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Gradient Semantic Intuitions of Metaphoric Expressions

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Metaphoric expressions are not all equal, in the sense that some are intuitively more or less metaphoric than others. Part of this intuition is influenced by the underlying metaphor, but another part is influenced by the linguistic expression which carries that metaphor. This paper puts forward a system, first, of dividing the two important elements which contribute to gradient intuitions of metaphoricity. These are (1) the density of the metaphor in the surface semantic content of the expression and (2) elements of the relationship between source and target in the underlying metaphor. Second, the paper puts forward a system for measuring the overall metaphoricity of an expression. This is a comparative system which can replicate intuitions that any two expressions have either equal or varying degrees of metaphoricity. The most interesting conclusion which can be drawn from intuitions of metaphoricity is that there are multiple factors with equal influence on metaphoricity. These factors can create conspiracies which disguise the strength of the underlying metaphor.

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VARIATIONS IN METAPHORICITY

The clearest available pieces of evidence for a metaphor are the linguistic metaphoric expressions which that metaphor produces in the surface semantic structure of language. Metaphor is a cognitive process which is difficult to see, and it follows from this that we should try to discover as much about that process as we can from these surface metaphoric expressions. And yet we talk about metaphoric expressions as if they were all equal – as if every metaphoric expression represents its underlying metaphor with equal density, and as if every underlying metaphor itself were of equal strength (for lack of a better term). In other words, we talk about metaphor as if something either is one or is not one, with no variations in metaphoricity. It seems clear, however, that this is not the case. Some metaphoric expressions are more metaphoric than others. Consider the following examples:

(1) *"This unrequited love has [swallowed up] my sanity."*
(2a) *"This unrequited love has become [an empty bottle]."*
(2b) Context: *There is nothing left to pour out.*

Example (1) is a less metaphoric expression in which an emotional event is given the properties of a physical event. While metaphoric, it is so only to a medium degree (this "degree" is currently undefined, but I am issuing a promissory note to be redeemed shortly). Example (2a) is

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a more metaphoric expression in which an emotional event is given the properties of a physical object. While more marked, it is perfectly acceptable when followed, for example, by (2b). We can say that the metaphoric expression in (2a) is intuitively more metaphoric than that in (1). If this intuition is correct, there seem to be two possible explanations: (i) the first sort of metaphor is so common that by sheer frequency it has become less metaphoric; (ii) there is some sort of underlying semantic competence which distinguishes between the two.

Before discussing these two possible approaches, I want to discuss, for a moment, this property "metaphoric." There is clearly an intuition possessed by native speakers that some utterances are metaphoric and others non-metaphoric. The vast literature on metaphor is enough to show that this intuition exists. The question is whether this intuition is atomic and cannot be broken apart, or whether it is gradient. If the former, we should be able to detect no consistent difference between metaphoric expressions. If the latter, we should expect that native speakers can identify some expressions as "more metaphoric" than others. These more metaphoric expressions are more marked, in the sense that they stand out more clearly from "literal" expressions. Another property of more marked or metaphoric expressions is their increased vagueness: less metaphoric expressions can often be given a rather precise paraphrase, while very metaphoric expressions only provide a general sentiment or mood and cannot be precisely paraphrased. As Sperber and Wilson point out (1995, p. 60), the vagueness of these metaphors is an important property: we cannot (or at least, should not) assume that all metaphors can be interpreted with the same level of precision. If this is the case, then it follows that we need to identify the properties which contribute to metaphoricity.

Let us return briefly to the question of what sort of explanation we should consider for this variation. One approach is to say that some underlying metaphors are more common and thus processed more often, resulting in a less marked or metaphoric expression. A second approach is to posit an underlying competence or system of rules, the application of which creates this variation. Both approaches are useful and necessary (see, for example, Steen's insightful, 2007, account of the different approaches to metaphor in grammar and usage). We will abstract away from this question here, however, and take the polytheistic stance that both performance and competence provide legitimate and useful explanations. This present paper is concerned with competence which, while unable to explain every intuition about metaphor, is nonetheless a vital component.

I have a simple goal for this paper: to provide a system for measuring varying intuitions about metaphoric expressions in two respects, as listed in (3) below. At the very least, we will gain from this the ability to break metaphoric expressions apart and stop treating "metaphoric" as an atomic property.

(3) Intuitions of metaphor
(3a) Strength: how metaphoric is the underlying conceptual metaphor?
(3b) Density: how much of this metaphor is present in the metaphoric expression?

Examples (1) and (2) above were meant to show how the "strength" of underlying metaphors can vary. I would like to find a way to measure this "strength" so that we do not have to rely on terms like "more metaphoric" or "a stronger metaphor," which are vague at best.

In order to explain the density mentioned in (3b), consider examples (4)–(6) below.

(4) *Mary disproved John's argument*.
(5) *"Mary demolished John's argument."*
(6) *"Mary demolished John's strongest weapon."*

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Example (4) is a literal sentence meaning that Mary and John were debating and Mary falsified John's argument. Example (5) is a mild metaphoric expression, in which the verb is changed according to the *"ARGUMENT IS WAR"* conceptual metaphor. Both case roles of the verb continue to be filled by non-metaphoric material. In example (6), however, the theme role is replaced with metaphoric material according to the same underlying conceptual metaphor, with the result that the metaphoric expression now contains more of that metaphor, is "denser" in respect to metaphoricity. Further, example (6) is ambiguous between literal and metaphoric readings: we could also read this as a literal description of a battle of some sort. Rather than use informal terms like "density," I would like to find a way to measure this.

The formulation in (7) is a first approximation of what this measurement will look like. It simply states that the metaphoricity of a given sentence (i.e., a metaphoric expression) can be found by taking the strength of the underlying metaphor and multiplying it by the amount of its density in the final expression.

(7) Metaphoricity = [Strength of metaphor] × [Density in metaphoric expression]

Finally, what does it mean to say that we can model gradient intuitions of metaphoric expressions? To develop a set of necessary and sufficient conditions for a sentence to be metaphoric involves setting up a sharp boundary between metaphoric and non-metaphoric sentences. A gradient measure, on the other hand, takes a relative approach in which a metaphoric expression is compared only to other expressions. Even if we cannot say precisely what is both necessary and sufficient for a sentence to be metaphoric, we can still compare two particular sentences and say that one is more metaphoric than the other (even if one is metaphoric and the other is not). Thus, even without a strict categorization of the supposedly binary property "metaphoric," we can provide a finer-grained treatment of the particular properties which, when combined, create a metaphor – even if it is the case that no one metaphor must have each of the properties in order to be considered metaphoric. As we will see in section 4 below, an important fact about metaphoric expressions is that the properties which control metaphoricity can combine in unexpected ways, creating what I will call conspiracies. These conspiracies are precisely what makes a formulation of the necessary and sufficient conditions of metaphoric expressions impossible.

We will start with an examination of the density of metaphoric expressions, for the simple reason that we need to take density into account when we try to compare intuitions about underlying metaphors. Before starting, I want to briefly mention some of my operating assumptions. First, we are dealing with metaphoric expressions and with underlying metaphors. We will discuss ways of dividing the metaphoric expressions into their necessary components, but will assume that the underlying metaphor is also available as input. In other words, I will assume that we know from the outset that examples (4)–(6) above are instances of the "*ARGUMENT IS WAR"* metaphor. In no way is this a trivial assumption: deriving the underlying metaphor from a metaphoric expression is a difficult and important task. But, in order to stay focused on the task at hand, we will assume that such a method is available and that we start with access to both forms of input (i.e., to both metaphoric expressions and their underlying metaphors).

DENSITY OF METAPHORIC EXPRESSIONS

The density of a metaphoric expression is the amount of the underlying metaphor which appears in the surface semantic structure. Stepping back for a moment, the surface semantic forms of

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language are propped up by encyclopedic knowledge, against which the underspecified surface forms are interpreted (see Raskin, 1985, for a discussion of the line between encyclopedic and linguistic knowledge). This encyclopedic knowledge takes the forms of lexical entries, knowledge about the world (including common sense), and a collection of scripts or frames which bind together certain pieces of encyclopedic knowledge so that other elements can go unspecified in context. Natural language semantics is underspecified in the sense that the surface elements of meaning rest on assumptions, or reasonings from assumptions, drawn from common sense (see for example Searle, 1978). Because these elements of semantic meaning are not overtly present, it is a difficult task to make them explicit. Without making them explicit, however, a large gap in meaning is missing and reasoning becomes impossible. Take, for example, sentence (8) below (from Collins & Quillian, 1972; see also Schank & Abelson, 1977).

(8) *The policeman held up his hand and stopped the car.*

The proper interpretation of this sentence requires the common sense knowledge that the policeman did not physically stop the car, but rather that the authority which the policeman represents persuaded the driver of the car to stop voluntarily. Some entity below the surface, whether it is called a script or a frame, supports the underspecified meaning of this sentence. And this entity is itself supported by a model of the world, which is itself supported by common sense (or, to use another term, by embodied experience). Metaphor is a process which changes the encyclopedic (or, more precisely, the ontological) knowledge underlying the underspecified surface forms of natural languages. The more the surface semantic form depends upon metaphorically altered or connected structures, the denser the metaphoric expression will be. In other words, metaphor is ontological change and "density" refers to the degree to which this change is explicit or apparent in the surface semantic content.

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Semantic Constituents

The first step in measuring density is to divide the surface semantic form of the metaphoric expression into the constituent parts which can be filled with metaphorically altered material. Case roles (or thematic roles) distinguish the relationships between an event and its participants. There are many accounts of which case roles should be recognized. The issue is of secondary importance here and we will adopt those defined in Nirenburg and Raskin (2004): *agent, beneficiary, destination, experiencer, instrument, location, path, purpose, source,* and *theme*. We will add *event* to this list, for those situations in which the verb carries the metaphoric material. The above list of possible case roles contains both necessary and unnecessary (or in other terms, obligatory and optional) elements. What this means is that some case roles are arguments that are necessary for an event (i.e., *put* requires both a theme and a location) and others are adjuncts which supply other sorts of information (i.e., specifying a path or manner for *put*, both of which are allowed but not required). The collection of obligatory and optional case roles constitutes for our purposes the surface semantic structure of the sentence (and the sentence becomes a metaphoric expression if any of these case roles are filled with metaphoric material).

What constitutes a metaphoric case role? A metaphor consists of a target and a source (in *"ARGUMENT IS WAR,"* the target is ARGUMENT and the source is WAR). A case role filled with

material from the source domain is metaphoric. To operationalize density measurements, first we need to divide the metaphoric expression into its various case roles. Each case role which contains material from the source increases the density.

The examples in (9) through (11) show how a single underlying metaphor can be present in various case roles. Each of these examples contains an instance of the "*ARGUMENT IS WAR*" metaphor. In (9), only the event contains metaphoric material; in (10) the agent; in (11) the theme. Because only one of the case roles in each of these examples contains metaphoric material, there is a semantic clash when interpreting the sentence. In other words, no literal reading is possible.

(9a) Event
(9b) "*Mary [demolished] John's argument*."

(10a) Agent
(10b) *"[The enemy] produced a strong argument*."

(11a) Theme
(11b) "*Mary disproved [John's strongest weapon]."*

The density of a metaphoric expression increases which each semantic constituent which depends upon metaphoric material. For example, (12) below is ambiguous between a literal and a metaphoric reading. In contexts where the agent "Mary" has been identified in the previous discourse as an interlocutor, however, this ambiguity is not possible, or at any rate is not likely. In (13), on the other hand, even the agent has been replaced with metaphoric material and the interpretation is truly ambiguous even in discourse context. The conclusion we can draw from this is that semantic constituents have a direct influence on the density of metaphoric expressions.

(12a) Event-Theme
(12b) "*Mary [demolished] [John's strongest weapon]."*

(13a) Agent-Event-Theme
(13b) *"[The enemy] [besieged] [John's best stronghold]*."

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Zero and Total Density

We will say that a metaphoric expression is "saturated" when it contains a metaphor with sufficient density to be ambiguous between a metaphoric reading and a literal reading in a different domain. Example (14a) below is an instance of a saturated metaphoric expression. That it is ambiguous between the two readings can be shown by following it with either (14b) or (14c). The idea of saturation provides us with an upper bound for density judgments. On one end, a sentence with no metaphorically filled case roles is not at all metaphoric; on the other end, a saturated sentence can be either entirely metaphoric or not at all metaphoric. These two ends of the spectrum can be filled with the same surface content (i.e., (14a) could be either saturated or non-metaphoric, depending on context).

(14a) *"[The enemy] [besieged] [John's stronghold]*."
(14b) *He was denied tenure after his theory was disproved.*
(14c) *He was captured and convicted of treason.*

Measuring Density Intuitions

Measuring density is the first step in making metaphoricity judgments consistent. In other words, we can filter out differences of density in order to focus on differences in strength. The basic form which measuring density will take is determining a relative numerical value for density and multiplying the "strength" of the metaphor by this value. The numerical value itself is of course meaningless except in its relation to the numerical density value given to other metaphoric expressions. Essentially, this means that density measures how much of the underlying metaphor is projected onto the metaphoric expression. A first approximation of this measurement is to simply count the number of metaphoric case roles in the utterance. We must, however, be sure to count semantic constituents: metaphor is phenomenon which affects the *semantic* structure of an expression. So, for example, measuring the number of metaphoric words is inaccurate because multiple words can fill a single semantic constituent. And we need to measure semantic, not syntactic, density. Counting the number of metaphoric words (see Pragglejaz Group, 2007) is the linguistic equivalent of counting the number of morphemes or syllables which make up the metaphoric material. It will only indirectly approximate semantic density. These elements (words, morphemes, syllables) are contained in semantic constituents; it is important not to conflate them with semantic constituents.[1]

There are three relevant questions about density values: (i) do some case roles consistently have a greater influence on density than others? (ii) do obligatory case roles have a greater influence than optional case roles? (iii) does the number of metaphoric lexemes within a given case role influence that case role's overall contribution to density? The first two are interesting questions which we can avoid for the present by treating all case roles as holding equivalent influence. The third we will investigate here by comparing the density of metaphoric expressions with a single metaphoric case role, one version of which with a single lexeme filling that case role and a second version with two lexemes. The example in (15) is an instance of the underlying metaphor "*POLITICS IS LOVE*." (a) contains a single one-lexeme metaphoric case role, (b) contains a single two-lexeme metaphoric case role, and (c) contains two one-lexeme metaphoric case roles. The question at hand is whether (b) is denser than (a), and whether (c) is denser than (b).

(15) Event
(15a) "*Senator Jones is [courting] the other party.*"
(15b) "*Senator Jones is [courting and messing around with] the other party.*"
(15c) "*Senator Jones is [courting] [a new mistress].*"
(15c') . . . *the Democratic party.*

Example (15) shows that additional lexemes within a single case role can only slightly increase the density. Thus, the difference here between (a) and (b) is almost trivial. However, the addition of a second case role, as in (c), dramatically increases the density to the point of saturation. In (15c), the *mistress* could very well be a literal sexual partner or a metaphoric reference to the opposing political party (as when followed by (15c'). From this example, then, it

[1]And yet the Pragglejaz method captures an intuition which we should not throw away. Lexemes (a formal term for "word" to avoid confusion) are involved in the density of metaphoric material, but only in a way secondary to semantic constituents. We will see this shortly.

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seems that case roles have a far greater influence than lexemes. For present purposes we will use the broadest formulation of density, given in (16), and move on.

(16) Metaphoricity = [Strength of metaphor] × [# Case Roles]

STRENGTH OF UNDERLYING METAPHORS

Now that we have factored out density, we are in a position to assess more directly the metaphoricity of the underlying metaphor (which I have been referring to as "strength"). Even when two metaphoric expressions are of equal density, one can be more metaphoric than other. It turns out that the strength of the underlying metaphoric structure is a direct result of the relationship between the target and source of the metaphor. Further, there are few (if any) absolute constraints on this relationship because any underlying metaphor is possible. Conceptual metaphor theory, for example, focuses on a relatively small number of recurrent metaphors such as *"ARGUMENT IS WAR"*. In all of these conceptual metaphors, however, the target and source can be reversed, as in (17) below. The challenge, then, is that all underlying metaphors are possible but all are not equal. This is where gradient judgments of metaphoricity come into play. We cannot by fiat exclude some metaphors, but we also cannot include all metaphors equally. Given, then, that all or nearly all arrangements of target and source of possible, what are the relationships between target and source which increase the strength (or metaphoricity or markedness) of the underlying metaphor?

(17) "*The enemy battle lines debated lightly with their muskets until dusk.*"

To measure the strength of a metaphor, we first need to discover the relevant components of the relation between target and source. Stepping back, there are two general explanations for metaphor: (i) two independent concepts (target and source) are combined or connected (e.g., conceptual metaphor theory; Lakoff & Johnson, 1980, 1999; Lakoff, 1993); (ii) a single concept is modified (e.g., relevance theory; Sperber & Wilson, 1995). For our purposes, a choice of one over the other is irrelevant. We are concerned with the relationship between target and source, which remains constant under either theoretical approach. A metaphoric expression depends upon an underlying ontologically changed concept(s). The question, then, is how to measure these ontological changes. An approximate measure is given in (18) below.

(18) Strength = [Distance] + [Direction]

Distance

Distance refers to the ontological separation between the target and source concepts. This distance is measured in terms of domains. The question of which ontological domains are relevant is secondary to our present purposes and we will follow the system given in Nirenburg and Raskin (2004): *mental, social, intangible, physical*. The question here is whether target-source relationships between these various domains are consistently more or less metaphoric. Given that we are concerned with four domains, there are twenty-four possible relationships which can hold between target and source. Rather than examine each possible combination, we will instead look at only four. The reason for this minimal number is that there are two broad sorts of domain

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relationships: cross-domain or same-domain metaphors. The argument I will make below is that cross-domain metaphors are more metaphoric than single-domain metaphors, but that more fine-grained judgments which take into account the specific domains involved are, at least for now, impossible. Thus, we are looking only configurations of domains in which the identity of the domains is inconsequential.

(19a) "*MENTAL IS MENTAL*"
(19a') "*This relationship is a bad dream.*"

(20a) "*PHYSICAL IS PHYSICAL*"
(20a') "*The eagle is a lion among birds.*"[2]

(21a) *[This relationship / the nightmare] kept me up all night.*
(21b) *[The eagle / the lion] swoops silently onto its prey.*
(21b') *[*The eagle / the lion] runs silently through the underbrush.*

Examples (19) and (20) are metaphoric but do not involve cross-domain mappings. Both are mild or unmarked metaphors, and in neither example is there semantic clash or ambiguity. At the same time, both concepts share so many properties that they also share many inferences. The result is a metaphor so mild that slight substitutions can cause it to disappear. In example (21) the same material can be predicated of either the target or the source. Such substitutions are not as widely possible in cross-domain mappings. At the same time, (21b') shows that some substitutions are simply not possible. Overall, these intuitions about same-domain metaphors lead us to the conclusion that they are the weakest or mildest.

(22a) "*MENTAL IS PHYSICAL* [*LOVE IS A BUILDING*]"
(22a') *"This relationship needs a new roof."*

(23b) "*PHYSICAL IS MENTAL* [*BUILDING IS LOVE*]"
(23b') *"Our roof has been cheating on me every time it rains."*

Examples (22) and (23) both contain cross-domain mapping. Both are more marked than their counterparts in (20) and (21). Intuitions about the relationship between domains are less clear, however, once we consider the domains involved. In other words, (22) is equally as metaphoric as (23). Given these intuitions about the domains involved, we can define distance as in (24) below. Same-domain metaphors thus will be given a value of [1] for distance and cross domain metaphors will be given a value of [2]. Much like the influence of different case roles and of obligatory vs. optional case roles mentioned above, finer-grained judgments about the relations between the ontological domains will not be considered here.

(24a) Distance = [# Domains]
(24a') Distance = [1] or [2]

Direction

There are two basic types of concepts, events and objects (we will refer to this type-distinction as "function"). Events are actions, occurrences, happenings, and the like. Objects are the entities

[2]Example taken from Tourangeau and Rips (1991).

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which participate in events, and can exist across multiple events. Both events and objects can be located in any of the basic ontological categories discussed above. In other words, mental and social and intangible and physical concepts can take shape as either events or objects. Thus, direction can be viewed as the mapping of event and object status on top of the mapping of particular ontological category. This means that the relationship between the target and source includes the event/object status of each. There are four possible relationships between functions and we will consider examples of each. For these examples we will return to the underlying "*POLITICS IS LOVE*" metaphor. We will restrict the case roles involved to only patient/theme. The proto-typical events are verbs and the proto-typical objects are nouns, but this does not have to be the case. We will consider only nouns here in order to hold the judgments as constant as possible (which, of course, constrains the form of the metaphors).

(25) Event is Event
(25') "*[The controversial vote] quickly became [a circus act.]*"

(26a) Event is Object
(26a') "*[The controversial vote] quickly became [a dead fish.]*"
(26a") "*. . . It started to stink that same day.*"

Let's start with the comparison with metaphoric expressions according to the event function. (25') is an instance of the "*POLITICS IS LOVE*" metaphor in which both target and source are events. We have used nominal events for consistency, which perhaps can cause confusion because *act* has facets referring either to an event (the process of voting) or an object (the entity of a single vote). This is a common sort of meaning variation which does not constitute true ambiguity. In this case, *a circus act* requires an event reading for *vote*; we could, for example, assume that the controversy is contained in the act of a single vote, perhaps a swing senator. However, for this reading of the metaphor, that one act of voting would need to be performed in a strange manner, as if the senator danced down the aisle as he voted. The default reading, then, is that an event of voting involving many senators became a show, with filibusters and drama and those sorts of things. Under this reading (e.g., as an *event is event* metaphor), (25) is less marked than (26a') in which the *event is object* reading is the only available reading.

(27) Object is Object
(27') "*After the vote, [the construction bill] became [an abandoned widow].*"

(28) Object is Event
(28') "*After the vote, [the construction bill] became [a honeymoon in Canada].*"

The next pair of metaphoric expressions leads to a similar conclusion: (27'), in which the target and source share the same function, is less marked or metaphoric than (28') in which an object target is matched with an event source. The function distinction in target-source relationships only influences metaphoricity when there is a mismatch. The best way of measuring this component of metaphoric expressions, then, is given in (29a). Essentially, this means that direction normally has the value [0] when the target and source share a function, and has a value of [1] when they differ, whether that is an *event is object* or an *object is event* relationship.

(29a) Direction = [Number of Function Mismatches]
(29b) Direction = [0] or [1]

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CONSPIRACIES

We now have a system for measuring gradient intuitions of metaphoricity. (30a) repeats the general outline of the system and (30b) shows the developed version. The importance of the gradient variations which I mentioned in the first section should be clear by now: not only do metaphoric expressions vary widely in metaphoricity (so that "metaphoric" is not a binary or atomic property), but increased metaphoricity can be built up through a conspiracy of the various components of metaphoricity (what I have called density, distance, and direction). This sort of conspiracy can influence research on underlying metaphors because the linguistic metaphoric expressions which carry those underlying metaphors may become more "metaphoric" as a result of factors not present in the underlying metaphor itself. So, for example, if we wanted to examine the relationships between two domains or sub-domains, we would need to keep the function (e.g., event/object) and case role status constant. This is important for any metaphor research which depends upon metaphoric expressions for access to the underlying metaphor.

(30a) Metaphoricity = [Distance + Direction] × [Density]
(30b) Metaphoricity = [[# Domains] + [# Functions]] × [# Case Roles]

In the remainder of the paper I want to go through some examples of different measurements of metaphoric expressions, starting with the least metaphoric to the most metaphoric. Along the way we will keep an eye out for conspiracies to see whether the different components of metaphoricity really can combine in this particular manner. It is important to keep in mind that the upper bound for density is saturation (i.e., ambiguity between literal and metaphoric readings). In most cases this will be reached at three or even two case roles. In addition, the highest value which the underlying metaphor can contribute is [3]: a cross-domain mapping with a difference in function. This provides the upper bound of the measurements, judgments about which increase rapidly in metaphoricity. This models the intuition that, after a certain point, metaphors quickly become marked and difficult to interpret. The lower bound is not so easy to define, however, and this is a weakness which prevents us from establishing the necessary and sufficient conditions of metaphor. What this means, in other words, is that the status of expressions with a metaphoricity value of [1] is unclear. For example, (31a") below has a metaphoricity value of [1]. Is this a metaphor? I am not sure that it is. For instance, such a metaphor only appears to be possible (in a single case-role form) in an *A is B* construction. Expressions such as (31a"') can only be interpreted as false literal statements. The underlying structure is given in (31a'), and involves no mismatches in either domain or function. The reason it is not clear that *A IS B* expressions like this with a metaphoricity of [1] are metaphors or not is that any other single case-role formulation, like (31a"') and (31a"") becomes unacceptable. No other form of a metaphoric reading is possible. At any rate, we have avoided the question of a lower bound here by offering a system of gradient judgments which only compares the metaphoricity of two expressions relative to each other.

(31a) Metaphoricity (1) = [[1 Domain] + [0 Function]] × [1 Case Role]
(31a') "*PHYSICAL IS PHYSICAL*," *object is object, theme*
(31a") *"The eagle is [a lion] among the birds."*
(31a"') ?The eagle roars during the hunt.
(31a"") ?The eagle has strong, sharp teeth.

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The next group of expressions have a metaphoricity of [2], a rating which is possible under three different combinations. Although each of these expressions is clearly metaphoric, we cannot intuitively say that one is more or less so than another, even though each expression's metaphoricity has a different source. (32a") is a cross-domain metaphor with a MENTAL target and a PHYSICAL source. There remains only a single possible reading, however. (32b") is a single domain metaphor in which the act of running a marathon is compared to the object which results from that action. Again, this is clearly metaphoric but can be given only a single reading. (32c") is a version of (31a") above, except that it has been reformulated so that the metaphor is present in two case roles. In the version in (31a"), a single case-role version can only be formed in a *A IS B* format, but here the two case roles allows different formulations of the expression. The fact that these three metaphoric expression share a similar degree of metaphoricity even though they differ in the sources of that metaphoricity is evidence of the conspiracy between factors that we have been considering.

(32a) Metaphoricity (2) = [[2 Domains] + [0 Function]] × [1 Case Role]
(32a') "*MENTAL IS PHYSICAL," event is event, event*
(32a") "*Trying to research metaphor [swallowed up] my sanity."*

(32b) Metaphoricity (2) = [[1 Domain] + [1 Function]] × [1 Case Role]
(32b') "*PHYSICAL IS PHYSICAL," event is object, theme*
(32b") *"Yesterday's marathon was [a pair of dirty shorts]."*

(32c) Metaphoricity (2) = [[1 Domain] + [0 Function]] × [2 Case Roles]
(32c') "*PHYSICAL IS PHYSICAL," object is object, agent / event*
(32c") "*[The lion among the birds] [roars] during the hunt."*

The only combination which can give a value of [3] in the present system is shown in (33) below. (33') is, again, clearly more metaphoric than its counterpart in (32b") above. The expression as a whole is marked in the sense that no clear precise interpretation is possible. However, the expression still can be interpreted in less clear terms, especially when followed by something like (33"').

(33) Metaphoricity (3) = [[2 Domain] + [1 Function]] × [1 Case Role]
(33') "*MENTAL IS PHYSICAL," event is object, theme*
(33") *"Trying to research metaphor soon became [an empty bottle]."*
(33") "There was simply nothing left to pour out."

The trend continues in (34), whose expressions are more metaphoric than those proceeding. (34a") is similar to its counterpart in (32a"), but the markedness is increased. Further, the expression is ambiguous between a metaphoric reading and a literal (albeit unlikely) reading in which the physical marbles are physically swallowed. It may require a science fiction context, but the sentence could be non-metaphoric nonetheless. (34b") is more metaphoric than its counterpart in (32b").

(34a) Metaphoricity (4) = [[2 Domain] + [0 Function]] × [2 Case Role]
(34a') "*MENTAL IS PHYSICAL," event is event, event / theme*
(34a") *"Trying to research metaphor [swallowed up] [my few remaining marbles]."*

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(34b) Metaphoricity (4) = [[1 Domain] + [1 Function]] × [2 Case Role]
(34b') *"PHYSICAL IS PHYSICAL," event is object*
(34b") *"Yesterday's marathon was [a pair of dirty shorts] [dripping with sweat]."*

The final, and most metaphoric, example is (35) below. Metaphoricity ratings at this level and above quickly increase in markedness and vagueness. There is no precise mapping or interpretation, only a broad impression. We see, as a result of this, the importance of distinguishing between degrees of metaphoricity, since a metaphoric expression like (35") clearly should not be equated with an expression like (31a") or (32a"). All three are metaphors, but certainly are not equally so.

(35) Metaphoricity (6) = [[2 Domain] + [1 Function]] × [2 Case Role]
(35') *"MENTAL IS PHYSICAL," event is object, theme*
(35") *"Trying to research metaphor is [an empty bottle] [broken on the ground]."*

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Metaphoricity, Saliency, and Aptness

Now that we have worked out an understanding of metaphoricity, I want to briefly consider the distinction between metaphoricity, saliency, and aptness. All three terms are used in reference to a similar property of metaphors and yet have clearly distinct meanings. The first distinction involves the level of semantic structure to which each refers. Metaphoricity, as I have been using it here, refers to the expression of a metaphor in language: a sentence (or rather, an utterance) has a metaphoricity value, but the underlying metaphor-in-thought has something else. I have called this something else "strength" to avoid theoretical assumptions. It has also been called aptness and saliency. The metaphoricity of an utterance is only indirectly related to aptness and saliency, as we have seen, because metaphoricity only has value in reference to the surface language structure.

Saliency is involved in metaphoric language. Yet it is equally involved in non-metaphoric language. The problem of saliency in the interpretation of non-metaphoric language is almost, if not entirely, as difficult as in the interpretation of metaphoric language. The idea behind saliency in metaphor is that when two concepts (target and source) are combined, the most salient or relevant or central portions will be combined and entailed, rather than more outlying portions or properties of the concepts. A counter-argument to the measurement system developed here (i.e., that strength depends upon the relation between target and source) is that this should be replaced with a treatment of saliency. In other words, "stronger" metaphors have less salient connections and thus trigger stronger intuitions of metaphoricity. The problem with this sort of argument is that there does not seem to be a threshold of saliency in the creation of metaphors: in the right context, any metaphoric connection can be made. Further, this is a problem because saliency, in both figurative and non-figurative language, is not a matter of degree (e.g., more salient, less salient), but rather of what portion of a concept something is salient to. Consider the following examples:

(36a) *Peter enjoyed the [pepperoni] pizza.*
(36b) *Peter enjoyed the [cafeteria] pizza.*
(36c) *Peter enjoyed the [occasional] pizza.*
(36d) *Peter enjoyed the [stolen] pizza.*
(36e) *Peter enjoyed the [occasional [stolen][pepperoni] pizza.*

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The examples in (36) show a series of adjectives in an utterance modifying the noun "pizza." Interpreting any of these non-figurative utterances involves discovering the salient connection between the adjective and the concept it modifies. In (36a), the adjective describes the sort of pizza involved; more precisely, what toppings the pizza has. In (36b), the adjective describes the location in which the pizza was either prepared or eaten. In (36c), the adjective "occasional" refers not to any property inherent in the pizza but to the frequency with which Peter is in the habit of enjoying pizza (see Raskin & Nirenberg, 1995, for further analysis). In (36d), the adjective explains the means by which the pizza has been obtained. In each of these examples, the adjective modifies a different salient property of the concept "pizza". In what way is any one of these adjectives more "salient" than the others? This is not an issue of degrees of saliency. Rather, this is an issue of what aspect or portion of the concept, script, or other semantic structure these particular attributes are salient in respect to. The particular arrangement, in English, of adjectives with different saliency-relationships is rather fixed, as shown in (36e). Yet it is not clear whether this is evidence for a hierarchy of saliency-in-thought or for an arbitrary semantic grouping in English. At any rate, saliency is only an indirect property of the underlying metaphor: necessary for interpretation, but with little or no influence on the metaphoricity of the utterance or the "strength" of the metaphor. Saliency is a matter of relation and not of degree.

What, then, is aptness? The use of this term (for example in Tourangeau & Sternberg, 1981, 1982) corresponds more or less with the strength of the underlying metaphor. When we define aptness, which we can do in many different ways, it is important to avoid aesthetic or artistic overtones. The quality which makes a metaphor successful in literary or rhetorical contexts is not a question for linguistic semantics. Tourangeau and Sternberg define aptness as the combination of within-domain similarity (in which two concepts are situated in comparable locations inside their own domains) and between-domain similarity (in which the two domains involved are more distant from one another). The more similar the inter-domain positions and the less similar the between-domain distances, they argue, the greater the aptness of the metaphor. This is a good approximation, so long as we put aside matters of definition. In general terms, distance as we have defined it here is equivalent to between-domain distance and direction is equivalent to inter-domain position. In the end, then, aptness and strength are equivalent ideas, with the essential difference that strength has been defined precisely. The problem with the definition of aptness is that domains are not in any sense two-dimensional entities, so that such spatial metaphors are misleading (e.g., position within domain is an unclear definition because domains do not have positions within them). Furthermore, any attempt to define aptness in terms of saliency (see, e.g., Utsumi, 2007), while providing interesting results, is difficult to interpret without a comprehensive account of saliency in non-figurative language. In this case, defining aptness in terms of saliency is a step in the wrong direction.

There is one final crucial difference between strength and aptness: the idea of conspiracies. We have seen that an increase in either distance or direction can increase the strength of the metaphor, and can do so independently of the other attribute. This independence characterizes metaphoric expressions and it requires treatment in terms of a gradient scale instead of in terms of necessary and sufficient conditions. A further distinction between aptness and strength is that aptness has overtones of successfulness or quality. In other words, a more apt metaphor is a better metaphor. But this is true only for a certain range of aptness. Once we recognize that metaphors are gradient (especially in their surface expressions), then we see that metaphors can become so strong that they are marked. The problem with using "aptness" as a label for this property is that

it is counter-intuitive to talk about a metaphor being "too apt" to be precisely interpreted, even though this is clearly possible. In other words, once aptness increases beyond a certain point, the technical and informal uses of the word diverge. This creates ambiguity. For these reasons, I have used "strength" instead of "aptness" to describe this particular attribute.

CONCLUSIONS

Metaphors and metaphoric expressions are not the same thing, as has been discussed in the literature. We have seen, however, that metaphoric expressions are not simply the carriers of metaphors that they have been assumed to be. Metaphoric expressions vary widely in their degree of metaphoricity, and this variation cannot simply be equated with variations in the underlying metaphors. Metaphoric expressions can themselves influence metaphoricity judgments. At the same time, we have also seen that it is possible to analyze metaphoric expressions in such a way that we can control for this influence. In other words, if we are careful we can keep the metaphoric expressions constant and compare the metaphors upon which they depend.

What are the uses of metaphoricity judgments of the sort developed in this paper? I will mention two here. First, they allow us to control for the influence of metaphoric expressions in discussions of and experiments about metaphor in thought. When we deal with metaphors embedded into natural language, we should choose metaphoric expressions with equal metaphoricity ratings to ensure accuracy. Once the expression has been properly controlled, the underlying metaphor in thought is more clearly available. Second, metaphoricity ratings let us be more precise in computational treatments of metaphor. Some approaches (e.g., Barnden, 2007) assume that any differences in metaphoricity originate in the underlying metaphor. But we have seen that this is not the case, as important as mappings in thought are to metaphoric expressions. The first step to computing a metaphor in artificial intelligence should be to unwind the language of its metaphoric expression as much as possible. This is a task for computational semantics. The bottom line is that, if native speakers' intuitions about metaphoric expressions are gradient, then theoretical and computational approaches should also be gradient.

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