphors are part of our conceptual system, even if they do not constitute most of our abstract concepts (as we have discussed in the previous section); (ii) conceptual metaphors affect how metaphors are processed, but not always (THIBODEAU; DURGIN 2008; MCGLONE, 2007; MILLER *et al.*, 2020); (iii) metaphors affect reasoning under very specific conditions (see below); and (iv) the effects of metaphors on reasoning are not exclusive to conceptual metaphors, but extends to analogies in general (e.g. THIBODEAU; BORODITSKY, 2011; GENTNER; GENTNER, 1983).

The tests of how metaphors affect reasoning have some similarities. Scientists present participants with texts about a subject (e.g., crime). The texts are almost the same in every condition, except for the metaphors: each condition has a metaphorical framing. That is, they have the same base (e.g., crime), but different vehicles (e.g., beast vs. virus). For the experiment to work, participants need to understand the implied analogy. They need to understand that when we say that "crime is a beast", we mean that the crime situation is (possibly) dangerous, out of control, aggressive, in need of authorities to contain it. On the other hand, when we say that "crime is a virus", we emphasize (possibly) that crime is spreading from person to person, and in need of social action, conscientization, remedy. Participants must (unconsciously) understand some of the implications of these analogies, as they reply to questions about the text they have just read (e.g., what recommendations would they make to stop crime). Experiments show that participants reply in a metaphor-consistent way. That is, in the "beast" condition, they tend to suggest (consistently with the metaphor) more punitive measures ("Lock up criminals"), and in the "virus" conditions, they tend to suggest preventive measures ("invest in educational programs") (see Thibodeau & Boroditsky 2011).

Experiments using metaphoric framing are an effective way of showing that people can respond to metaphors by working out the implicit analogies. But how well do these findings illuminate real-world possibilities? An experiment's ecological validity might be questioned because experimental stimuli (texts) are tailor-made to produce effects – if we add more

information to the text or change information in the text or the world, we can no longer be sure how participants will behave upon encountering the same metaphors.

For instance, Hart (2017) found that metaphors could shape thought, but not when participants had a conflicting source of information. In their experiment, participants read a text about a civil disorder that was framed with "fire" metaphors. Participants were more likely to support police use of water cannons in response to social unrest when they read a text with fire metaphors than when they read a text with the same information but no fire metaphors. However, when the same texts were presented with an image of civilians that suggested their actions were not so threatening, participants were not influenced by fire metaphors. Thus, when participants were exposed to images (photos) that contradicted what the metaphor (text) suggested, the evidence suggested their thoughts were not shaped by metaphors. But is it the case that having a conflicting source of information will always win over metaphoric description? What counts as a conflicting source of information for different people along the ideological spectrum (regarding different subjects) may well be very different in the wild, as opposed to in the lab (considering the few interacting constraints we can test in the lab).

Elmore and Luna-Lucero's (2017) research on the interaction between metaphor and beliefs/stereotypes produced some enlightening evidence. In their experiment, the authors found an interaction between metaphors about seeds or light bulbs and beliefs about the quality of women's and men's inventions. When an idea was described as a light bulb (implying suddenness and genius) and was attributed to a woman, participants rated the idea as less genius-like than when it was attributed to a man. When the same idea was described as a seed (implying long processes and effort "to grow") and was attributed to a woman, participants rated the idea as more genius-like than when it was attributed to a man. This suggests that there is an interaction between metaphors and stereotypes (or beliefs about women and men in science), since, apparently, it is believed that a woman's idea can be genius-like if she develops them during a long period of time (seed), but not if she has a sudden insight (light bulb). On the other hand, men's ideas appeared to conform to the stereotype of genius only if they occur suddenly (light bulbs), but their ideas seemed unimpressive if they needed to develop over time (seed). Thus, the very same metaphor yielded the opposite effect when a small change was made, in this case, the sex of the scientist to which the metaphor alluded. But is it always the case that metaphors will interact with beliefs about gender? Or might it be the case that different metaphors have different "interactive profiles"?

Hart (2021) suggests that hyperbolic metaphors, such as calling immigrants a "plague", are resisted by participants who do not find the metaphors appropriate. But are they resisting

the metaphor out of moral obligation? Could these metaphors impact their thinking under other conditions that were not met by the experiment? For example, the same experiment (in which participants either read a text that compares immigrants with a plague or a text with no such a metaphor) could be followed up by a question related to how much money participants thought the government should allocate to helping immigrants. If participants who were exposed to "plague" metaphors suggested spending less money on immigrants than participants in the control condition, we would be capturing a metaphoric framing effect that is more subtle. The psychological literature is full of examples of the discrepancy between what people consciously say, and what they unconsciously do (cf. GIBBS; SIMAN, in press). We might expect that a metaphoric effect is essentially the process by which metaphors scaffold reasoning, but metaphors have other dimensions, like valence, that can bias thought independently of structural effects.

Experiments are different in several ways. Some studies about metaphoric framing effects use texts and images (reinforcing the metaphors, for instance), others use only texts; metaphors are of different types (conventional, novel, etc.) in different experiments; metaphors are displayed in different positions in the text and different numbers. Sometimes it is rather unclear if all metaphors in an experiment are equally contributing to the effect or if there are specific metaphors that are responsible for the effect. For instance, in Hauser and Schwarz's (2015) experiment, it is possible that the metaphor in the question alone is the key to producing the effect, with the other metaphors in the text being less relevant. In short, experiments create optimal conditions for metaphors to shape thought, and there is no evidence that the effects they produced would be reproduced under modified experiments, much less in the wild, where we have contrasting sources of information and real consequences to consider.

Paying attention to these issues can help us develop a better sense of how situations build up around metaphors to create an effect. We must realize what conclusions we can derive from experiments (and from theories) if we want to effectively interfere with metaphor use in society (i.e., recommend the use of one metaphor over the other, e.g., HAUSER; SCHWARZ, 2016). There are still many questions we can ask regarding what metaphors may shape whose thoughts about what issues and under what circumstances. In this section, we have emphasized that there can be no deterministic generalization about metaphors, because metaphoric effect and meaning are subject to the "interactive" context in which they emerge.

4. A model for reasoning

In section 2 and 3, we discussed the claim that metaphors shaped thought and how it has evolved from the original theory (e.g., LAKOFF; JOHNSON, 1980) – where metaphors were argued to determine thought – to the experimental literature (e.g., THIBODEAU; BORODITSKY, 2011; FLUSBERG *et al.*, 2018) - where metaphors are said to bias thought, given specific conditions. Again, interactions are key. The role of metaphor in shaping reasoning would be especially controversial if authors were claiming that metaphors, as a fixed entity, had a determinant role in shaping reasoning. Dynamical systems theory offers a potentially more productive framework to understand the behavior of metaphors (THIBODEAU *et al.*, 2019). From this perspective, metaphors play a probabilistic role in reasoning (GIBBS, 2017; 2019), which means that depending on contextual variables, metaphors may have either a strong effect, a small one, or no significant effect. Experiments must continue to explore what variables are relevant and in what contexts.

Currently, we have no models to account for the differing interactive factors that constrain our metaphoric reasoning. To make progress in this direction, this section presents two ways to envision a model for metaphoric framing effects. Both models are supposed to account for the probabilistic and interactive nature of reasoning. Computational models help us focus on fine-grained cognitive phenomenona. Complex systems models help us focus on how behavior is, in fact, constrained by different factors in different timescales. It is important to keep in mind that no model is complete.

Kruglansky *et al*. (2007, p. 272) use the notion of "judgmental parameter" to propose a judgment model with several variables intersecting at some of their values in each judgmental instance. Their model can account for different parameters that could influence or bias reasoning, and that are weighted contextually and individually:

> As presently conceived, the judgmental parameters constitute quantitative continua whose specific values are determined by diverse factors: A given informational stimulus may afford a strong inference because its perceived relevance was innately ''wired into'' the human perceptual system, because such relevance was learned over repeated experience (Neal *et al.*, 2006), or because it was derived from highly regarded ''epistemic authority'' (Kruglanski *et al.*, 2005), and so on. Similarly, task demands could be multiply determined by informational complexity, signal to noise ratio, ordinal position, or perceptual modality. Cognitive capacity could be determined by rule accessibility, in turn affected by the recency or frequency of its activation (Higgins, 1996), and/or by cognitive capacity determined by cognitive load, fatigue, and depletion occasioned by prior pursuits (Baumeister *et al.*, 2000).

> Motivation could be determined by expectancies and values attached to a variety of judgmental outcomes and processes, for example to the cognitive activity itself (Cacioppo & Petty,1982), to cognitive closure (Kruglanski, 2004; Kruglanski & Webster,1996), accuracy (Funder, 1987; Kruglanski, 1989), accountability (Tetlock,1985), impression management (Chaiken *et al.*, 1989), ego enhancement (Kunda, 1990), and so on.

Kruglansky *et al.* (2007) also assume that judgmental parameters are orthogonal and that their values derive from largely independent determinants. This means that the subjective-relevance of information may derive from a prior forging of conditional IF-THEN links between informational categories. Also, the authors explain that the magnitude of processing motivation may derive from various goals that persons might have; task demands may depend on the nature of the problem posed; and the stimulus context and cognitive resources may depend on rule accessibility and cognitive business, all representing very different concerns. This is a model that highlights that judgments are multivariate and context-sensitive. Besides, we would like to add that values are not fixed, but change in relation to one another in context. This is what allows humans to exhibit rich kinds of behaviors.

By using this parametric system to understand experiments on metaphors, we suggest that what experiments do is an attempt to downplay (or weigh down) all the competing variables that could enter participant's judgments configurations, so that what will stand out is the metaphor. Thus, it is never the case that experiments find that metaphors shape thought in a given portion of the population about some subject – it is rather the case that metaphors offer analogical implications, that will be derived (if participants have the proper semantic knowledge) and used by people unless some other variable interferes with it. What counts as an interfering variable depends on the context, on what participants think they are doing, their beliefs, other sources of knowledge, etc.

Moreover, success in identifying an important variable does not mean this variable is always relevant. Findings can be counteracted provided the right conditions are met. For instance, Thibodeau and Boroditsky (2011) found that metaphors influence reasoning when they are at the beginning of a text, but not at the end. But Robins and Mayers (2000, study 3) found that metaphors at the end of the text work just fine. It seems that the difference between the two studies lies in the function of metaphors. In the first case, the metaphor at the end of the text had a wrap-up function, perhaps, it was not perceived as an argument. In the second case, the metaphor at the end of the text was a character's reply, which counted as central information for the activity proposed in the experiment.

In short, we are arguing that people can infer cross-domain mappings, especially during off-line judgment tasks – which is not the same as saying that cross-domain mappings and inferences are realized every time one reads a metaphor (cf. STEEN, 2017; BOWDLE; GENTNER, 2005; GLUCKSBERG *et al.*, 1997; MILLER *et al.*, 2020). Moreover, metaphors may influence reasoning, but under very specific conditions, and experiments do not reflect the full range of dynamics that metaphors exhibit as part of our daily lives. Metaphors shape thought, but not just any metaphor, and not in just any context.

This understanding is implied by some scholars, but it is not often discussed. Thibodeau *et al.* (2017, p. 860) state that:

> One important consideration in attempting to quantify the influence of metaphor on reasoning is the laboratory environment, which may artificially constrain (or inflate) such estimates. [...] Experiments are often designed to answer specific questions about how metaphors influence language processing, memory, or inference; as a result, they are carefully constructed to, for example, minimally instantiate the metaphor. In the real world, metaphors are often extended and supported in ways that might make them more (or less) influential. Future work may seek to establish a more ecologically valid way of estimating the effect of metaphor by using more realistic stimuli.

It is important to contrast what experiments show with any categorical or deterministic claims about metaphors. It is also important to acknowledge this discussion in the face of claims that stand out as carrying a different message, such as: "Metaphoric thinking exerts a significant and far-reaching influence on consumer thought and behavior" (LANDAU *et al.* 2018, p. 54) or:

> We find that exposure to even a single metaphor can induce substantial differences in opinion about how to solve social problems: differences that are larger, for example, than pre-existing differences in opinion between Democrats and Republicans. (THIBODEAU; BORODITSKY, 2011, p. 1)

With these excerpts, we point out a discrepancy, on the one hand, in how we frame the importance of metaphors and findings, which seems to imply that framing effects are quite significant for society (instead of being significant under experimental conditions), and, on the other hand, what experiments suggest, which is a dynamic, multivariate phenomenon (relationships with society are not so clear yet). When excerpts like these are added to the classic background about conceptual metaphors, they imply that we must stop using one metaphor or

another, or that we can solve social problems by changing metaphors (see discussion in the next section). We need to reach a more complex understanding of metaphor's role in reasoning.

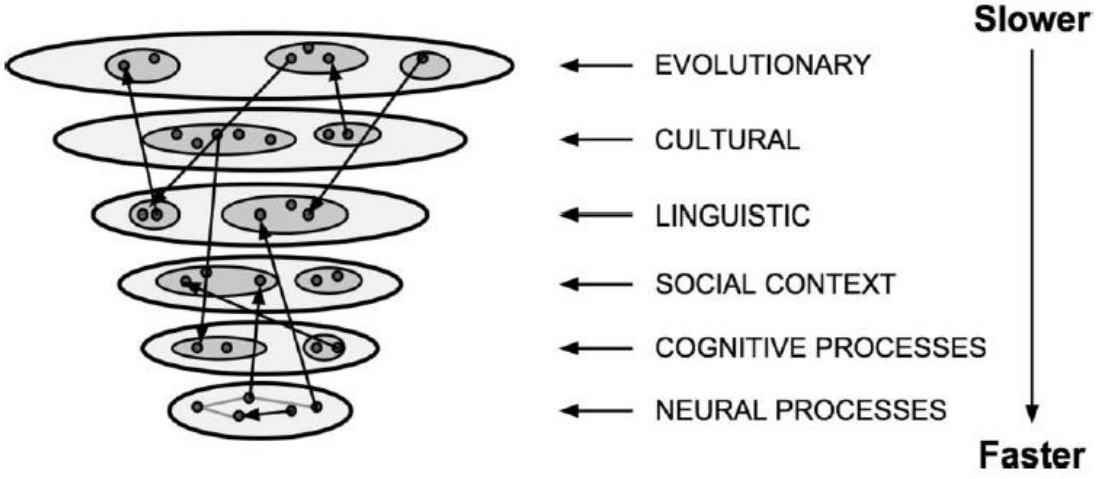
The first model we have introduced is based on the classic (computational) sciences. We hoped that by presenting it, scholars may start to consider how the interplay of factors can be accounted for in our theorizing about metaphoric framing effects.

Let us consider now how to model metaphoric framing effects using a background in complex systems science. This model would have to contemplate multiple timescales that affect reasoning, as people's judgments are self-organized in real time. Every behavior is caused by multiple factors that extend from evolutionary time to development, to what has just happened in the context people are in, to the experiences they had days earlier, etc. A real explanation involves considering all the interdisciplinary knowledge we have about the phenomena we study. As Sapolsky (2017, p. 18) says:

> […] it is impossible to conclude that a behavior is caused by a gene, a hormone, a childhood trauma, because the second you invoke one type of explanation, you are de facto invoking them all. No buckets. A "neurobiological" or "genetic" or "developmental" explanation for a behavior is just shorthand, an expository convenience for temporarily approaching the whole multifactorial arc from a particular perspective.

We can extend Sapolsky argument to say that every time one is evoking a "linguistic", or a "psychological" or a "cultural" or a "social" or a "evolutive" explanation for any cognitive phenomenon, they are de facto invoking everything at once – there is no separation and no precedence of one type of explanation over the other. In this sense, every time one reads a metaphor, the type of behavior that they engage in (e.g., thinking or making decisions that may be affected or not by the metaphor), is the result of the self-organization of multiple probabilistic and mostly non-deterministic factors. Discussing all these factors is beyond the goal of this paper (but see GIBBS; SANTA CRUZ, 2012; GIBBS, 2013).

Figure 1: "Multiple Interacting time lines" (GIBBS; SANTA CRUZ, 2012, p. 304)



In fact, as Gibbs (2017, p. 15) points out: "[...] conceptual metaphors may be emergent products of multiple, nested factors (i.e., biological, historical, cultural, social, cognitive, and linguistic), and may interact with many knowledge sources and experiences to create context-sensitive, task-specific metaphoric behavior". Not only does conceptual metaphor emerge from multiple factors, but so does reasoning.

The point of complex systems thinking is that we are generally dealing with phenomena that are much more complex than our minds or computers can adequately model. Thus, we end up making choices regarding what goes in and out of our models. A complex systems' model, in contrast with classic models, would have to be holistic, specifying how behavior (e.g., metaphoric framing effects) can emerge from the interaction of factors that are embodied, contextual, social, biological, evolutionary, etc. Not being able to account for the entire model, choices are made to accomplish useful goals (cf. SMALDINO, 2017), for example, gaining insight on how to best approach a complex social phenomenon.

5. Metaphoric reasoning in the wild

Metaphors in the wild are somewhat different from metaphors in experiments. For one thing, metaphors in the wild are not followed up by a question or a need to make a judgement. Moreover, metaphors in the wild may involve many different variables that are not present in the experiments and that might render metaphors ineffective.

It is important to make clear what we mean when contrasting the laboratory and the wild – or social contexts written large. There are experiments on some topics that are very suitable to real life situations, meaning that what happens in the wild is not so different from what

happens in the lab (e.g., GIBBS; VAN ORDEN, 2012). But this is by no means always the case (e.g., SMITH *et al.*, 1999). When we talk about metaphors in the wild, we have to acknowledge that (i) people are exposed not to one metaphor in a text (e.g., a War metaphor in a Newspaper), but to many metaphors (e.g., Journey, Fire, etc. metaphors in different texts); (ii) different events may unfold from the time a person reads a metaphor to the time she makes a judgement; (iii) external factors might interfere with the judgement (e.g., even if a person was influenced by the metaphor, she might discuss the subject with someone else, or engage in other activities that might counteract the metaphoric effect); (iv) (most/some) people might not always read metaphors for interpretation in the wild, but merely skim through; etc. These points are important insofar as we want to establish what role metaphors may play in shaping the course of an event (e.g., a candidate winning the elections).

At this point, there is no clear understanding of how metaphors operate in society. There is no way of predicting how society (or anybody) will respond to metaphors. To begin to understand this problem, we might have to consider the many timescales and dimensions of meaning a metaphor may have. Some of them are:

(i) The timescale of interactions: at this timescale, a person either produces or comprehends a metaphor. Situated in a task, the listener may either fully process a metaphor (i.e., interpretation) or not (in the last case, no effect is supposed to arise). The speaker may also produce a metaphor that they choose to commit to (i.e., seeing the situation X as if it were Y), but in any case, as situations can change with time, so can the speaker's commitment to the metaphor.

(ii) Larger timescales (cultural, historical, etc.): At larger timescales, a metaphor can be recurrent and culturally entrenched, so it may have the effect of being strongly and readily available and have cultural significance. This is what happens with War metaphors as applied to diseases. War metaphors seem more appealing, emotionally engaging, and useful to describe diseases than intellectually crafted alternative proposals (SEMINO, 2020; MITCHELL, 2020). This commentary, we must insist, is not deterministic, but is meant to suggest that as much as novel metaphors may be semantically appealing, conventional metaphor has a history with multiple dimensions of psycho-social significance. And they are always there at "cognitive reach".

(iii) From shorter to longer timescales: Novel metaphors might be used once, by a few people, during a short time. Or they might be used frequently, by many, and enter our cultural shared background of metaphors, or our semantic memories (cf. BOWDLE; GENTNER, 2005). What makes a metaphor enter our collective cultural backgrounds? Here is what the answer is

not: sheer repetition (PINKER, 2006). If society is a self-organized system, asking people to stop using a metaphor that they are biased to use and change it for a random metaphor, does not seem to be the best option as well (not that language and conceptual change cannot happen by overt agreement, but most of the time, change does not take place by following a central command) – but then again, this is not deterministic (since even the mere fact of proposing a change is contextual and interacts with many factors). A reasonable answer is that novel metaphors that enter the cultural system are those which capture people's worldview and values. What we mean is that one does not need to persuade people to say that "Alzheimer's disease is a tragedy" – the analogy is trivial for anybody who shares the values of a western society. However, one would encounter obstacles in persuading people that Alzheimer is not a tragedy, but a "teacher who teaches us that forgetting is a part of life". Novel metaphors that capture hegemonic experiences prevail. If this is so, what we need is not a change of metaphors, but a change of society, so that our collective experiences can change enough to accommodate a different type of novel metaphors.

Do not change the metaphors, change the (social) system is an argument consistent with complex systems science (FISHER, 2017, p. 27):

> Planned economies have a dismal record. Attempts to alter ecological systems for our own benefit have sometimes proved disastrous, as when the Hawaiian cane toad was introduced into Australia in an attempt to control the destructive cane beetle, only to prove itself to be the much more destructive agent itself. Attempts to set up planned utopian societies have almost inevitably ended in failure. If we can't easily foresee the consequences of our actions in complex situations, should we not simply leave the situation alone and watch what develops? The argument, cast in mathematical form by Wolfram (1984), has a beguiling appeal, especially if it appears that any action we take has an equal chance of improving the situation or making it worse, and that there is nothing else that we can do. But often there is something else that we can do, in principle at least. We can change the system.

In the beginning of this paper, we introduced a social problem: American society is sexist, and this is captured in the baseball metaphor used to talk about sex. Will suggesting new metaphors counteract thousands of years of culturally ingrained sexism? There are two outcomes that are more likely to happen every time we attempt to change language or metaphors: (i) nothing changes (i.e., changing the word "idiot" for "person with mental retardation" becomes a matter of fashion; prejudicial people will continue being prejudicial, and we will be forced to pick another name to label the mental condition ad-infinitum). Up to this point, of the many new metaphors suggested by scholars to reframe numerous issues, we

can hardly estimate their benefit; (ii) it starts a social turmoil: that is, every time we propose linguistic changes, they become ideological disputes – because language choices, especially in the case of metaphors, are interrelated with ideological viewpoints. What is the solution then? Change the system. It is not the point of this paper to discuss how to change society, but a cognitive change would start with having more women in powerful roles, so that our unconscious mind picks up on different patterns.

The investigations over how metaphors shape people's thoughts are in their infancy and many questions remain to be answered. Up to now, no study has been able to clarify how metaphors could have impacted an actual societal problem. When we consider how metaphor might be shaping people's thought in society, it is important to note that even if everything seems to point to a metaphoric influence, a question would remain. Has the metaphor influenced people (e.g., people who were undecided about a subject), or were the people who were already thus inclined only further supported by the metaphor?

6. Final considerations

In this paper, we discussed how Lakoff and Johnson's (1980) original claim that metaphor shaped thought because it determined the structures of abstract concepts may have contributed to some misconceptions regarding metaphoric reasoning in the wild. "Metaphors we live by" (LAKOFF; JOHNSON, 1980) is still one of the most important books on metaphors, and it sends the message that metaphors have a stronger and deterministic power over thought, which we have argued against in this paper.

On the other hand, experiments that study both conceptual and non-conceptual metaphors reveal that metaphors are one of the forces that might shape reasoning. The metaphoric framing effect might depend on how metaphors interact with other variables in the general context. The role of metaphors in reasoning is not deterministic and may shift as contexts change. If we want to claim that experiments on metaphor and reasoning can be attributed to CMT (or read in the light of CMT), we must make clear how CMT can accommodate dynamic and nonlinear findings.

Moreover, in this paper, we briefly suggested two models that can help make sense of metaphor's probabilistic role in reasoning. We also point out that it is difficult for experiments to make claims like "metaphors work better at the beginning of the text than in the end", because there is different overlapping information that will be processed with the metaphor, which is arranged (or self-organized) contextually. For example, metaphors at the end of the text can

have different textual functions: they can be wrap-up commentary (in which case they are probably not going to be used for reasoning) or they can be an important argument (in which case they should be used for reasoning). Thus, generalizations over experiments need to be taken with caution, because slight changes in the text may render the generalization problematic.

In short, metaphors are a useful instrument for reasoning, albeit arguably only in some contexts. They comprise one variable that may shape reasoning unconsciously or consciously. All things being equal, it is important to carefully select metaphors to deliver the best message to an audience. But once one uses a metaphor in speech or text, metaphors enter a very dynamic cognitive world, with many variables that change from time to time, and for different people, making it a challenging task to predict the effects of metaphors on reasoning in the wild. After all, one might need to ask: what metaphors, stated by whom, to what type of audience, read/heard under what conditions, in what supporting textual environment? – the questions go on, as do the empirical investigations that are meant to shed light on metaphoric framing effects.

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