A Tale of Two Tropes:

On the Relationship Between Metaphor and Simile

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Running Head: DIFFERENCES BETWEEN METAPHORS AND SIMILES

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Abstract

Four experiments tested three competing theories of metaphor comprehension: comparison, categorization, and career-of-metaphor. The findings shed light on key mechanisms involved in metaphor processing and conceptual combination. They show that some novel tropes are privileged in metaphor over simile form, and others may express different interpretations in simile and in metaphor form. These results speak against the assumption that metaphors and similes are interchangeable, thus providing support for the categorization model. A unifying account of metaphor comprehension is proposed, along with a discussion of implications for conceptual combination.

New metaphors are quickly created and propagated among the speakers of any language and even across languages. The experiments described below addressed the issue of how novel and conventional metaphors and their corresponding similes are understood and interpreted.

Existing models propose different mechanisms for metaphor comprehension (see, for example, Gibbs, 2011; Gibbs & Colston, 2012; Steen, 2007). Comparison theorists (Ortony, 1979; Gentner, 1983; Fogelin, 1988) claim that metaphors such as "*Some lawyers are sharks*" are understood as implicit similes, e.g., "*Some lawyers are like sharks*", via a property matching process. Proponents of the categorization model (Glucksberg & Keysar, 1990; Glucksberg, 2001; Glucksberg & Haught, 2006; Haught, 2013) argue that metaphors are understood as categorization statements via dual-

reference, an interactive property attribution process. Similes, on the other hand, are understood as comparisons. In metaphor form, the vehicle term *shark* refers to an abstract level, to the class of vicious, predatory creatures, of which the literal shark is a prototype. In simile form, it is used to refer to the literal level, to the marine creature with fins and leathery skin. The career of metaphor account (Bowdle & Gentner, 2005) aims to integrate the two approaches. It proposes that novel metaphors are always processed as comparisons, i.e., similes. As these metaphors become conventionalized through repeated use, they can be processed as comparisons or categorizations.

A more detailed overview of each of these models, below, is followed by a description of four experiments that tested the predictions of these models.

The Comparison Model

The proponents of standard pragmatic theory assume that nominal metaphors (of the type X is a Y) must first be recognized as false literal assertions, which violate the maxim of truthfulness in a conversation (Grice, 1975). Indeed, if taken literally, the statement that some lawyers are sharks is "defective" (Searle, 1979), i.e., it does not make sense. Once this violation has been detected, an active search begins for an alternative, non-literal, interpretation that is truthful and informative. According to this model, which applies not only to metaphors, but to any type of non-literal language, people always attempt to first derive the literal meaning of an utterance. When the literal meaning of a metaphor such as "*Some lawyers are sharks*" does not satisfy the maxims of conversation, the statement is converted into a simile: "*Some lawyers are like sharks*", which can then be interpreted as any other literal comparison. Thus, a literally false,

"defective" statement becomes a comparison, i.e., a statement that is always true (because one can always identify ways, whether obscure or obvious, in which two things are alike).

The comparison view of metaphor comprehension postulates that metaphors are recognized as implicit similes and understood via a comparison process (Gentner, 1983; Gentner & Wolff, 1997; Miller, 1979; Ortony, 1979). Thus, nominal metaphors such as *"Some lawyers are sharks"* are treated as if they were explicit comparisons, i.e., *"Some lawyers are like sharks"*. In this nominal metaphor of the form X is a Y, *some lawyers* (the X term) is the topic of the metaphor, and *sharks* (the Y term) is the vehicle. When treated as a simile, the features of the topic are compared with the features of the vehicle and only the relevant subset of these features is used in interpreting the given statement. How are these common features identified?

Ortony (1979) has proposed a salience imbalance mechanism, based on Tversky's (1977) contrast model of similarity, to explain feature selection in metaphor comprehension. According to Tversky's theory, perceived similarity between two objects X and Y is a weighted function of common features that are shared by X and Y minus the features that distinguish X from Y, i.e., are not common to both terms. In an elaboration on Tversky's contrast model, Ortony put forth his account of metaphor recognition and comprehension based on the notions of a) knowledge representations, whose function is to hold the information regarding the attributes of a concept, and b) salience imbalance. His proposal rests on the assumption that the same feature can have different levels of salience depending on the particular concept of which it is an attribute.

The referents of a comparison *X is like a Y* can share features that differ in terms of their salience, yielding four possible kinds of matches: 1) The matching properties can be salient for the predicate term Y, but not for the subject term X. 2) They can be of low salience for both terms, e.g., *brown* and *creamy* for "*Chocolate syrup is like steak sauce*". 3) They can be of high salience for both terms, as in "*Billboards are like placards*". Or 4) they can be highly salient for the subject term X, but not salient for the predicate term. Assertions whose shared properties are described in the first two cases do not convey any new information, hence they are perceived as anomalous. Statements that fit under the third description, i.e., whose features are highly salient for both the X and the Y terms, are understood as literal comparisons. For example, in the statement "*Billboards are like placards*", both terms have equally salient matching properties. The fourth case describes the requirements for a statement to be understood as a figurative comparison. For example, in the statement "*Some billboards are like warts*", shared features such as *unsightly* are highly salient for the predicate *warts*, but are not salient for the subject concept *billboards*. In this last case, the salience constraint is also the criterion used to judge the level of metaphoricity of an utterance: "the imbalance […] in salience levels of matching attributes of the two terms is a principle source of metaphoricity" (Ortony, 1979, p. 164).

Ortony proposed salience imbalance as the criterion for distinguishing figurative statements from literal ones and specified the importance of informativeness in accepting and interpreting a statement. However, literal assertions of the type described in case 3 above, i.e., high salience for A and B, as in "*Billboards are like placards*", do not meet the informativeness requirement: they convey information that is trivial to anyone other

than, perhaps, a listener who does not share the same high salience match as the speaker (a situation which is difficult to imagine). Indeed, for any comparative statement to be considered informative, the matching properties must be of low salience for the subject term X and highly salient for the predicate term Y. Ortony reserves this salience imbalance scenario to metaphoric statements, but upon closer observation, following the informativeness rule, it appears to be a requirement for any comparison statement, whether literal or metaphoric. Therefore, the model fails to account for distinctions between the literal and the figurative.

Despite its intuitive appeal, Ortony's simple matching mechanism is not an adequate explanatory framework for the comprehension of either literal statements or metaphors, the latter of which are treated as implicit comparisons, i.e., similes. The model fails to account for those utterances, literal or metaphoric, that convey new information about the subject. For instance, the metaphoric statement "*Peter is like a shark"* informs the listener about a set of properties that characterize Peter, but that were not part of the listener's knowledge about this person before the metaphor was processed (Glucksberg, 2000).

Gentner (1988) also argued that metaphors are understood as comparisons. She proposed an elaboration of Ortony's answer to the question of how the features of metaphor interpretation are identified. According to her structure-mapping model, the matching features are often relations, not object attributes, as the salience imbalance model had suggested. An example used by Gentner is Rutherford's analogy between the hydrogen atom and the solar system: in this metaphor, the physical attributes of the entities are irrelevant. Instead, the relationship between the planets and the sun is

mapped onto the domain of the topic. This account was initially developed as an explanatory framework for a limited subset of analogies, but was then extended as an account for metaphor comprehension. Indeed, the application of the structure-mapping model to metaphor comprehension assumes that metaphor is a type of analogy. According to the initial account, a metaphor's topic and vehicle can be matched in three ways: in terms of their relational structure, e.g., *"The moon is a lightbulb";* in terms of their attributional structure, e.g., *"A cloud is a marshmallow"*; or in terms of both relational structure and attributes, e.g., *"Tree trunks are drinking straws"* (the relation of upward movement of liquid and the attribute of thin, tube-like appearance).

According to the revised structure-mapping theory, in metaphors, relations that apply to the vehicle also apply to the topic and these relations are independent of whether the objects represented by the topic and vehicle are similar or not (Gentner et al., 2001; Gentner & Markman, 1997). In other words, similarity is based on relations. Consistent with this notion, when participants are asked to generate interpretations of metaphors, their paraphrases include more relations than properties (e.g., Gentner & Clement, 1988; Shen, 1992; Tourangeau & Rips, 1991).

According to both Ortony's and Gentner's accounts, the grounds for comparison are established via a matching process. Properties (or relations) of the metaphor topic and vehicle are first extracted exhaustively and then checked one against the other. From the set of matching properties (or relations), those that are most relevant and informative are identified and used as the grounds for the comparison. The ensuing interpretation process is then no different than the one used for literal comparisons.

The Categorization Model

Glucksberg and Keysar (1990) proposed that nominal metaphors are processed not as comparisons, but as class inclusion statements, with the metaphor vehicle serving as a name for the superordinate category to which the topic is assigned. In the example "*Some lawyers are sharks"*, the metaphor vehicle (*sharks*) is used to refer to a superordinate category ('predatory and vicious creatures') within which the metaphor topic (*some lawyers*) is included. The vehicle term *sharks* has dual reference, i.e., it can be used at the literal level to denote the marine fish *shark* or at the metaphorical level to denote the category of 'predatory, ferocious creatures' that is exemplified by the literal term *sharks*. In a similar vein, Utsumi and Sakamoto (2011) proposed categorization as the key mechanism in understanding predicative metaphors, and Chiappe, Kennedy and Smykowski (2003) showed that metaphors are distinct from similes, and function more like categorization statements.

Dual reference is not unique to figurative language, and is a common communicative strategy. In literal language, words such as Kleenex or Frisbees, which represent brand names, are commonly used to refer to superordinate categories, e.g., all tissue products and all flying discs. The dual reference property is especially useful in classifier languages, such as the American Sign Language, that do not have names for superordinate categories, but that do have basic level names which can serve as prototypes of a category (Glucksberg, 2001). In such languages, the nameless superordinate category can still be referred to through a word used to represent the overall category. Even in English, not all categories have lexicalized names of their own, in which case a noun referring to a prototypical member of the class can be used to refer

to the superordinate category as a whole (as in the Kleenex example above). In

Glucksberg and Keysar's (1990) example "*My job is a jail*", the vehicle *jail* is considered

to be a prototypical member of the class of restrictive and unpleasant situations, and it

can therefore be successfully employed to name the superordinate category of such

confining places or circumstances to which the topic *job* belongs.

Dual reference explains why similes such as "*Some ideas are like diamonds*" can

be paraphrased as metaphors, e.g., "*Some ideas are diamonds*", but literal comparisons

such as "*Emeralds are like rubies*" cannot be paraphrased as category assertions, e.g.,

"*Emeralds are sapphires*". In literal comparisons, the two concepts are at the same level

of abstraction and belong to the same category, e.g., both emeralds and rubies are gems.

Indeed, if a new concept X were introduced by comparing it to an existing concept, e.g.,

X is like a sapphire, one would infer that it is part of the same superordinate category,

e.g., *gems*, to which the predicate *sapphire* belongs. In literal comparisons, the predicate

term does not have any other level of abstraction beyond its literal referent, so

paraphrasing such a comparison as a categorization statement is not permissible. In

metaphoric assertions, the vehicle refers to both the literal and the abstract referent,

which allows for paraphrases of metaphors as similes and of similes as metaphors.

However, the fact that the referents of the simile and metaphor predicates are distinct also

allows for the possibility of differences in interpretation of the two tropes, i.e., metaphors

and similes may not be always be identical paraphrases of each other.

According to the categorization model, metaphor comprehension involves

property attribution (Glucksberg & Keysar, 1990; 1993; Glucksberg, McGlone, &

Manfredi, 1997) rather than property matching, as comparison theorists had proposed.

Two important criteria are used to determine which vehicle properties are attributed to the metaphor topic (Glucksberg, 2000). One is a superordinate category to which the vehicle term refers and which is specified by dual reference. The other criterion is the relevance of that category's prototypical properties to the topic, which is a function of the interaction between vehicle attributes and constraining topic dimensions.

This second representational assumption assigns different roles to the vehicle and topic terms, with the vehicle yielding properties for attribution to the topic and the topic yielding the relevant dimensions for attribution. In the lawyers/sharks metaphor, the topic *lawyers* provides different relevant dimensions such as competence, reputation and cost. The vehicle *sharks* provides candidate properties such as vicious, predatory, that can be attributed to the topic. In this example, the vehicle term *sharks* has a limited number of highly salient properties that characterize the category of predatory, aggressive creatures. The topic *lawyers* also has relatively few relevant dimensions that highly constraint the attribution process. Clearly, not all metaphors have vehicles with such few salient vehicle attributes and topics with such few, highly restricting relevant dimensions. Metaphors topics such as *my parents* have many relevant dimensions, hence they pose minimal constraints on the attribution process. Metaphors can also have vehicles that differ as a function of the number or type of candidate properties. In some instances, the same literal vehicle exemplar, e.g., *snake*, can be prototypical of more than one category, e.g., "anything with twisting shape" or "anything devious." The dual reference, property attribution framework proposed by the categorization model can account for all these instances, regardless of the number of vehicle attributes and the level of constraint imposed by the topic. For example, in the metaphoric context "*Some lawyers are*

snakes", the topic *lawyers* constrains the candidate attributes to those that are meaningful

for topic dimensions such as character. In the metaphor "*Some roads are snakes"*, shape,

rather than character, is a relevant dimension for the topic *roads*, hence the attribution is

restricted to properties of snakes such as twisting, curved form.

The Career of Metaphor

Bowdle and Gentner (Bowdle & Gentner, 2005; Gentner & Bowdle, 2001) have

put forth a hybrid model, called the "career of metaphor." It claims that the processing of

metaphors shifts from comparison to categorization, as metaphors are used repeatedly

and thus become conventionalized. According to this account, conventionalization is a

property of the vehicle term, not the entire metaphorical expression. In the lawyer-shark

example, *shark* would be a conventional vehicle for "devious, aggressive creature."

Novel metaphors, such as "*Science is a glacier"* or "*Mind is a kitchen",* have

vehicles, e.g., *glacier* and *kitchen,* with a clear literal sense, but without a well established

metaphoric sense. Therefore, these assertions can only be processed as comparisons. In

conventional metaphors, e.g., "*An opportunity is a doorway"*, vehicles have been used

repeatedly and therefore now have both a literal and an abstract, metaphoric meaning.

This polysemy or dual reference allows for the possibility that they can be interpreted as

either comparisons or as categorizations.

Although the dual reference function proposed by Glucksberg and his colleagues

is incorporated into their hybrid account, Bowdle and Gentner argue that metaphor

comprehension does not depend on categorization, but on the type of alignment process

described in the structure-mapping model. All novel metaphors are understood as

comparisons and only conventional metaphors can (although do not have to) be processed via categorization. When conventional metaphors are processed as categorizations, the metaphoric categories to which the vehicles refer take the form of abstract relational schemas and they are nothing but a byproduct of figurative comparisons.

The career of metaphor argument was supported by data from studies that compared novel tropes, such as "*Mind is (like) a kitchen*" and "*A newspaper is (like) a telescope*" to conventional tropes, such as "*Faith is (like) an anchor*" and "*Alcohol is (like) a crutch*". For instance, in a ratings task, participants strongly preferred the simile form for novel assertions, but showed no preference for similes or metaphors for conventional assertions. A similar effect was observed in a study that measured speed of processing: novel tropes were understood more quickly when presented as similes than as metaphors, but the reverse was true for conventionalized tropes (Bowdle & Gentner, 2005).

The hypothesized shift from comparison to categorization was assessed most directly in an experiment that attempted to simulate the process of metaphor conventionalization (Bowdle & Gentner, 2005). Participants were exposed to sets of novel similes with the same vehicle, e.g., "*An acrobat is like a butterfly*" and "*A figure skater is like a butterfly*." Then they were asked to generate a topic for the statement "_____ *is like a butterfly*" such that it expresses the same meaning as in the previous two similes. The test phase measured participants' expressed preference for the metaphor form, e.g., "*A ballerina is a butterfly*", relative to the simile form, e.g., "*A ballerina is like a butterfly*". Metaphor preference was greater when participants had been exposed to the vehicle concept than when they had not. Assuming that the repeated exposure to

the same simile predicate simulated the conventionalization of metaphors, the results were taken as support for a shift from comparison to categorization. While this finding does indicate an increase in categorization as the mode of processing for conventional metaphors, it does not show that novel metaphors are understood only via comparison.

Another problematic issue is the confounding role of aptness in the experiment that compared comprehension times for conventional and novel metaphors and similes. Conventional tropes were understood more quickly in metaphor than in simile form, but the reverse was true for novel tropes, which took longer to understand in metaphor than in simile form. This finding was attributed to differences in conventionality and was interpreted as support for the claim that novel tropes could be processes only as comparisons, whereas conventional ones could be processed as categorizations. However, the items used in this experiment also appeared to differ in aptness, with novel metaphors such as "*Mind is a kitchen*" or "*The fisherman was a spider*", seeming less apt than the conventionalized ones, e.g., "*An opportunity is a doorway*" or "*Alcohol is a crutch*". It is therefore difficult to assess how much of the variability reported in the results is attributed to the confounding variable of aptness and how much is the results of the intended manipulation, i.e., a metaphor's level of conventionalization. Bowdle and Gentner acknowledged this issue and they conducted a post-hoc test to measure the aptness of the experimental items employed.   The novel tropes were indeed rated significantly less apt than the conventional ones. Within the novel tropes, similes were rated as significantly more apt than the corresponding metaphors, a finding that Bowdle and Gentner interpret as support for their account that all novel metaphors are initially understood as comparisons, i.e., similes. However, this result does not eliminate the

confounding effect of aptness. In fact, it may well reinforce it: because the novel

figuratives are less apt, they are more likely to be processed as comparisons than as

categorizations.

Interestingly, Chiappe, Kenney and Smykowski (2003) found that the preference

of metaphors over preferred is largely due to the aptness, rather than the conventionality,

of the statement. They showed that what seems to predict the use of the metaphor form is

the extent to which the sentence is apt, i.e., it conveys important features of the topic.

The evidence in support of the career of metaphor account suggests that some

novel tropes (perhaps those that are not particularly apt, as the current investigation will

argue) may initially be processed as comparisons/similes and that only once they become

lexicalized are they understood as categorizations. However, on the basis of the studies

reported by Bowdle and Gentner (2005), one cannot conclude that all novel metaphors

begin their "career" as similes. Indeed, anecdotal evidence suggests that some novel

tropes are introduced and only make sense as metaphors, e.g., "*What will be the next*

Enron?", not as similes, e.g., "*What will be like the next Enron?"*

Moreover, Glucksberg and Haught (2006) found that some novel metaphors can

be preferred and understood more quickly as categorizations than as comparisons. In this

experiment, the novel metaphors generated by Bowdle and Gentner (2005), e.g., "*A*

rumor is a mushroom", "*Moonlight is bleach"* were our literal-referent metaphors. We

modified their vehicles by an adjective that was only applicable to the metaphor topic,

which yielded our figurative-referent metaphors, e.g., "*A rumor is an unfounded*

mushroom" and "*Moonlight is romantic bleach"*. Aptness ratings and comprehension

times revealed a preference for the comparison over the categorization form only for

literal-referent metaphors. For figurative-referent metaphors, the reverse was true: they were judged as more apt and understood more quickly in categorical than in comparison form.

An Overview of the Present Research

A critical assumption of the comparison and career of metaphor accounts is that similes and metaphors convey the same meaning and are interchangeable. This article challenges this assumption. I argue that metaphors and similes are processed and interpreted differently and they are not always interchangeable.

The first proposal is that metaphors and their corresponding similes could differ in their interpretations. This hypothesis is contrary to the comparison and career of metaphor accounts, which assume equivalence in meaning of the two tropes. Experiment 1 was designed to test a likely preference for metaphorical properties in the interpretations of metaphors and a preference for literal vehicle properties in the interpretations of similes.

The second prediction is that some novel tropes could be privileged in metaphor over simile form. This stands in contrast to the career of metaphor account, according to which all novel metaphors are processed as similes. To test this hypothesis, apt novel tropes were generated, a method that allowed for the study of differences between novel and conventionalized metaphors and similes without concern for the confounding variable of aptness. Data from aptness ratings (Experiment 2), comprehensibility ratings (Experiment 3) and response times in a sensibility judgment task (Experiment 4) speak directly to this hypothesis.

Experiment 1

In general, metaphors and similes have similar interpretations, so they can be paraphrased into each other. However, via dual-reference, metaphors are understood to refer to a higher level of abstraction than similes do. Consider the lawyers-sharks metaphor and its corresponding simile. Whereas the simile predicate *sharks* refers only to the literal level of the term, with its characteristic properties of viciousness and aggressiveness, the metaphor vehicle denotes an abstract, superordinate category, that can include members other than the prototypical marine creature *shark*. Therefore, in the metaphor form, the topic *lawyers* is included into the abstract category that represents all vicious and predatory things and people. This metaphoric category elicits additional properties that emerge from the interaction of topic and vehicle and that could be ascribed to vicious people and to the topic term *lawyers*, but not to the literal *shark*. The role of such emergent features has been documented in the context of the poetic appreciation of metaphors (Utsumi, 2005).

One testable implication of this dual-reference account is that metaphors should elicit interpretations that are richer than literal interpretations of similes. For the lawyer-shark example, emergent properties such as *competent*, which are not typical of the literal vehicle *shark*, but are elicited in the context of the metaphor, should be preferred in describing the meaning of the metaphor than the simile.

Barsalou (1982) proposed that certain properties of concepts, termed context-independent, are, as the name suggests, always activated, regardless of contextual relevance, whereas other properties are context-dependent, i.e., they are salient only in a given context. For instance, the property *round* for the concept *basketball* is activated

regardless of context. A property such as *it floats* becomes activated only in certain contexts, e.g., in the assertion *The basketball fell into the pool*. Becker (1997) further categorized the properties that may or may not be activated during metaphor comprehension into four classes: features that are common to both topic and vehicle; vehicle-shared features; topic-shared features; and so-called emergent features, a concept similar to Barsalou's context-dependent properties. In her study, Becker found that when asked to interpret metaphors the participants listed more vehicle-shared and emergent features than either common or topic-shared features. Moreover, emergent features seemed to be most influenced by the vehicle representation, as shown in an analysis of the context-dependent features: more similar features were listed for sets of metaphors with the same vehicle than for sets of metaphors that shared the same topic. This study replicated the results found by Tourangeau and Rips (1991) with different items and a modified experimental design.

Further support for the activation of these emergent features comes from a study by Gineste, Indurkhya and Scart (2000), which showed that over 60% of the properties generated during the interpretation of a metaphor were context-dependent, i.e., not directly associated with either the topic or the vehicle. As Glucksberg, Manfredi and McGlone (1997) pointed out, people seem to arrive at an appropriate interpretation of a metaphor via an interaction between the topic and the vehicle.

Unlike the comparison and career of metaphor models, the categorization account postulates that metaphors and similes may yield interpretations that are different. It allows for some overlap in interpretations because the metaphor vehicle refers to both the basic, literal category and the superordinate, abstract one. The account predicts that

interpretations of metaphors can include different properties that emerge primarily in the context of the metaphor, hence they may not be derived from the corresponding simile.

Specifically, interpretations of metaphors such as "*Some ideas are diamonds*", whose vehicles do not refer directly to a literal entity, but to a superordinate concept (i.e., valuable and desirable things), should include more metaphorical or emergent properties, such as *creative* and *insightful*. These properties are normally not included in the representation of the literal concept *diamonds*. They are activated only in the context of the metaphor. Interpretations of similes, e.g*., "Some ideas are like diamonds"*, on the other hand, should include fewer of these emergent properties and more vehicle properties, such as *valuable* and *rare*, that do apply to *diamonds* regardless of context.

Method

Participants This study consisted of two parts. In the first part, seven native speakers of English rated adjectives on their applicability to the metaphor vehicles. Twenty-six Princeton University undergraduates participated in the experiment proper for course credit.

Materials Twenty-four metaphors were selected that could also be expressed as similes. For each metaphor, the author generated and, following a norming study, selected three adjectives describing vehicle properties and three adjectives describing emergent properties. Each adjective was then incorporated in a sentence that described an interpretation of the metaphor. For example, for *"Some lawyers are sharks"*, the

assertion *"Some lawyers are vicious"* is an interpretation that uses a vehicle property.

"Some lawyers are greedy" is an interpretation that uses an emergent property.

Norming: The selection of the properties was based on ratings from seven judges, who

rated on a scale from 1 to 7 how well each of the nine adjective generated by the

experimenter (three vehicle-applicable, three emergent and three fillers) applied to the

target concept, i.e., the metaphor vehicle. As expected, vehicle adjectives were rated as

significantly better descriptors of the vehicle concept (M = 5.05, SD = .42) than emergent

adjectives (M = 3.14, SD = .62) or fillers (M = 2.75, SD = .69), p < .0001.

Design and Procedure A 2 x 2 within-subjects design was used: statement format

(metaphor or simile) by type of property (vehicle or emergent). The order of the items

was randomized. Participants were asked to rate on a scale from 0 ("not at all") to 6

("very well") how well they thought a particular interpretation fit with their

understanding of a given metaphor. It was emphasized that the ratings should reflect the

participant's own judgment and that there were no right or wrong answers. Four practice

items followed the instructions to familiarize the subjects with the task and with the

presentation format.

Results and Discussion

Two repeated measures ANOVAs were conducted: one with participants as a random

factor (F_p) and one with items as a random factor (F_i). The participants ANOVA

revealed that vehicle properties (M = 3.88, SD = .66) received higher ratings than

emergent properties (M = 3.36, SD = .65), both for metaphors, F_p (1, 25) = 19.9, p < .001 and for similes, F_p (1, 25) = 38.2, p < .0001. The items ANOVA showed that the effect of property type was significant for similes, F_i (1, 23) = 11.49, p < .003, but not for metaphors, F_i (1, 23) = 2.67, p > .11.

These findings are consistent with the dual reference account: the metaphor vehicle and the simile predicate share the same literal referent, e.g., the fish *shark* in the example "*His lawyer is (like) a shark*". Therefore, interpretations of both the metaphor and the simile should include properties that describe the literal referent of the metaphor vehicle. More importantly, the dual reference mechanism predicts that emergent properties should be preferred in the interpretations of metaphors than in the interpretations of similes. This is exactly what we found: emergent properties were rated significantly higher for metaphors (M = 3.48, SD = .62) than for similes (M = 3.25, SD=.71), F_p(1, 25)=14.7, p<.001 and F_i (1, 23)=5.22, p<.03.
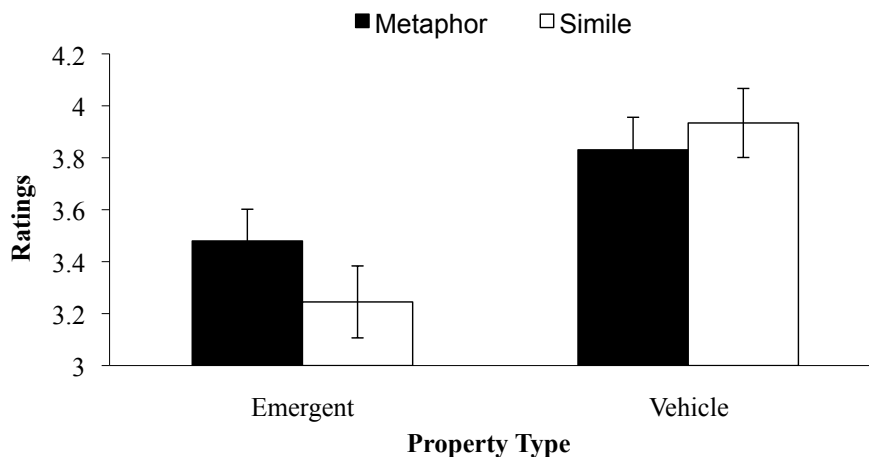
Figure 1: Ratings of interpretations with vehicle and emergent properties as a function of statement form: metaphor and simile, Experiment 1.

Figure 1 shows the crucial significant interaction, F_p (2, 50) = 12.7, p <. 001 and F_i (2, 46) = 8.38, p < .008, between statement form (simile vs. metaphor) and type of property (vehicle vs. emergent): the interpretations that included vehicle adjectives were rated as equally applicable to similes (M = 3.93, SD = .67) and to metaphors (M = 3.83, SD = .64), whereas the interpretations that included emergent adjectives received higher ratings for metaphors (M = 3.48, SD = .62) than for similes (M = 3.24, SD = .71).

These results speak against the original comparison account, which holds that metaphors are implicit similes, and they support the predictions made by the categorization model and its postulated dual reference mechanism.

The preference of interpretations with emergent attributes for metaphors than for similes supports the predictions made by the categorization model and its postulated dual reference mechanism. Whereas the simile predicate *sharks* refers only to the literal level of the term, with its characteristic properties of viciousness and aggressiveness, the metaphor vehicle denotes an abstract, superordinate category, that can include members other than the prototypical marine creature *shark*. Therefore, for the metaphor "*Some lawyers are sharks*", the topic *lawyers* is included into the abstract category that represents all vicious and predatory things and people. This metaphoric category elicits additional properties that emerge from the interaction of topic and vehicle and that could be ascribed to vicious people and to the topic term *lawyers*, but not to the literal *shark*.

The findings clearly speak against the original comparison account, which holds that metaphors are implicit similes. They support the categorization model, but they could also be accommodated by the career of metaphor argument, which postulates that

metaphors acquire dual reference and are treated as categorizations as they become

lexicalized or commonly used in everyday language. As metaphors become

conventionalized, they could convey meanings that are richer and more complex than

those conveyed by similes (during the initial comparison process). Therefore,

conventional metaphors, which can be processed as categorizations, may be somewhat

privileged in interpretations over novel metaphors, which are processed as

comparisons/similes. Experiments 2 through 4 aimed to draw a clear distinction between

the categorization and the career of metaphor models by further exploring potential

differences between metaphors and similes.

Experiment 2

The dual reference mechanism that explains the findings in Experiment 1 is at the

core of the categorization model (Glucksberg & Keysar, 1990), but it also plays a critical

role in the career of metaphor model (Bowdle & Gentner, 2005). The latter account posits

that novel metaphors, i.e., those that have just been introduced in a language, are always

understood as comparisons. Then, through repeated and consistent use, the metaphors

become conventionalized and their vehicles acquire polysemy or dual reference.

Bowdle and Gentner supported their account by the finding that novel metaphors

were strongly preferred in simile form, whereas conventional assertions were slightly

preferred in metaphor form. One important variable that may have been confounded with

the assessment of novelty/conventionality, however, is the aptness of the expressions: the

novel metaphors used, e.g., *"A fisherman is a spider"*, *"A mind is like a kitchen"*,

"Science is a glacier", were rated as significantly less apt than their conventionalized counterparts.

To address the challenge of generating apt novel metaphors, existing conventionalized metaphors such as *"His lawyer is a shark"* were modified by an adjective, such that the new expressions had vehicles formed not by one noun (*shark*), but by a conceptual combination consisting of an adjective and a noun (e.g., *old shark, respectable shark, razor-toothed shark*). Using this procedure, experiments 2, 3, and 4 explored how metaphors and similes are interpreted when they include one of three types of adjectives. The adjectives differed as a function of whether the properties they conveyed applied in their literal sense only to the topic term, only to the vehicle term, or to both the topic and the vehicle.

The prediction was that novel tropes with adjectives applicable to the topic only, e.g., *"Some lawyers are well-paid sharks"*, are privileged in metaphor form. When converted into similes, e.g., *"Some lawyers are like well-paid sharks"*, they become less apt. If the results support this hypothesis, then they would provide a clear counterexample to the career of metaphor argument. They would show that novel tropes can be privileged in categorical (metaphor) rather than comparison (simile) form. Hence, novel metaphors are not necessarily preferred as comparison assertions. The findings would support the categorization model, whose dual reference mechanism allows for processing and interpretation differences in metaphors versus similes. The metaphor *Some lawyers are well-paid sharks* is apt because the vehicle refers to the metaphorical shark, which can be described as well-paid. In the corresponding simile, *sharks* is used at its literal

level, in which case the attribute *well-paid* used to describe the fish would make for a strange conceptual combination at best.

For the other types of adjectives, the predictions regarding differences in aptness between the metaphor and the simile conditions are as follows. Statements with topic-and-vehicle-applicable adjectives (e.g., "*Some lawyers are old sharks*") should be equally apt in metaphor and simile form. Metaphors with vehicle-applicable adjectives (e.g*., "Some lawyers are razor-toothed sharks*") should be judged as apt as the corresponding similes, but may be judged as less apt than the unmodified source metaphors (e.g., "*Some lawyers are sharks*") because the adjective does not apply to the metaphor topic.

Method

Participants The experiment consisted of two parts. Sixteen Princeton undergraduates were given course credit for participating in the norming part of the experiment, which determined the three adjectives to modify each metaphor's vehicle term. Twenty-six participants were then tested in the experiment proper for course credit. All the participants were native speakers of English.

Materials The materials consisted of thirty-two pairs of nominal metaphors-similes. Each metaphor vehicle/simile predicate was modified by an adjective or not. When an adjective was included as a modifier, it was chosen from a norming study such that it was applicable to the vehicle only, the topic only, or both topic and vehicle.

The experimenter selected the three target attributes for each metaphor based on the criteria specified above. For example, for the source metaphor *Some lawyers are sharks*, which contains no adjective (NA), the topic-applicable (TA) adjective had to be applicable to lawyers, but not to sharks (e.g., *well-paid*); the vehicle-applicable (VA) adjective had to apply to sharks, but not to lawyers (e.g., *razor-toothed)*, and topic-and-vehicle-applicable (TVA) adjectives had to apply to both lawyers and sharks (e.g., *old*). Then, in the norming part of the study, participants were asked to rate how well each of six attributes applied to the representation of a concept. Three of these attributes were the adjectives that had been generated by the experimenters and the other three were fillers. The subjects rated the six adjectives on a scale from 0 to 6 based on how well each property applied to the description of a noun. The nouns were the topic and the vehicle terms, e.g., *lawyer* and *shark*. Half of the participants rated the applicability of the properties to the topic and half of them rated the applicability to the vehicle. The nouns and the adjectives were presented in a randomized order.

An initial 2 (target concept: topic and vehicle) x 3 (adjective type: TA, VA, TVA) ANOVA revealed a significant interaction, F_i (2, 30) = 28.8, $p < .0001$ and F_p (2, 30) = 23.6, $p < .0001$. As predicted, topic-applicable (TA) adjectives were rated higher for the topic (M = 5.04, SD = .71) than for the vehicle (M = 1.33, SD = .80). This effect was reliable both by items, F_i (1, 31) = 287, $p < .0001$, and by participants, $F_p = 83$, $p < .0001$. Vehicle-applicable (VA) adjectives were rated significantly higher for the vehicle (M = 4.97, SD = 1.08) than for the topic (M = 1.54, SD = 1.03), F_p (1, 31) = 71, $p < .001$ and F_i (1, 31) = 282, $p < .0001$. This interaction of topic/vehicle and topic-applicable/vehicle-applicable adjectives was significant, F_i (1, 31) = 565, $p < .0001$ and F_p (1, 31) = 380, $p <$

.0001. There was no difference in ratings for the TVA adjectives, which were equally applicable to the topic (M = 4.4, SD = 1.15) and the vehicle (M = 4.75, SD = 1.07), p > .3.

Design and Procedure A 2 x 4 within subjects design was used: statement format (simile or metaphor) by type of adjective (topic-applicable, vehicle-applicable, topic-and-vehicle applicable, or no adjective). Half of the statements were presented as metaphors in one block and the other half were presented as similes in a different block. The order in which the two blocks were presented was counterbalanced and order of statements within each block was randomized. The task consisted of an aptness measure, in which the participants rated how good each metaphor or simile was on a scale from 1 (not at all apt) to 10 (extremely apt).

Results and Discussion

The experimental design aimed to avoid the confounding issue of aptness that was problematic in the studies reported by Bowdle and Gentner (2005). Instead of using novel figuratives that are less apt than the conventional ones, we employed novel, adjective-modified metaphors that were judged to be as apt as their conventional, unmodified counterparts. Indeed, there was no difference between the aptness ratings of novel topic-applicable metaphors (M = 6.2, SD = 1.51) and their non-modified conventional counterparts (M = 6.7, SD = 1.41), p > .23. In simile form, the topic-applicable statements were rated as significantly less apt (M = 5.25, SD = 1.65) than the corresponding non-modified similes (M = 6.5, SD = 1.56), F_p (1, 31) = 22.06, p < .0001

and F_i (1, 31) = 17.8, p < .001 and in fact lower than the ratings of any of the other

conditions.

As predicted, the similes modified by topic applicable adjectives were rated as

less apt (M = 5.25, SD = 1.65) than the corresponding metaphors (M = 6.2, SD = 1.51).

This effect was reliable by participants, F_p (1, 31) = 9.21, p < .005, and by items, F_i (1,31)

= 6.51, p < .016.   For the unmodified condition, there was no difference between

metaphors (M = 6.7, SD = 1.41) and similes (M = 6.5, SD = 1.56), p > .97. The 2

(metaphor / simile) x 2 (topic-applicable / non-modified) interaction was significant in

the ANOVA by items, F_i (2, 30) = 4.3, p < .05 and marginally significant in the analysis

by participants, F_p (2, 30) = 3.6, p = .06. This finding undermines the career of

metaphor's assumption that all novel tropes are understood as comparisons, hence they

should always be preferred in simile form. What seems to determine this preference is

not level of conventionalization, but aptness. The novel simile "*Some lawyers are like

well-paid sharks*" is not very apt, but the novel metaphor "*Some lawyers are well-paid

sharks*" is. This result supports the dual reference hypothesis: a metaphorical shark, to

which the superordinate metaphor category refers, can be *well-paid* (a TA adjective), but

the literal shark, to which the simile predicate refers, cannot.

In the other two conditions (VA and TVA), the novel metaphors were not rated as

significantly different in aptness from their simile counterparts. The metaphors modified

by a topic-applicable adjective and those modified by a topic-and-vehicle-applicable

adjective were also rated as apt as the source (NA) metaphors.

There was a difference between the VA metaphors (M = 5.74, SD = 1.47) and the

NA metaphors (M = 6.70, SD = 1.41): the metaphors with vehicle-applicable adjectives

were rated significantly lower than the non-modified metaphors, F_p (1, 31) = 13.42, p <

.001 and F_i (1,31) = 6.3, p < .017. This finding may explained by the fact that a vehicle-

applicable adjective, such as *razor-toothed* for the lawyer/shark example, reflects an

essential property of the metaphor vehicle. Therefore, it may have been perceived as

redundant when used to modify the vehicle: because the property *razor-toothed* is

intrinsic to a description of any shark, people preferred the more parsimonious of the two

categories: *sharks* over *razor-toothed sharks*.

This experiment provided direct evidence against the career of metaphor

account's claim that all novel metaphors are privileged in simile form. Bowdle and

Gentner (2005) attribute the simile preference for the novel tropes to the fact that all new

metaphors are processed as comparisons and they dismiss the potential role that aptness

may play. The current experiment presented a counterexample where a novel trope that

was as apt as a conventional one was preferred in metaphor over simile form. As

expected, the novel topic-applicable metaphors were rated as apt as their non-modified

conventional counterparts, but the corresponding topic-applicable similes were rated as

less apt than the non-modified similes and indeed lower than any of the other categories

of statements.

Experiment 3

In Experiment 2, the results showed that some novel metaphors (whose vehicles

were modified by topic-applicable adjectives) were considered more apt when presented

in categorical than in simile form. The aptness test was important because it showed that,

in contrast to the career of metaphor account, not all novel metaphoric expressions are

privileged in simile than in metaphor form. Moreover, the comparison of the novel (adjective-modified) metaphors with the conventionalized (unmodified) ones revealed that the two groups of statements did not differ reliably in their aptness. This finding ensured that any preference for any of the novel items in metaphor or in simile form was not due to differences in their aptness, a concern that had been raised and not adequately addressed by Bowdle and Gentner (2005).

Experiment 3 aimed to extend the findings from Experiment 2, using a task that required participants to judge the comprehensibility, rather than the aptness of a set of metaphors. This test is an important complementary tool to the aptness ratings because it allows for an assessment of the ease (or difficulty) with which the participants understand the items. By employing the same materials that were used in Experiment 2, the study can also address the possible criticism that some of the novel items, though apt and preferred in metaphor form, might have been understood with more difficulty than their corresponding similes.

The predictions for the current experiment mirror those of Experiment 2. Some novel apt tropes can be preferred in metaphor than in simile form. An interaction between type of trope and vehicle modifier was predicted: the similes whose predicates are modified by topic-applicable adjectives should be rated significantly lower on the comprehensibility scale than their corresponding metaphors, but there should be no difference in ratings for the unmodified tropes.

Method

Participants Thirty-two Princeton undergraduates, all native English speakers, participated in this study for course credit.

Materials The items were identical to those used in Experiment 2.

Design and Procedure The design and the procedure were parallel to those in Experiment 2. A 2 x 4 within subjects design was used: statement format (simile or metaphor) by type of adjective (topic applicable, vehicle applicable, topic and vehicle applicable, or no adjective). The task consisted of rating each statement based on how easy it is to understand it on a scale from 1 (not at all easy) to 10 (extremely easy). The participants were asked to use their best judgment and to produce the first rating that came to mind, without going back and revising their responses.

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Results and Discussion

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Analyses of variance were conducted with both participants and items as random factors. An initial 2 (statement form: simile or metaphor) X 4 (property type: TA, VA, TVA or no adjective) ANOVA revealed a significant interaction, F_p (1, 29) = 4.7, p < .009 and F_i (1, 29) = 5.3, p < .001.

As predicted, the metaphors that included topic-applicable adjectives received higher ratings of comprehensibility (M = 6.66, SD = 1.61) than the corresponding similes (M = 5.72, SD = 1.78), F_p (1, 31) = 7.59, p < .01 and F_i (1, 31) = 11.92, p < .002. No such difference was observed in the unmodified tropes, which were rated as equally comprehensible regardless of whether they were presented as metaphors (M = 7.27, SD = 1.52) or as similes (M = 7.35, SD = 1.59). This crucial interaction was significant both by participants F_p (1, 31) = 5.44, p < .026 and by items, F_i (1, 31) = 5.19, p < .03.   The ratings for topic-applicable similes were lower (M = 5.72, SD = 1.78) than the ratings for the corresponding non-modified similes (M = 7.27, SD = 1.52), F_p (1, 31) = 43.9, p <

.0001 and F_i (1, 31) = 36.2, p < .0001. However, the novel topic-applicable metaphors were rated as not reliably different in comprehensibility from their non-modified conventional counterparts.

The topic-applicable condition was the only one that yielded a significant difference between metaphors and similes: there was no preference for either statement form for any of the other metaphor types. As predicted, there was no reliable difference between the novel metaphors that included topic-applicable or topic-and-vehicle-applicable adjectives and the original conventional metaphors: both types of statements were rated as being equally comprehensible. This point speaks against the career-of-metaphor hypothesis, which predicts that novel figuratives should always be more comprehensible in simile than in metaphor form.

Experiment 4

In order to converge on the argument that novel metaphors can be privileged in categorical form, Experiment 4 employed an online measure of comprehension using the same set of materials as in Experiments 2 and 3. The task did not require the participants to produce or make decisions about interpretations. Instead, they were simply asked to read various statements (the target metaphors and literal fillers) and make a speeded judgment about each assertion's comprehensibility, i.e., whether it makes sense or not. Overall, the participants should take longer to understand the novel tropes than the conventionalized ones because the novel statements include an additional word (the adjective), which increases reading time, and because they should be less familiar than the conventional items. Participants should also take more time to reach a decision

regarding the similes with topic-applicable adjectives and they should reject them more often, i.e., produce more "no" responses, because these assertions are less apt, as was shown in Experiment 2. No significant differences between metaphors and similes are expected for any of the other conditions.

The prediction is straightforward: similes with topic-applicable adjectives, e.g., "*Some lawyers are like well-paid sharks"*, would not only be judged to be less apt and comprehensible, as shown in Experiments 2 and 3, but they would also take longer to understand than their corresponding metaphors, e.g., "*Some lawyers are well-paid sharks"*.

Method

Participants Twenty-four Princeton undergraduates, all native speakers of English, participated for course credit.

Materials The materials consisted of the same set of thirty-two nominal metaphor-simile pairs that were used in Experiments 2 and 3. In addition, sixty-four literal statements were included as fillers: half of them were comprehensible and the other half were not. Sixteen of the literal comprehensible items and sixteen of the incomprehensible items were of the form *X is a AY*, where X and Y are nouns and Y is an adjective, and the rest of the fillers had other grammatical structures, such as *X [transitive verb] AY* (e.g., *X had a AY)*. Twelve additional items were generated and were used as warm up materials at the beginning of the experiment.

Design and Procedure This experiment employed a sentence comprehension task, in which I manipulated the statement format and the type of modifier. This yielded, as in the previous two studies, a 2 x 4 design: simile or metaphor by vehicle-applicable (VA) adjective, topic-applicable (TA) adjective, topic-and-vehicle-applicable adjective (TVA) or no adjective (NA).

The statements were presented in random order on a computer screen and the participants were asked to complete a sentence comprehension task. They were instructed to look at a fixation cross, which always appeared in the center left area of the screen. After 1500 milliseconds, a statement appeared, which the participants were asked to read as soon as they saw it on the computer screen. They were instructed to make a judgment as quickly and accurately as possible about whether the statement made sense or not. They responded by pressing one of two keys, each of which was clearly labeled with *yes* or *no*. The instructions emphasized that the participants keep constant steady hand positions, which was assessed during the practice trials, in order to minimize the variability attributed to different hand movements.

Ten practice trials were used to familiarize the participants with the task, and the first twelve items in the experiment proper were considered warm-up. All the statements were presented in random order, and the computer recorded the participants' response choices (yes or no) and their reaction times.

<div align="center">

Results

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Participant (F_p) and item (F_i) analyses of variance were conducted on the time it took each participant to decide on the comprehensibility of each statement and on the percentage of *yes* and *no* responses that they produced.

Response times As predicted and as shown in Figure 2, the mean response times were longer for the novel statements that included an adjective (M = 1995.84 ms., SD = 627.77) than for the unmodified, conventional ones (M = 1604.75 ms., SD = 605.31). This result is attributable to two factors: first, the novel tropes included an additional word, which may have increased reading times. Second, the modified tropes were novel and less familiar than the conventionalized tropes.
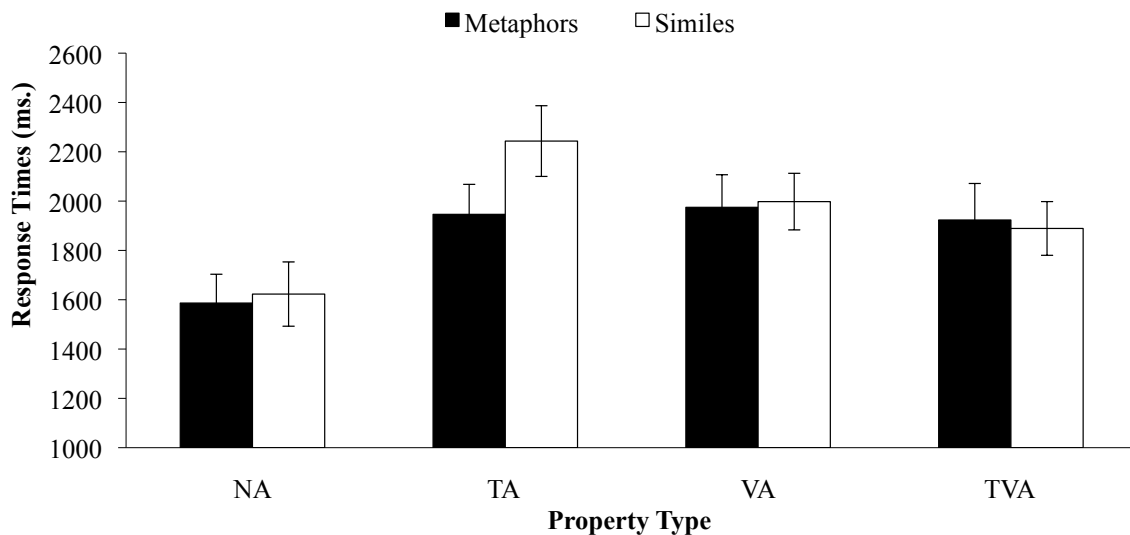
Figure 2: Response times in milliseconds as a function of statement form: metaphor and simile, and of property/adjective type: no adjective (NA), topic-applicable (TA), vehicle-applicable (VA), and topic-and-vehicle-applicable (TVA), Experiment 4.

The participants took significantly longer to respond to similes with topic-applicable adjectives (M = 2243.45, SD = 143.36) than to their metaphor counterparts (M =

1946.32, SD = 121.59), F_p (1, 23) = 9.49, p < .005 and F_i (1, 31) = 8.3, p < .008. No such

difference between similes and metaphors was observed for any of the other adjective

conditions. Three separate 2 (metaphor or simile) X 2 (topic-applicable adjective or one

of the other adjectives) ANOVAs were conducted and they revealed the following

significant interactions. While the similes with TA adjectives took longer to understand

than the TA metaphors, VA similes and metaphors were understood as quickly, F_p (1, 23)

= 5.6, p < .027, F_i(1, 31)=4.9, p<.03. Similarly, there was no difference in response times

to TVA metaphors and similes, F_p(1, 23)=4.36, p<.048 and F_i(1, 31) = 5.23, p < .04.

These findings are consistent with the aptness and comprehensibility results from

Experiments 2 and 3, respectively. When a simile predicate is modified by a topic-

applicable adjective, participants take longer to understand the simile than they do to

understand the corresponding metaphor. The reason for the delay is that similes such as

"*Some lawyers are like well-paid sharks"* are not particularly apt. The adjective *well-

paid* does not apply to the literal term *sharks*, to which the simile predicate refers. On the

other hand, well-paid does apply to the metaphor topic *lawyers* and to the metaphoric

vehicle referent *sharks*. This dual reference accounts for the difference in aptness and

comprehensibility and for the delay in understanding the simile over the metaphor.

Sensibility judgments Overall, the participants responded that the similes made sense

more often than for metaphors, with the crucial exception of the case when a topic-

applicable adjective was included. Although the difference for the topic-applicable

condition between metaphors (M = .76, SD = .21) and similes (M = .72, SD = .25) was

not significant, p > .43, there was a significant interaction with the vehicle-applicable

condition, in which similes (M = .77, SD = .22) were judged to make sense more often than their corresponding metaphors (M = .65, SD = .29), F_p (1, 23) = 4.28, p < .05. This interaction was marginally significant by items, F_i (1, 31) = 2.8, p > .07. The interaction of the topic-applicable adjective with the no adjective condition was marginally significant by participants, F_p (1, 23) = 3.76, p = .065 and by items, F_i (1, 31) = 3.21, p < .08.

These results were consistent with our predictions and with the ratings of aptness and comprehensibility from Experiments 2 and 3. First, similes whose vehicles were modified by topic-applicable adjectives took longer to understand than their corresponding metaphors. Second, while the similes were judged to make sense more often than the metaphors for the vehicle-applicable, topic-and-vehicle-applicable, and no adjective conditions, the reverse tendency was observed for the topic-applicable condition.

General Discussion

Four experiments made it possible to distinguish between existing models of metaphor comprehension and to draw some important observations about the processing of adjective-noun combinations in a figurative context.

First, they showed that novel tropes could be privileged in metaphor form, a finding that the career of metaphor argument cannot account for. When novel metaphors such as "*Some lawyers are well-paid sharks*" include adjectives that apply only to the metaphor topic, they are considered more apt and comprehensible and take less time to process than their corresponding similes, e.g., "*Some lawyers are like well-paid sharks*".

The dual reference function of the vehicle term provides a straightforward account for this finding: while the metaphorical shark can be well-paid, the literal one, to which the simile refers, cannot. Such results support the categorization model by showing that novel metaphors can be privileged as categorical assertions. The findings are a clear counterexample to the career of metaphor's postulate of a mandatory comparison process for all novel metaphors.

Second, the current findings showed that metaphors whose vehicles are modified by certain adjectives could express meanings that differ from the meanings of the corresponding similes. For instance, the interpretation *"Some lawyers are vicious"* was rated to be equally applicable to the metaphor and the simile form of *"Some lawyers are (like) sharks"*, whereas *"Some lawyers are greedy"* was preferred as an interpretation of metaphors. So, when the interpretation included properties such as *greedy*, which do not apply to the literal shark, but emerge in the context of the metaphor, it was the preferred to describe the meaning of the metaphor, but not the simile form. Such differences in interpretations can be accounted by the dual reference property of the vehicle: the adjective *vicious* refers to the literal predicate, encountered in the simile, while *greedy* refers to the abstract, metaphorical category, encountered in the metaphor. Interestingly, recent fMRI data suggest that different brain areas may be activated during the processing of metaphors and similes (Shibata, Toyomura, Motoyama, Itoh, Kawabata, & Abe, 2012).

Third, the use of an adjective modification paradigm yielded conceptual combinations that served as novel metaphor vehicles, e.g., *old sharks* in the lawyers-sharks example. This procedure raises the interesting and previously unexplored question

of how such adjective-noun combinations are processed in literal versus figurative expressions. The issue has been marginalized by theories of conceptual combinations, which are focused largely on nouns and modifiers that are not embedded in sentences. The results reported here suggest that some adjective-noun combinations may be understood differently or may elicit different meanings depending on the type of sentential or discourse context in which they are presented. Specific interpretations seem to be computed online and require an enriched form of semantic composition (e.g., Traxler, Martin, & McElree, 2002). Therefore, the same conceptual category may be interpreted differently in a literal sentence or in a simile, than in the corresponding metaphor.

Theoretical Implications for Metaphor Comprehension

Existing models of metaphor comprehension, including the standard comparison models (e.g., Ortony, 1979) and the recent career of metaphor argument (Bowdle & Gentner, 2005), assume that metaphors and similes are interchangeable. The dual reference property of the vehicle term is key. It specifies that metaphors and similes have distinct referents, which can lead to distinct meanings and distinct comprehension processes: categorization for metaphors and comparison for similes.

The career of metaphor account acknowledges the role of dual reference: as novel metaphors are lexicalized, their vehicle terms become polysemous, i.e., they are used to refer to both the literal term and the abstract, metaphorical category. However, crucially, dual reference is not an a priori property of the vehicle. Instead, it is acquired after repeated use as a byproduct of the initial comparison process and is only relevant for

conventional metaphors. Therefore, this account cannot accommodate the current results, which show significant changes in the meaning of novel metaphors as a function of grammatical form. The postulated shift from comparison (similes) to categorization (metaphors) that occurs over time implies equivalence in the meaning of the two tropes.

The career of metaphor argument also cannot explain the aptness and comprehensibility effects reported here. Bowdle and Gentner (2005) argue that novel metaphors are invariably processed as comparisons, hence they should always be privileged in simile form. Conventional metaphors are processed as categorizations or comparisons, hence they may be privileged in metaphor form. This is not always the case. We showed that novel metaphors could be privileged when expressed in metaphor rather than simile form, as shown in the current experiments. Conventional metaphors also exist that are apt and interpretable as similes, e.g., "The lecture hall was so crowded that *she felt like a sardine,"* but not as metaphors, e.g., *She felt she was a sardine*.

According to Bowdle and Gentner (2005), conventionality is a sufficient condition for categorization. However, based on the evidence reported here, it is not a necessary one. Instead, the present findings support the view that apt metaphors, both novel and conventionalized, can be understood as categorical, class-inclusion statements, while metaphors that are not apt, as well as similes, are likely to require a comparison evaluation. The key factor that determines whether metaphors are processed as comparisons or categorizations seems to be not conventionality, but aptness. Findings by Chiappe et al. (2003) similarly suggest that aptness, rather than conventionality, mediate the categorization process via which metaphors are understood.

Aptness is viewed as relative difficulty of comprehension, such that apt metaphors are easily understood, even out of context, whereas non- or less apt metaphors are more difficult to process, and may require non-trivial inferential work. In other words, metaphors differ in comprehensibility, with aptness being one determinant, and familiarity another, along with possibly other variables that may affect comprehensibility.

The issues of aptness and conventionality are related, in that aptness can be an important predictor of a metaphor's "career" and a prerequisite for "promotion" to metaphor conventionalization. Bowdle and Gentner (2005) define conventionality in terms of metaphors and similes with vehicle terms "that have become polysemous because of repeated and consistent figurative use" (pp. 204). Aptness is not directly incorporated in this definition, even though in most cases, aptness seems to be a necessary, albeit not sufficient, condition for conventionalization. Metaphoric expressions such as "*Mind is a kitchen"* and "*Science is a glacier",* which are not particularly good or apt to begin with, are unlikely to become lexicalized. Mere exposure to the same vehicle term, which was used to simulate lexicalization in one of Bowdle and Gentner's experiments, does not seem to ensure or predict conventionalization. Nevertheless, it is conceivable that some metaphors that are not very apt when they enter a language could persevere: with repeated use, they can climb up the career ladder to become more apt and acceptable as categorization statements. But, most importantly from a theoretical standpoint, novel metaphors do not have to start out as comparisons and follow the lexicalization route to be promoted to categorization. Instead, as the current studies have shown, they can be introduced and interpreted as categorizations right from the beginning of their career.

The implications of the present findings are clear. First, aptness seems to be a more important condition than conventionality for metaphors to be understood as categorical assertions. Apt metaphors, regardless of whether they are novel and conventionalized, are processed as categorizations, whereas similes and inapt metaphors are likely to be processed as comparisons. Second, metaphors and similes are not interchangeable and they do not always mean the same thing. Therefore, theories that assume equivalence in the interpretations of metaphors and their corresponding similes are flawed.

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