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TOWARDS A COMPUTATIONAL MODEL OF METAPHOR

A Thesis

Submitted to the Faculty

of

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by

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of

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To Naomi, who wishes this were a dissertation.

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ABSTRACT

Dunn, Jonathan E. M.A., Purdue University, May, 2010. Towards a Computational Model of Metaphor. Major Professor: Victor Raskin.

This thesis works towards a micro-theory of metaphor within the ontological semantics framework. It does so using a parameter-based system modeled roughly after Attardo and Raskin's (1991) general theory of verbal humor. At the same time, it tries to convert Lakoff and Johnson's (1980) observations about metaphor and conceptual networks into a theory defined against a formal ontology. The first chapter deals with the nature of a theory of metaphor and how a parameter- and ontology-based approach compares to other (informal) theories of metaphor. The second chapter deals with identifying and informally explaining the parameters of metaphor. These are the distinctive features by which we can track the changes which metaphor creates in the underlying conceptual network / ontology, which in turn causes metaphoric expressions to appear on the surface. The third chapter attempts to order the relations between these parameters. The ultimate goal of a computational model of metaphor is to explain the metaphoric relationship between any two concepts whose connection exists in the conceptual system (formalized in the ontology) rather than in external reality (which the conceptual system otherwise models in "literal" language). The input to such a model will be the two concepts (Target and Source) and the method of reconstructing their metaphoric relationship will depend in a large part on precisely defined relationships between the parameters. This thesis does not offer such a definition, but it does set-up the theoretical foundations which such a system must rest upon, does identify the relevant parameters, and does provide an informal and initial ordering, all as steps toward a complete computational model.

CHAPTER 1: THEORETICAL FOUNDATIONS

1.1. <u>Introduction</u>

In preparing a computational model of metaphor based on meaning, we must first consider the theoretical foundations on which such a model is based. We must also consider the foundations of non-computational theories or models of metaphor, in order to make use of as many of their insights as possible. To this end, this chapter will consider the relationship between conceptual metaphor theory (Lakoff and Johnson, 1980, 1999; and Lakoff, 1987, 1993), ontological semantics (Nirenburg and Raskin, 2004), and the general theory of verbal humor (Attardo and Raskin, 1991).

First, metaphor is not something which is directly present in language. Rather, only the effects of metaphor are visible. Lakoff and Johnson (1980) divide these two layers or levels of metaphor into (1) unseen conceptual metaphors and (2) attested metaphoric expressions. Figure 1 shows how the unseen metaphor LOVE IS A JOURNEY is revealed in multiple expressions. None of these expressions are themselves metaphors. They are, instead, metaphoric expressions; that is, reflections or by-products of some other entity which we are calling "metaphor." The goal of linguistic metaphor research is to uncover this unseen entity. In other words, the problem which we face here is that there are multiple expressions with related semantic content but apparently unrelated surface forms. How can we explain this related semantic content? How can we explain these variations in the expressions of a single metaphor?

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┌─────────────────────────┐
│      LOVE IS A JOURNEY   │
└─────────────────────────┘
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| Look *how far* we've *come* | We're *at a crossroads.* |

| We'll have to go *our separate ways.* | This relationship is not *going anywhere.* |
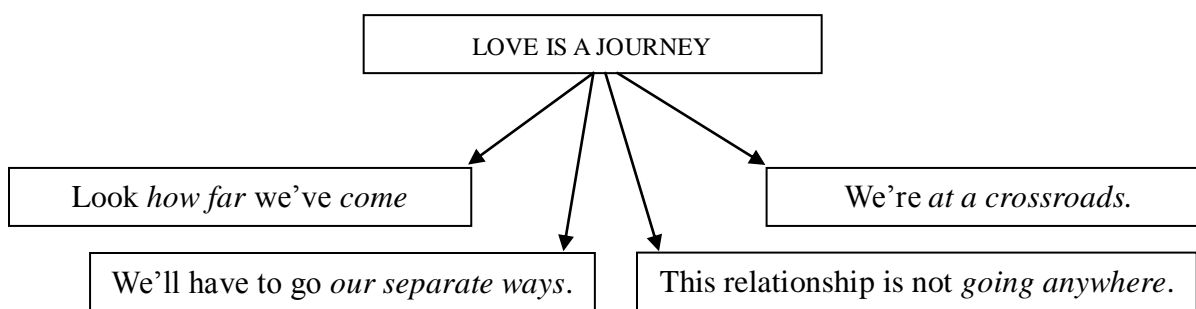
Figure 1. Metaphoric concept and metaphoric expression.

As helpful as this distinction is, however, L&J conflate an understanding of metaphor in two distinct ways. First, they conflate the levels or layers or parameters of metaphor. In other words, the variation in surface metaphoric expressions reveals that metaphors contain a complicated structure composed of multiple parameters. This structure reveals more depth than the three-way model provided by L&J (e.g., primary metaphor, conceptual metaphor, and metaphoric expression). To make an analogy, these parameters are the semantic morphemes of metaphor. L&J fuse these morphemes together and thus disguise the mechanisms of productivity in metaphor. Second, the theory conflates the structure, the processing, and the cognitive reality of metaphors. In other words, it conflates a linguistic description of metaphor structure both with a diachronic analysis of embodied experience and with speculations about the human conceptual system. Yet we must first dissect the semantic structure of metaphor before we can accurately use those semantic structures to study the human conceptual system. The final issue is that the human conceptual system is hard to reach and, for computational purposes, unavailable. For this reason, a formal ontology representing that conceptual system is a necessary backdrop for a linguistic examination of metaphor.

We have evidence of some structure of metaphor behind metaphoric expressions. The question is, what sort of structure is it and how can we represent it? This paper argues that L&J's conceptual networks are better understood in terms of the sort of ontology put forward by ontological semantics, and that their conceptual metaphors are better

understood in terms of a structured hierarchy of abstract parameters of metaphor, the sort of model provided for humor by A&R (1991). A computational model of metaphor which provides an ordered hierarchy of abstract parameters is better equipped to explain both the systematicity and the variety of metaphoric expressions than is conceptual metaphor theory, which provides no link between conceptual metaphors and their linguistic expressions.

1.2. Conceptual networks and ontologies

It turns out that conceptual metaphor theory has three distinct components: (1) an account of systematic metaphoric expressions, (2) an account of the origins of these metaphors as grounded in embodied experience, and (3) an account of the conceptual system in the human mind. Another way of looking at these three divisions is as follows: (1) the first account looks at metaphor as it exists within language, (2) the second account looks at the connection between linguistic metaphors and the external world, and (3) the third account looks at the relationship between metaphor and the internal world, the human mind. Conceptual metaphor theory and, to a lesser extent, cognitive linguistics focuses on (3) and, in fact, uses (1) and (2) as evidence for inquiries into (3). This paper pursues a different tact. As L&J (1980) write: "One can believe that objectivist models can have a function -- even an important function -- in the human sciences without adopting the objectivist premise that there is an objectivist model that completely and accurately fits the world as it really is" (219). Thus, this present attempt to create a linguistic model of metaphors does not make any claims about the human conceptual system.

The elements (2) and (3) in conceptual metaphor theory constitute the second conflation mentioned above, that of structure, processing, and cognitive reality. First, (2), the grounding of metaphors in embodied experience, is a diachronic concern. Even if metaphors are grounded in this way, it occurred far enough in the past that we cannot observe its mechanisms. Further, if it is conceptual metaphors (and not embodied experience) which is responsible for the production of new metaphoric expressions, then we need to account for conceptual metaphors and not for their distant forebears. However, the idea underlying conceptual metaphor theory, that metaphor exists below the

semantic surface in conceptual networks is certainly in the right direction, so long as we model these networks within an ontology and not within the human mind.

1.2.1. Metaphors and embodied experience

Before we can separate conceptual networks from embodied experience, we need to examine the idea behind embodied experience. Then, we can try to rework it so that it remains entirely synchronic and available for use within a computational system. In conceptual metaphor theory, basic physical experiences provide the base material of conceptual metaphors. Orientational metaphors depend upon the constant relationship between the human body and its environment: up and down, for example. Ontological metaphors depend upon physical knowledge about containers and actions and objects. L&J's theory then posits a continual compounding and building up of abstract conceptions: experiences form abstract concepts which, in turn, form categories for processing experience. Past and communal experiences categorize present and individual experiences. Each experience has been eaten, digested, discharged, and eaten again so many times that each embodied experience fuels infinite conceptual categories and each conceptual category draws on infinite embodied experiences. The conclusion, then, is that abstract reasoning is capable of regurgitating, dissecting, dissembling and reassembling embodied experience. There is no one-to-one relationship between experience and abstract conceptions (L&J, 1980: 57). Furthermore, embodied experience does not exist without these abstract conceptions, which shape it from the very beginning. Embodied experience becomes the material for conceptual metaphors, but it is never the raw material. This is because the perception of experience is modified by existing conceptual metaphors. This last point is possibly the most important in our summary.

This is a brief summary of L&J's explanation. It is obviously diachronic, in that each cycle takes an indefinite amount of time. It is also not reconstructable, in that each cycle erases evidence of the previous cycle. Thus, we cannot follow the trail back in time to its origins. But there is a synchronic way of looking at it is this: embodied experience consists of both physical and metaphysical experience. At every moment, the human perceives simultaneously both his external physical environment and his internal mental

environment. Thought is as important a grounding for metaphor as is physical experience; in fact, we experience our own conceptual systems. This, of course, is what raises the great difficulty in examining those systems. Intellectual and emotional experiences occur at the same time as external physical experiences, and there is not always a causal link between them. As L&J note, most metaphoric structurings use external physical experiences as their source (1980: 59, 109). At the same time, however, these physical sources are metaphorically modified by abstract conceptualizations. In other words, abstract thought influences the perception of physical experiences. So, in the end, metaphors are grounded as much in our abstract conceptualizations as they are grounded in physical experience. And this is what we mean by saying that physical and metaphysical experience comes hand-in-hand: "It would be more correct to say that all experience is cultural through and through, that we experience our world in such a way that our culture is already present in the very experience itself" (1980: 57). Cultural assumptions, values, and attitudes are part of the metaphysical experiences in which metaphors are grounded.

1.2.2. Variations in source, target, and expression

Because there is no one-to-one correspondence between embodied experience and abstract conceptions, there are multiple metaphors for each domain (e.g., multiple sources for each target). Thus, LOVE IS A JOURNEY, but it is also MADNESS, WAR, and A FINANCIAL TRANSACTION. Further, there are also multiple targets for each source. Thus, LOVE IS WAR, but so are ARGUMENTS and BUSINESS. This does not pose a theoretical problem for conceptual metaphor theory's posited conceptual networks, as some have argued (Murphy, 1996, Vervaeke and Kennedy, 2004). It does not pose a theoretical problem because (1) conceptual metaphor theory expects abstract thought to digest and regurgitate embodied experience in multiple ways; and (2) conceptual metaphor theory realizes that humans experience their own conceptual systems as much as they experience their physical surroundings: thus, thinking about JOURNEYS and WAR can go hand-in-hand with various unrelated experiences. But the multitude of sources, targets, and metaphoric expressions for each conceptual metaphor does pose another problem, that of adequacy. Simply put, the question which needs to be answered is how each source and target is

reused multiple times and how each conceptual metaphor is realized in a great number of linguistic metaphoric expressions. If we lump each of these variations into one level (e.g., conceptual metaphor) and then posit individual networks like LOVE IS A WAR, BUSINESS IS WAR, ARGUMENT IS WAR, we are simply offering a description and not a theory. The fact that sources and targets are reused in so many different conceptual metaphors needs to be explained. This variation can be explained with a series of abstract parameters which underlie the conceptual metaphor.

1.2.3. Metaphor within an non-cognitive ontology

L&J define their metaphors against the human conceptual system. A computational model, however, needs to be defined against a formal ontology instead. Given the above summary of conceptual metaphor, the following is an informal description of the same process within an ontology. First, the ontology represents the human perception of external reality and not external reality itself, so that L&J's reorientation to a human-centered semantics is unnecessary. The ontology, therefore, like L&J's conceptual networks, ultimately depends upon human experience of the external world, although these experiences have been changed (possibly in a fundamental way) by the conceptual system itself. For L&J, the conceptual system is at once both the source of change and the recipient of change. In other words, the basic structure of human perception of external reality controls how humans continue to add to their conceptual systems. The question is, how far does this self-manipulation transfer to a non-cognitive ontology, which does not claim to represent the actual human conceptual system? To some extent the existence of the ontology argues that self-manipulation is in play. In other words, L&J argue that there is no one-to-one correspondence between the structure of the conceptual system and the structure of external reality, so that linguistic semantics (which presumably is based on the former) is not subject to the constraints of the latter. Thus, metaphor is a manipulation of reality which is not simply a semantic-level trope of some sort, but rather a systematic gulf between the conceptual system and the external world. By creating an ontology against which to define semantic meaning (as opposed to defining it against external reality), such a computational model admits that such a gulf (i.e., conception vs. reality) exists.

If the abstractions of the conceptual system are capable of changing themselves and the world which they describe (at least, diachronically), then when one of the goals of constructing a computational model of metaphor is to create an ontology capable of similar self-manipulation. What do we mean by self-manipulation? First, metaphor can create a conceptualization that has no counterpart in external reality, a metaphoric concept. Second, metaphor can create links between existing concepts which have no such connection in external reality. The result of the process of metaphor, then, is a growing gap between representation of reality (in the conceptual system or in the ontology) and external reality itself. Some metaphors are fossilized remains of such processes in the past, while are others are still active.

We made the distinction above between embodied experience derived from physical and from metaphysical experiences. One of L&J's more interesting ideas is that humans experience their own conceptual systems, and in fact experience their conceptual systems (or internal environs) at the same time that they experience their external environs. This is an indirect argument for an ontology-based semantic theory, then, because the ontology is two-thirds of semantic meaning and external reality only a third (because the conceptual system experiences itself).

1.2.4. Purpose of an ontological theory of metaphor

The discussion in the previous section was purposely vague, to be better formulated later. The reason for beginning with L&J's work on metaphor is that the idea, although underlyingly brilliant, remains unformulated. Metaphors surface in semantic meaning, but do not originate there. Rather, they originate below the surface in the conceptual system. However, L&J do not build this idea into a theory, do not explore the premises behind the idea, and do not formalize their observations. As hinted above, turning conceptual metaphor theory into a theory proper requires (1) a formalized ontology to model the conceptual system, and (2) a system for modeling the parameters of metaphor.

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┌─────────────────────────────────────┐
│     External Physical Experience     │
└─────────────────────────────────────┘
                  ↓
┌─────────────────────────────────────┐
│    Internal Metaphysical Experience  │
└─────────────────────────────────────┘
                  ↓
┌─────────────────────────────────────┐
│             Metaphoric               │
│             Projection               │
└─────────────────────────────────────┘
        ↓                   ↓
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│         Conceptual Networks          │
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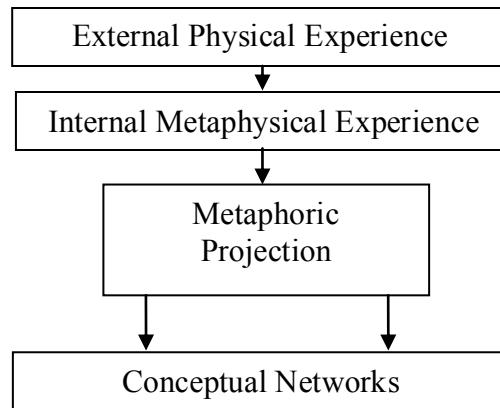
Figure 2. Embodied Experience

1.3. Uncovering metaphor

The task facing linguistic metaphor research is to uncover the unseen metaphor structure, whatever it may be, which underlies metaphoric expressions. It turns out that this task of uncovering is doubly difficult because semantic content is itself elusive. In other words, there are two conflated questions which such a model faces: (1) how to represent semantic meaning and (2) how to analyze it. We want to study and explain the variations in metaphoric expressions, but before we even approach this variation in semantic content we must first find a way to make that semantic content available for analysis. To make an analogy, both syntax and phonology are also concerned with analyzing variations in surface forms and in describing the mechanisms necessary for reproducing those variations. But in syntax and phonology the surface forms are readily available. We can observe sounds; we can observe the possible forms and arrangements of words. But we cannot in the same way observe semantic content because these "surface" forms still have no well-defined physical shape. How can we model or formalize the semantic intuitions of native speakers? What data can we collect in preparation for our analysis? Thus, we are asking two questions: (1) which system best represents semantic meaning in a formal way; and (2) which system offers the best analysis of this formalized meaning.

The stance taken here is that ontological semantics, replacing conceptual networks with a formal model of human knowledge of the world, provides the best solution to problem

(1). The answer to problem (2) begins with an examination of a related phenomena, humor, which has already been treated within the ontological framework. The following section examines past approaches to humor.

1.3.1. Humor and metaphor

Linguistic theory must first define and understand the exceptions or limited cases before approaching the normal or unlimited cases. As Hempelmann (2008) explains, "humor is a more narrowly and easily circumscribable function than human language use at large, thus providing a more tractable engineering task" (333). How, then, does humor work? First, a humorous text contains an overlap between two or more different frames, so that the text can be interpreted in two separate ways. Second, these two frames are opposed to one another (e.g., *real vs. unreal*). The logical mechanism (LM) of Attardo and Raskin's (1991) theory forces a switch between the two overlapping frames, bringing that frame opposition to the forefront. Metaphors overlap frames in the same manner. The difference is that these overlapping frames do not have to be opposing (although they can be). In other words, that frame opposition which creates humor is not necessary for metaphor. Thus, we can say that metaphors have no strict limitation on the degree of opposition necessary for something to be metaphorical. The logical mechanism in humor theory reverses or switches the frames. In metaphor, however, there is no switch, no jumping from one interpretation to the other. Rather than highlight the opposition between two frames, metaphors bind or blend them together and highlight their similarity. The "logical mechanism" in metaphor, then, has almost the opposite purpose: it brings the overlapping frames together. Metaphor and humor work in a similar manner, but the frame oppositions in humor limit it and make it a more specific instance than metaphor. Metaphor is less limited than humor, but more limited than language use at large. When we talk about language use at large, however, we are considering a deceptive subject: it turns out that both humor and metaphor are freely and frequently dispersed in language. In fact, humor and metaphor are vital and primary parts of semantic competence.

1.3.2. The variety of surface expressions

How then can we model the oppositions contained in humor? A&R (1991) are concerned with investigating the similarities and differences between verbal jokes. Is a Polish joke about changing a light bulb by turning the table essentially different than the same joke about Jews? Is it more similar to non-light-bulb Polish jokes, or to Jewish light-bulb jokes? Raskin and Attardo devised a system of abstract parameters to explain these joke variations. These parameters present an ordered hierarchy of the structure of verbal humor.

First, the Language (LA) parameter is the surface form of the joke, encompassing all the linguistic components (phonology, morphology, syntax, etc.). LA can be paraphrased in many ways while still remaining the same joke.

Second, the Narrative Strategy (NS) parameter is the structure of the joke's surface expression: a riddle, a question-answer sequence, an expository joke, etc. In metaphoric terms, the NS would encompass all the structures of surface metaphoric expressions, such as nominal and verbal metaphors, A is B, etc.

The Target (TA) of a Polish joke is a Pole: in other words, the entity in the real world against which the joke is directed. The Target in a metaphor differs from A&R's Target, and in fact we only use this term because it is standard in metaphor scholarship. The Target in a metaphor does not point into the external world, but rather back into the semantic structure of the metaphor. Thus, in LOVE IS A JOURNEY, the Target is not any particular relationship or person. Rather, it is the domain or script LOVE onto which the source is projected. A&R's Target points out into the external world. The Target discussed here points inward to the internal structure of the metaphor.

The Situation (SI) of a joke includes its activities, props, and participants. Thus, Raskin and Attardo argue that jokes about someone who turns a table to screw in a light bulb, someone who moves a car back and forth to wipe it off, and someone who moves their head to brush their teeth all share a similar situation. The Situation represents the immediate script from which the metaphor / joke is drawn.

The Logical Mechanism (LM) of the joke is the means by which the script switch is triggered. Thus, in the Polish joke above the logical mechanism is the reversal of moving the light bulb and moving the table. The logical mechanism can be faulty and still work: for example, washing the car by moving it back and forth against the cloth. Metaphors do not have a Logical Mechanism.

Finally, the Script Opposition (SO) of a joke is the *real vs. unreal* distinction between the two or more scripts which overlap in the joke.

These parameters account for every possibility in a joke, from highest abstraction to surface expression. A change in each results in a change in the final expression, and any change to the final expression can be tied back to a change in one of these parameters.

1.4. <u>Theoretical defense of the parameter-ontology approach</u>

So far we have offered an approach to metaphor which makes two distinct choices: (1) to use a formal ontology to model the conceptual system; (2) to use an ordered parameter system to model metaphor. Since both of these decisions are minority views within linguistic metaphor research, this section defends them by examining how they respond, comparatively, to theoretical issues raised against the majority views.

1.4.1. The problem of inherent structure

Murphy (1996) presents two interpretations of the conceptual metaphor theory: the strong and the weak versions. The strong version argues that the target concept (e.g., ARGUMENT) has little structure on its own, instead borrowing its structure from the source concept (e.g., WAR) (178). Thus, in the conceptual metaphor ARGUMENT IS WAR, ARGUMENT is understood only by pointers or short-cuts to WAR; in fact, Murphy argues that in this strong interpretation ARGUMENT itself is never understood, only characterized in terms of WAR. The weak interpretation, on the other hand, argues that the target ARGUMENT maintains its own structure and exists separately from the concept of WAR. It "has some conceptual primitives and relations that are not the same as that of WAR" (178). Whereas the strong view posits an almost parasitic connection of the target onto the source, in Murphy's words, the weak view explains the conceptual networks in terms of

causation: we don't understand the target wholly by comparison to the source, but through constant use the metaphor has shaped our linguistic and conceptual understanding of the target (178-179).

One of L&J's criticisms of abstraction theories is that they cannot explain how one target is used with multiple sources (e.g., LOVE IS A JOURNEY and LOVE IS WAR). Conceptual metaphor theory, on the other hand, describes these multiple sources as structuring different aspects or facets of the source. In other words, some parts of LOVE (like marriages) are JOURNEYS and other parts (like infatuation) are WARS. This poses a problem, though, in that this "assumes that there is an independent conceptualization of *argument* [*love*, in this example], and multiple metaphors are needed to characterize all of its aspects" (Murphy, 1996: 185). In other words, in talking about different aspects of a concept (a source), L&J are relapsing into what they later denounce as objectivism: the idea that there is an essential or inherent meaning or structure for concepts. In his invariance principle, Lakoff writes, "Metaphorical mappings preserve the cognitive topology... of the source domain, in a way consistent with the inherent structure of the target domain" (Lakoff, 1993: 215). But what is this inherent structure and how does it exist outside of metaphorical understanding? Is it a product of the grounding which attaches the conceptual metaphor system to the external world? Murphy (see Murphy 1996: 187) suggests that metaphor is a skeleton framework in which the basic structure of the target is enlarged upon by the source.

In his reply to Murphy's arguments, Gibbs writes, "The so-called problem of multiple metaphors for concepts can be easily handled if we view concepts not as fixed, static structures but as temporary representations that are dynamic and context-dependent" (Gibbs, 1996: 313). In other words, concepts can co-exist because they not only describe different portions of the source, but do so in different times and in different contexts. Thus, Murphy makes the mistake of equating one momentary representation with a lasting and fixed understanding. Gibbs point is well taken. But it still leaves behind another question: in what way do conceptual networks provide an adequate system for understanding this temporary and dynamic representation? Further, Gibbs provides no

answer to the question of inherent structure. Most likely the answer is that grounding (external reality) provides this inherent structure. L&J (1980) write, "... [W]e classify particular experiences in terms of experiential gestalts in our conceptual system. ...[w]e must distinguish between (1) the experience itself, as we structure it, and (2) the concepts that we employ in structuring it" (83). In other words, the embodied experience itself provides the inherent structure of the target. "There is a correlation, dimension by dimension, between the concept CONVERSATION and the aspects of the actual activity of conversing" (83).

But there is another problem here: where do we draw the line between grounding in actual experience and metaphorical structuring? In other words, what do we make of L&J's earlier statement: "It can be misleading, therefore, to speak of direct physical experience as though there were some core of immediate experience which we then 'interpret' in terms of our conceptual system" (57). On the one hand, concepts are grounded and structured in physical experience, but on the other hand there is no direct physical experience entirely unaffected by our conceptual system. This is not a paradox, as Murphy would like to present it, but it is a tension. Where can we draw the line, or how can we understand this process? The biggest part of the problem can be found in the cognitive structures which conceptual metaphor theory poses, structures which influence perception. Because these structures both influence and are influenced by human perception of external realities, there is a sort of infinite regression.

1.4.2. The problem of reductionism

Abstract reasoning is more than a simple one-to-one correspondence or modification of embodied experience. If the role of embodied experience is too heavily emphasized, there is a danger of reducing abstract thought to mere pointers to the physical. As Vervaeke and Kennedy write, "One danger in the argument that our most abstract thought often has deep roots in embodied experience, via metaphor, is that the abstract matter (with many features, relations, and dimensions) is being reduced to a more primitive material (with fewer aspects and nuances)" (2004: 215). In other words, even though embodied experience contains the material for abstract concepts, abstract reasoning can enlarge and

rearrange this material. ARGUMENT IS WAR, but so are LOVE and BUSINESS. ARGUMENT IS WAR, but it is also a BUILDING, A CONTAINER, and A JOURNEY (Murphy, 1996a:185). Thus, embodied experience must be enriched and expanded, and the conceptual system is a fractured representation of experience. Any attempt to construct a simple and direct correspondence between the two will border on reductionism. This does not mean that embodied experience does not inform or influence or found abstract reasoning, only that abstract reasoning contains more than its bare inputs. Figure 3 shows how abstract reasoning contains more than simply embodied experience.
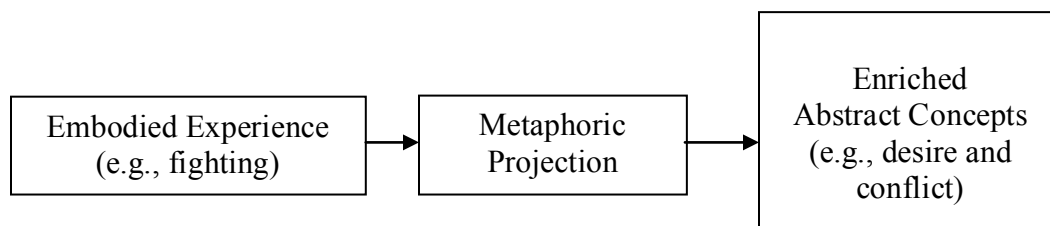
Figure 3. Enrichment of experience

Embodied experience can be enriched in three ways: (1) when, within the conceptual system itself, one old experience is digested and combined with another; (2) when a new experience occurs and begins the process of embodiment into the conceptual system; (3) when the conceptual system distorts or influences the perception of an old experience, turning it into a new concept. Any theory must reduce the content with which it deals, otherwise it would not be a theory. There is a danger in conceptual metaphor theory, however, that its proponents begin to make the relationship between embodied experience and the conceptual system too direct. This is a danger which abstraction theory (because it makes no tempting claims about the conceptual system) does not face. In short, it is a more constrained theory.

1.4.3. The problem of indirect experience

Another problem is that of actual experience. Far more people have experienced love and arguments than have experienced war. Thus, the embodied experience at work here must not be personal but, rather, collective experience. There seem to be two options in explaining this: (1) shared physical experience consists of the most basic experiences, orientational and ontological concepts about the relation of the body to the external

world; (2) shared linguistic experience consists of a common store of metaphors which are used to describe certain situations, in the exact same manner that a language acquires favored words, clichés, and idioms. It is important to make this distinction, lest ARGUMENT IS WAR seem as basic and conceptual as MORE IS UP. To ignore either source is to leave a large amount of linguistic evidence unexplained. There is, it seems, a third option, that of embodied metaphysical experience, but this is very close to (2) above. In other words, experiences can be shared by normal methods of communication, including language. Thus, reading an influential novel or listening to a popular song can pass along experiences. However, these experiences are a part of the linguistic experiences listed above.

Those metaphors which are most basic to human cognition will be, as a result, more constant and stable across various languages. The first step in indentifying these more abstract, higher-level metaphors, therefore, is to seek persistent and shared conceptualizations. The second step is to connect them with more basic and persistent embodied experience. In other words, ARGUMENT IS WAR is a linguistic conceptual metaphor, prevalent because of expectations and previous use but not from shared physical experience. War is a common but not necessary element of human experience. On the other hand, MORE IS UP is based more directly on embodied experience because it is more fundamental in human experience. Those metaphors which are contained within linguistic tendencies will be, as a result, closely connected with the genetic relationship between languages. For example, English, by genetic relationship and literary influence, would likely continue many conceptual metaphors common in Latin or, to a lesser extent, Greek. This is not a problem so much as a constraining consideration.
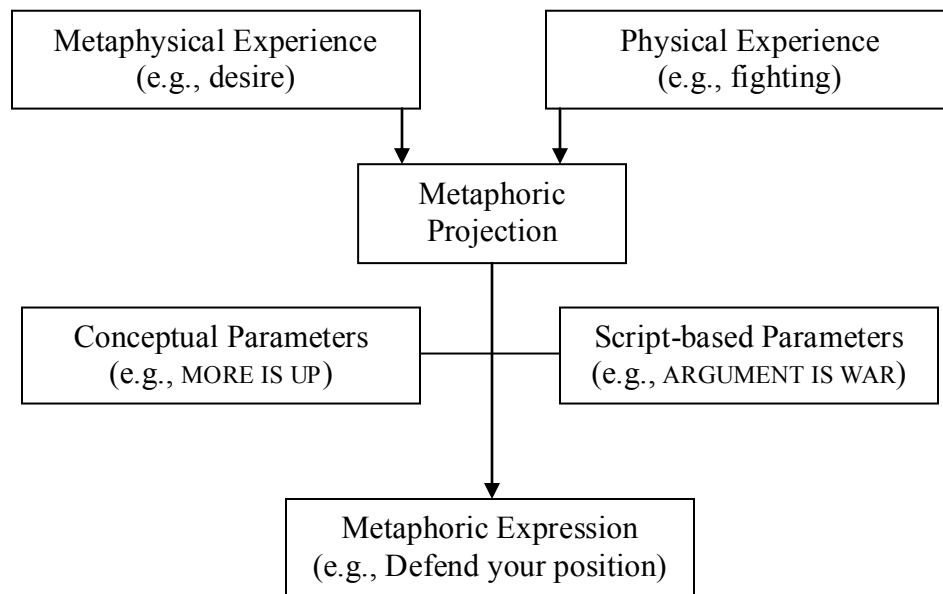
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┌─────────────────────────┐        ┌─────────────────────────┐
│  Metaphysical Experience │        │   Physical Experience   │
│     (e.g., desire)       │        │    (e.g., fighting)     │
└─────────────────────────┘        └─────────────────────────┘
              │                                  │
              ▼                                  ▼
                   ┌──────────────────┐
                   │    Metaphoric    │
                   │    Projection    │
                   └──────────────────┘
                            │
┌─────────────────────────┐ │ ┌──────────────────────────┐
│   Conceptual Parameters │ │ │   Script-based Parameters │
│    (e.g., MORE IS UP)   │─┼─│  (e.g., ARGUMENT IS WAR)  │
└─────────────────────────┘ │ └──────────────────────────┘
                            ▼
                 ┌───────────────────────┐
                 │  Metaphoric Expression │
                 │ (e.g., Defend your position) │
                 └───────────────────────┘
```

Figure 4. The mixed concept and abstraction model

1.4.4. The problem of a falsifiable theory

In comparing the adequacy of two competing theories, the one which is falsifiable, which can be tested, must come out on top. One of the classic problems with conceptual metaphor theory is that it cannot be falsified, cannot be tested, and, furthermore, can incorporate any content-based objections by positing new conceptual networks. As Vervaeke and Kennedy (1996: 275) point out, if a particular group of metaphors about arguments appear which do not coincide with ARGUMENT IS WAR, this cannot be evidence against that metaphor as a conceptual network. Rather, it is merely positive evidence for yet another conceptual metaphor. The same is not true of a parameter-based theory. Such a model provides a test: if the parameters of a metaphor can be changed without changing the metaphoric expression, or if the metaphoric expression can be changed without changing the parameters, the model is wrong. Let's go through an example, using the preliminary model given in Figure 4 above. "This relationship is going down a dead-end street." This metaphoric expression uses the CAR TRIP script. We can change this script to the STEAM BOAT script: "This relationship is going down a closed-off branch." This script, of course, is not available to most people directly, but can still be licensed indirectly. Now let's change the source to WAR: "I'm ready to throw up the white flag." One change in a

parameter leads to a direct change in the metaphoric expression without creating a new conceptual metaphor.

Furthermore, an ordered parameter model divides the issue, while conceptual metaphors bundle it together: we can test which parameter is wrong and correct it. But a conceptual metaphor is either existent or non-existent. In this sense, the parameter model is more adequate. Vervaeke and Kennedy (1996) write, "...The very flexibility of the implicit [conceptual] metaphor theory ... may be its undoing in the long run when it aims to be an empirical, testable theory rather than a brilliant feat of hunting, gathering, and interpreting" (278).

1.4.5. The problem of hierarchy within conceptual networks

The final problem with conceptual metaphor theory is that it provides no hierarchy for its conceptual networks, even though some metaphors are clearly more basic than others. This situation has been corrected somewhat with L&J's (1999) positing of primary metaphors. But the question remains why abstract conceptual metaphors are posited at a certain level of generality. Often, in fact, conceptual metaphors are posited which overlap one another. Vervaeke and Kennedy (1996) write, "Our point is that it is hard to be sure the correct level of generality has been reached. It seems to us that any claim about a particular implicit metaphor is open to this charge -- a slightly higher or lower level of generality can always be devised" (276). In other words, we can posit the conceptual metaphor ARGUMENT IS WAR, but we can also posit ARGUMENT IS CONFLICT, ARGUMENT IS A PHYSICAL DISPUTE, DISAGREEMENT IS PHYSICAL DISPUTE, CLASH OF DESIRES IS PHYSICAL DISPUTE, etc. Why is one correct and another incorrect? Why not posit each of these for various metaphoric expressions?

CHAPTER 2: THE ABSTRACT PARAMETERS OF METAPHOR

2.1. <u>Introduction</u>

We have now described in the barest possible terms the sorts of models which we are comparing. Rather than justify and order a computational model of metaphor here, before we have shown its advantages, we will present an unjustified preliminary model and test how it works in comparison with conceptual metaphor theory. L&J specifically oppose the abstraction view of metaphor (although their target is a word-level abstraction theory) and we will show how such a model can answer their objections.

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              ┌─────────────────────────────┐
              │      Domain Mapping          │
              │  NON- PHYSICAL IS PHYSICAL   │
              └─────────────────────────────┘
        ┌──────────────────┐    ┌──────────────────┐
        │      Source      │    │      Target      │
        │      LOVE        │    │     JOURNEY      │
        └──────────────────┘    └──────────────────┘
              ┌─────────────────────────────┐
              │    Conceptual Metaphor       │
              │     LOVE IS A JOURNEY        │
              └─────────────────────────────┘
                ┌───────────────────────┐
                │      Situation         │
                │   SCRIPT: CAR TRIP     │
                └───────────────────────┘
                ┌───────────────────────┐
                │   Narrative Strategy   │
                │    Verbal Metaphor     │
                └───────────────────────┘
          ┌─────────────────────────────────────┐
          │       Metaphoric Expression          │
          │ "This relationship is running out of gas." │
          └─────────────────────────────────────┘
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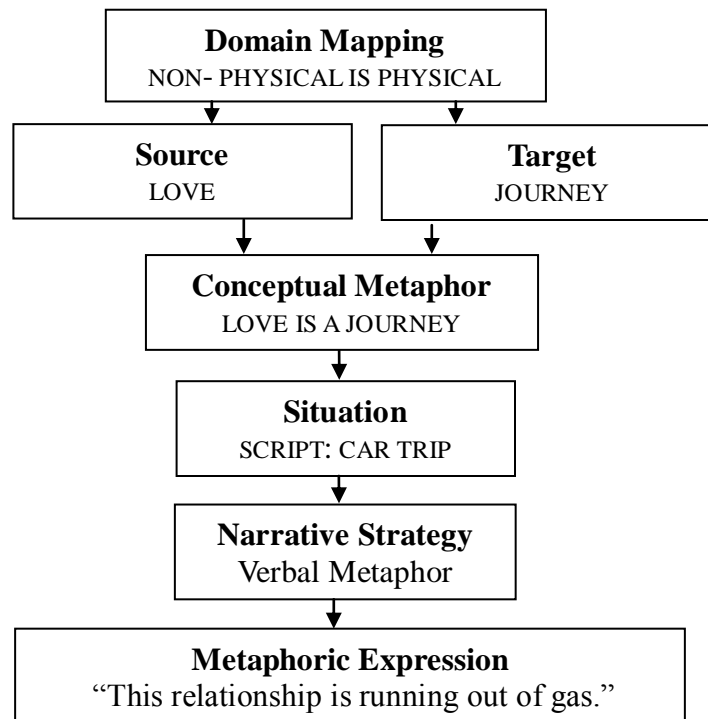
Figure 5. Preliminary metaphor structure

2.2. L&J's arguments against abstraction theories

The difficulty in understanding metaphors begins with the difficulty in accurately defining words. Consider these two sentences from L&J (1980: 107):

(1) He buttressed the wall.
(2) He buttressed his argument.

L&J argue that linguistics in 1980 had two ways of explaining this: homonymy and abstraction. Homonymy posited the existence of two different words that, by chance, sound the same. They rightly reject this view. But they also reject abstraction, the idea that there is some single, more general definition which applies equally to each instance of "buttress." In place of abstraction they offer the metaphoric view, that "buttress" occurs in both instances because the first is the actual, physical definition and the second is an expression of the metaphor ARGUMENTS ARE BUILDINGS. Thus "buttress" is, by definition, a physical act; but it takes on a metaphoric sense in the second example. In defense of the metaphoric view of polysemy, L&J present seven criticisms of abstraction theory.

2.2.1. Preliminary Points

There are two preliminary points to be made about the difference between a word-level abstraction theory and a parameter-based abstraction theory: (1) a parameter abstraction is not more general in the sense of being less precise; rather, it is abstract in that the common factor is at a higher level. Using Figure 4 as a preliminary example, we can better explain this statement. Let's change the TARGET parameter from LOVE to ARGUMENT: "The argument in this paper is running out of gas." Now let's change it to BUSINESS: "This business model is running out of gas." Using these examples, we can argue that the abstraction theory does not argue that there is some more general meaning behind the two. Rather, it argues that the parameter which governs the change in the metaphoric expression is a higher-level, more abstract parameter. To drive home this point, let's change the narrative strategy parameter from VERBAL to A IS B: "This relationship is a car without gas." This variation is closer to the original metaphor because the changed parameter is closer to the surface form, and thus less abstract.

The second preliminary point is that orientational metaphors like MORE IS UP are both very basic (i.e., a high-level parameter) and derived from embodied experience. The embodied experience, however, only serves to license this parameter. In other words, certain scripts are available to some people and not available to others on the basis of experience (experience being both physical, metaphysical, and linguistic). L&J are right that certain orientation-based scripts are available to all or nearly all human speakers. But the fact that these scripts are cognitively available does not mean that we have to deal with them only as cognitive structures. In other words, we can explain these formally and avoid making cognitive assumptions (and thus allow the testing of those assumptions).

2.2.2. Parameterized abstraction vs. abstraction

The first question which L&J ask about abstract definitions of word-level polysemy is, what is more abstract than UP and DOWN orientational metaphors? (108). They cite HAPPY IS UP, MORE IS UP, and THE FUTURE IS UP as evidence that there cannot be a single abstract (or general) definition that can encompass all these uses. The point here is not that there is a single shared parameter for both UP and DOWN metaphors. Rather, the point is that this orientational overlap exists in a high-level parameter. In other words, there is not a more abstract piece of content, but rather a more abstract slot into which that content fits.

2.2.3. Hierarchy of variation

Second, L&J argue that an abstraction view could not differentiate between A IS B and B IS A metaphors, whereas actual evidence shows that metaphors do not go both directions (e.g., LOVE IS A JOURNEY, but not A JOURNEY IS LOVE). Thus, they argue, there is no single abstract concept which covers both, or else the metaphoric exchange could go either way. However, the abstraction which LOVE IS A JOURNEY represents, at its most basic level, is an overlap of the scripts for LOVE and JOURNEY, which is an instance of a NON-PHYSICAL IS PHYSICAL overlap. This particular choice in this parameter governs the fact that these metaphors cannot be switched. The question is, is this restriction a function of the content (e.g., the conceptual metaphor) or of the parameter? Let's make an analogy to word formation. Some metaphors may be blocked in English because similar arrangements of the parameters are so common. They are conventional. These tendencies, however, will

only be language-specific (and likely also culture-specific). Certain A IS B metaphors are a common and productive arrangement on the parameter level, but a computational model must be able to account for all metaphors. Consider the following example: "I had two flat tires this week. Even my car dumped me." This is not conventional, but it remains possible, showing that a non-standard arrangement of the parameters remains possible. This is evidence that the restriction which L&J are talking about here is not a function of the content of the metaphor, but rather of a certain choice in a high-level parameter. A second limiting factor in metaphor formation is the licensing provided by embodied experience. However, in certain contexts it remains entirely possible for non-human metaphors to be produced. Thus, a theory of metaphor should not depend on embodied experience directly.

2.2.4. Surface variation vs. cognition

Third, L&J observe that one target can be described from multiple sources: LOVE IS A JOURNEY, WAR, MADNESS, etc. (1980: 108). Each of these metaphors structures a different aspect of LOVE, they argue, but an abstraction would require that there be "a single general concept of LOVE abstract enough to fit all of these aspects" (108). A proper theory of parameter abstraction is not dealing with a cognitive understanding of LOVE, but with the structure of these metaphoric expressions. Thus, if we are successful in removing our model of metaphor from the mind, we can rest content having explained linguistic metaphors without having touched human cognition.

2.2.5. Filling in the parameters

Fourth, L&J argue that many A IS B metaphors are asymmetrical and, further, that the B portions tend to be more physical and more delineated than the A portions. It turns out that the examples given here (LOVE IS A JOURNEY, IDEAS ARE FOOD, AN ARGUMENT IS A BUILDING) are, in fact, instances of the more abstract metaphor NON-PHYSICAL IS PHYSICAL. In other words, starting with the highest abstraction and filling in parameters, the A tends to be non-physical and the B physical only because in these instances the parameters A and B are filling in a higher-level abstraction. This particular parameter commands or governs the parameters below it. This explains the model, but the question

remains, why does this particular overlap seem to be so frequent? The point here is only to provide a method for precisely mapping such tendencies and variations.

2.2.6. Systematicity

Fifth, L&J argue that the abstraction view does not account for the internal or external systematicity of metaphors. However, a parameter-based theory like the general theory of verbal humor (A&R, 1991) explains this systematicity and, in fact, explains it more thoroughly. L&J do not provide a model to show how conceptual metaphors become metaphoric expressions. This model tries to explain the structure of conceptual metaphor and also how that unseen structure becomes manifest in a metaphoric expression. The abstract parameters influence and constrain one another, so that each metaphoric expression represent a unique mapping of the parameters.

2.2.7. Metaphoric Extensions

Sixth, L&J argue that the abstraction view "cannot account for metaphorical extensions into the unused part of the metaphor" (110). They give the example, "Your theory is constructed out of cheap stucco," saying that this makes use of a part of a conceptual metaphor which is normally not used. These metaphors simply take a different turn at the lower levels of Narrative Strategy (NS) and Language (LA). The metaphor itself is the same. Consider A&R's Polish joke: it can involve turning a table to unscrew a light-bulb, moving a car back and forth in order to wash it, turning your head to brush while holding your toothbrush still, etc. But it remains a similar joke with shared abstract parameters. This joke can be told quickly, or it can be elaborated into a story. In the same way, metaphorical extensions take a familiar structure and change one parameter to arrive at a new metaphor. Let's go back to the example given above: LOVE IS A JOURNEY. One surface form of this metaphor is "This relationship is running out of gas." First, let's change what part of the script CAR TRAVEL is used as the Situation: "This relationship needs an oil change." This information is contained in the script, which can be formalized linguistically. Second, let's change the narrative strategy to STORY and add some implicit references to the script: "This relationship has gone too far and we're starting to smell

smoke. We need an oil change." We can go further with the elaborations. But the point is that we can explain this with only linguistic tools.

2.2.8. Structuring concepts

Seventh, L&J argue that, without conceptual metaphors to structure vague concepts like LOVE, abstraction theories must find some other means of structuring the concepts. In other words, metaphor structures LOVE in the first place, but abstraction theories require that LOVE have a structure before metaphor. This creates a chicken-and-the-egg problem: which comes first? But this is a problem for more than just abstraction theories. (See the discussion in section 1.4.1. above.)

2.2.9. Conceptual metaphor theory as an abstraction theory

L&J argue against abstraction theories, but it turns out that conceptual metaphor theory is itself an abstraction. The metaphor ARGUMENTS ARE BUILDINGS has many different metaphoric expressions. Each of these seems, without knowledge of the underlying conceptual metaphor, to be a different metaphor in a different context. L&J have simply come up with a more abstract abstraction. The abstraction theory they denounce posits abstract definitions for single words; their abstraction theory posits abstract definitions for whole domains of bundled concepts (e.g., conceptual metaphors). The abstraction offered by L&J is a better abstraction and a better explanation than the one they denounce. It offers a semantic structure behind language and behind metaphor. Yet it is nonetheless an abstraction. Given this, it makes sense that their conceptual metaphors (themselves abstractions) are subject to various levels of abstraction: some are more basic, more experiential, more foundational than others. They later hit upon this idea when they talk about primary metaphors coming together to form new conceptual metaphors. But they overlook the fact that these conceptual metaphors, once properly divided into parameters, form a hierarchy. Thus, each conceptual metaphor like ARGUMENTS ARE BUILDINGS has lying behind it a series of more abstract parameters, in precisely the same way that each metaphoric expression of that conceptual metaphor has it lying behind them. To put it briefly, conceptual metaphors are abstractions and these

abstractions exist in a hierarchy. L&J have offered a brilliant and useful idea, and then condemned it unnecessarily.

2.2.10. Conclusions

Here, then, is our conclusion on conceptual versus abstraction theories: first, L&J's theory is an abstraction, yet it is a deeper structural abstraction beyond the word-level. Second, A&R's work has presented a similar structural depiction of humor. But their depiction relies on scripts instead of conceptual networks. The two function in much the same way, with two exceptions: (1) scripts do not require assumptions about the workings of the mind; (2) scripts lend themselves to computational approaches to language while conceptual networks leave us without a more practical understanding of the mechanisms behind them. Because conceptual networks are supposedly in the mind, computational approaches become false models of the mind. Scripts do no present this issue. Finally, conceptual metaphor theory first made explicit the influence of embodied experience on language. But there are two points to be made here: (1) embodied experience and the availability of scripts can license metaphors, but this does not mean that metaphors cannot be created from scripts which are not based on embodied experience; (2) certain patterns of parameter values are conventional in certain languages or cultures, in exactly the same way that certain arrangements of morphemes become fused together and are no longer compositional. But this does not mean that, in a different language or a different context, these patterns cannot come unbound. Thus, L&J's fusion of all these parameters into one (conceptual metaphor) is like using a dictionary instead of studying morphology. It describes what already is conventional. But it cannot model productivity.

2.3. Parameters of metaphor defined

Now that we have considered how a parameter model functions, this section tries to identify more precisely the parameters which are at work. We have discarded some of A&R's parameters which do not seem directly useful (e.g., SI, NS, LA) and incorporated some new parameters (FU, LI).

2.3.1. Domain mapping (DM)

L&J define metaphor as a cross-domain mapping, in which one domain of the conceptual system is connected to some other domain. Defining this instead in terms of an ontology (instead of a conceptual system), a metaphor is a mapping between concepts which is not motivated by a similar relationship in the external world. Such a mapping is temporary in that, when the metaphor is not in active use, the ontology again reflects more closely the relationship in the external world. The DM parameter contains the mapping between the highest level ancestors of the mapped concepts, excluding Event or Object distinctions (which is captured in a separate parameter). Thus, L&J's conceptual metaphor LOVE IS A JOURNEY would have a DM parameter of EMOTIONAL STATE IS PHYSICAL ACT.

2.3.2. Function (FU)

The FU parameter captures the distinction first hinted at by L&J's three functions of metaphors: structural, orientational, and ontological. However, it limits the distinction to the following values: EVENT IS EVENT, EVENT IS OBJECT, OBJECT IS OBJECT, and OBJECT IS EVENT.

2.3.3. Property overlap (PO)

In order for metaphor to artificially join two concepts, they must have a shared property around which the mapping occurs. One of the difficulties of metaphor is discovering which shared property is salient for that particular instance. In other words, there might be multiple shared properties between the two concepts, even though only one of these is active in any one metaphor. Thus, one of the issues in computing metaphor is determining which shared property is the shared link. PO is influenced by FU, in that objects and events will naturally share some properties with one another.

There are two basic types of property overlaps: (1) when two concepts share a specific attribute. For example, in *My love is a red, red rose*, both the lover and the rose share the attribute *beautiful.* In these cases, PO has the value ATTRIBUTE. (2) when two concepts share a specific relation with a third concept. In other words, in the first case two concepts are connected by a shared relation to a specific attribute, and in the second case two concepts are connected by a shared relation to a third concept.

2.3.4. Link (LI)

This parameter contains the element which links the two concepts, whether that is a particular attribute or whether that is a shared relation to another property. This parameter is sort of the neutral space in which the two concepts come together. In other words, the link can also be an entailment which two metaphoric concepts share (L&J, 1980: 96).
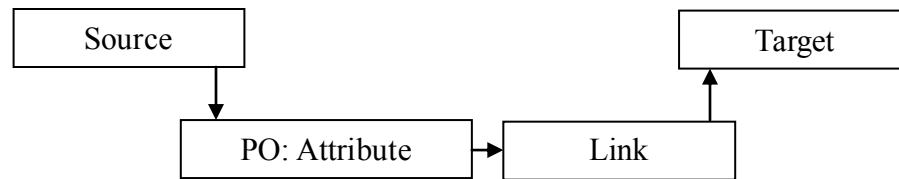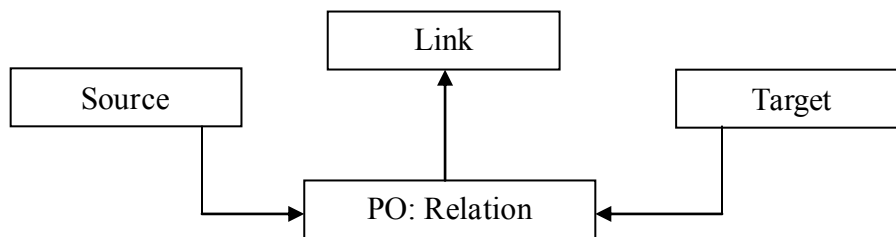
Figure 6. PO: Attribute

Figure 7. PO: Relation

2.3.5. Target (TA)

The target is the primary subject (Black 1993), the one which the metaphor describes. The target is often fixed because, in many situations, the purpose of the metaphor is to describe something. The target, thus, is that thing which the metaphor maps onto, the original concept. At the same time, the target has a somewhat limited influence on the metaphor itself. The metaphor must (at least in ordinary metaphors) be compatible with the target (what Lakoff calls the invariance principle). However, there are some metaphors (e.g., humorous metaphors) in which the target is purposely incompatible. Finally, the target has a limited influence on the more basic parameters because the same

metaphor can be used to describe a large number of targets. The TA parameter is the specific concept whose ancestor is given in the DM parameter.

2.3.6. Source (SR)

The source (secondary subject in Black 1993) is the script from which the metaphor is drawn. In other words, some element of the source is mapped onto the target. For our purposes here, this is the specific concept which serves as a source, as opposed to its ancestor given in the DM parameter.
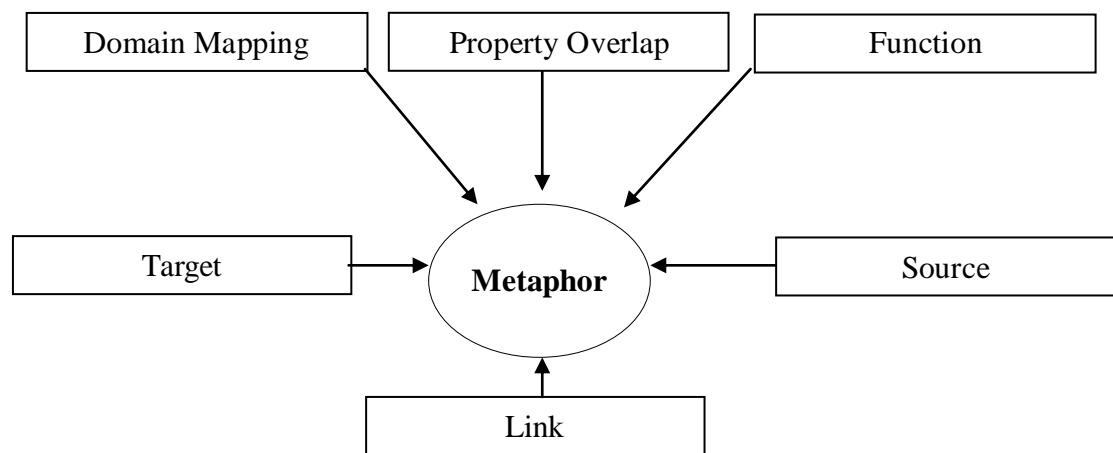
Figure 8. Unordered parameters

2.3.7. What is the point of the parameters?

At this point, we need to step back and ask what the purpose of these parameters is. In other words, how is this discussion working towards a computational model of metaphor? We are working towards a meaning-based model of metaphor, in which we attempt to show what element of meaning changes within metaphors and in what way it changes. These parameters provide a way of mapping or describing or identifying this meaning change: in other words, they model that change. As described above in section 1.2.2., metaphor is a manipulation of the conceptual system in that it creates links between concepts that are not present in external reality. These parameters are, in a sense, the distinctive features in these created links.

CHAPTER 3: ORDERING THE PARAMETERS

3.1. Introduction

This section examines the order in which these abstract parameters of the metaphor are structured. The end goal of a computational theory of metaphor is to take the available surface forms (TA and SR) and derive the relationship between them. One way of doing this is to investigate the relationships between the parameters so that these relationships can be used to reconstruct the metaphors which are represented by metaphoric expressions in the text. We can determine this order in three ways using the method developed by Attardo and Raskin (1991):

(1) by dividing the parameters between those which shape the conceptual content of the metaphor and those which shape the linguistic expression of the metaphor

(2) by giving a benchmark metaphor and, changing only one parameter in each reincarnation of this metaphor, order each successive version according to its similarity with the original

(3) by investigating the influence or control which certain parameters wield over other parameters; in other words, by investigating the bilateral and multilateral relationships between the parameters

3.2. Concept and expression

A&R's approach to humor deals with concept and expression. However, the approach to metaphor here is concerned entirely with the conceptual structure, because metaphor is primarily a manipulation of the conceptual system. Thus, Narrative Strategy and Language are excluded from the beginning (as is Situation, which is unnecessary]. In other words, we are dealing with the underlying meaning of metaphor, not with its

surface expression (which is not necessarily any different than other surface expressions, except it is interpreted against a metaphorically-altered conceptual system / ontology).

3.3. Metaphor similarity

The second way to determine parameter order is to divide a metaphor into its component parameters, then change the parameters one at a time and rank them according to similarity. Each resulting metaphoric expression differs in one and only one parameter (unless the changing of one parameter specifically requires the changing of another parameter, although the examples below were chosen purposely to avoid this). The more a changed parameter changes the metaphor as a whole, the deeper and more basic that parameter must be. The degree of similarity is based entirely on the intuitions of the author. At the same time, although there are borderline cases, there is clearly a hierarchy among the parameters, as shown in Table 1.

(1) This marriage has taken a wrong turn.
(2) This business has taken a wrong turn.
(3) This marriage is mutually assured destruction.
(4) This marriage is off to a bad start.
(5) This marriage has broken down.
(6) This marriage is a broken down car.
(7) This marriage is a badly planned vacation.

Table 1. Metaphor similarity

	TA	SR	PO	LI	FU	DM
1	Marriage	Journey	Attribute	Destination	E is E	Mental is Physical Event
2	**Business**	Journey	Attribute	Destination	E is E	Mental is Physical Event
3	Marriage	**War**	Attribute	*Result*	E is E	Mental is Physical Event
4	Marriage	Journey	**Relation**	*Beginning*	E is E	Mental is Physical Event
5	Marriage	Journey	Attribute	**Progress**	E is E	Mental is Physical Event
6	Marriage	*Vehicle*	Attribute	*Progress*	**E is O**	Mental is Physical Event
7	Marriage	Journey	Attribute	Destination	E is E	**Mental is Social Event**

From these examples, we can move closer to a basic ordering of the parameters. TA and SR have the most direct influence on the surface form of the metaphor. The slight different between (1) and (2) above shows that only changing TA leaves the structure of

the metaphor in place (assuming as we do here that the DM is fixed). Changes in SR seem to have a more profound effect on the surface metaphor. Since a computational model of metaphor will have the TA and SR as the input, it follows that these are the parameters nearest to the surface from which the deeper parameters must be reconstructed.

PO follows, in that a relatively small number of properties are used as primitives to define all available concepts. Thus, the chances that any two concepts will share a property is greater than the chance that they will share a single FU or DM. Because this parameter is less restricting, it has less of an effect on the surface forms (in other words, multiple surface metaphors can share the same PO. LI is much more restrictive than PO, but it also depends upon PO directly. FU captures a distinction which is far from the surface forms, as evidenced above where the difference between object and event does not render the metaphor unrecognizable. These three parameters, PO, LI, and FU, capture more of the mechanics than the content of metaphor (LI containing more content than the other two, of course) which make them more useful for a computational model concerned with the possible, unlicensed connections between concepts. Finally, the DM is the broadest parameter and, although it does not directly influence the surface form, it does constrain both TA and SR, with the end result that it forms the backbone of the metaphor.

Because the more abstract and higher level parameters are further from the expression of the metaphor, they have a lesser effect on metaphor similarity and difference in respect to expression and a greater effect in respect to substance (see Attardo and Raskin (1991: 323). Thus, our assumption that some of these parameters are more abstract is confirmed by the evidence found in metaphoric expressions. In other words, those metaphors with identical conceptual parameters have different expressions, although they remain more similar overall. See Figure 9 for an ordering based on metaphor similarity.

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           ┌─────────────────────┐
           │   Domain Mapping    │
           └──────────┬──────────┘
                      ↓
           ┌─────────────────────┐──────────────────────┐
           │   Property Overlap  │                      │
           └──────────┬──────────┘                      │
                      ↓                                  │
           ┌─────────────────────┐                      │
           │        Link         │                      │
           └───┬─────────────┬───┘                      │
               ↓             ↓                          │
  ┌────────────────┐   ┌────────────────┐               │
  │     Source     │───│     Target     │               │
  └───────┬────────┘   └───────┬────────┘               │
          ↓            ↓                                 ↓
        ╭──────────────────╮   ┌─────────────────────┐
        │     Metaphor     │ ← │      Function       │
        ╰──────────────────╯   └─────────────────────┘
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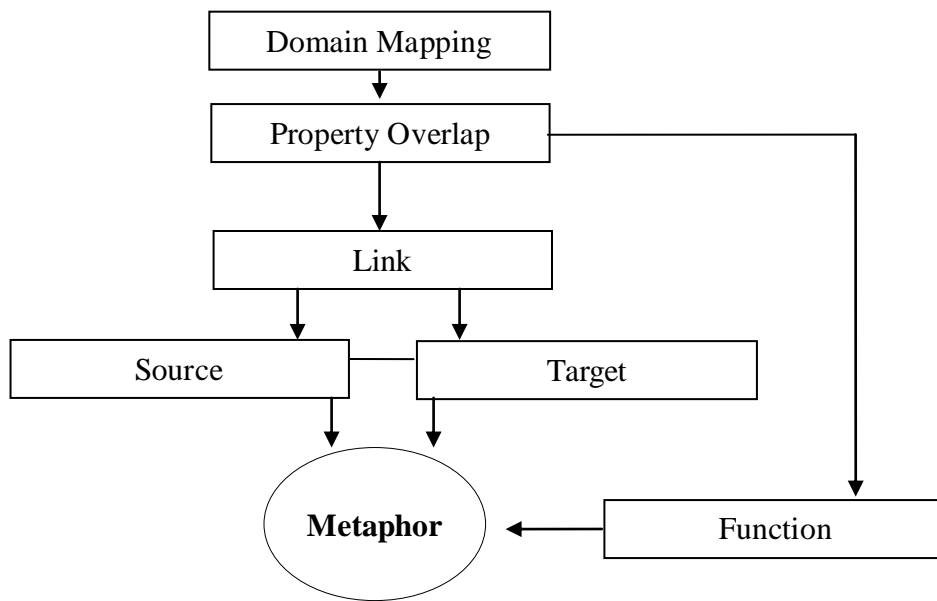
Figure 9. Metaphor similarity

3.4. Parameter interaction

The first way of ordering parameter interaction is to determine when one parameter constrains or limits the choices in another parameter. If one parameter has the possible choices {a, b, c}, and another parameter must follow those choices {a1, a2…; b1, b2}, then the first can be thought to constrain the second (A&R, 1991: 315). For example, if the DM is MENTAL IS PHYSICAL EVENT, then the SR must be a child of physical event. Thus, DM must come higher than SR. In these cases, the higher parameter limits the set of possible choices in the lower, but does not require one specific choice.

If, on the other hand, parameter 1 requires a specific choice in parameter 2, then it must follow parameter 2. In other words, the sex of a baby limits the choices of its name. A male baby can be called Peter or Paul, but not Mary. Thus, the sex is a higher, constraining division. But the name Peter requires that the sex be male. Thus, the name is a lower, determining division. In some situations, a higher level parameter will restrict a lower level parameter to a single option. For example, the pronoun for a male is "he." This is not the same situation as the above example, however (e.g., both Peter and Paul

can be called "he"). It is important to keep parameters separate even in situations, like the pronoun, where there is only a single possible choice. This avoids conflating the parameters into what Attardo and Raskin call a funnel (1991: 316). A funnel is created when multiple parameters are conflated into one, ignoring the distinctions between them.

Because of these two rules, there are three possible relations between the parameters. First, it is possible that two parameters are entirely Independent (No Infl) and do not influence each other at all. Second, it is possible, as in the first case, that one parameter limits the choices or possibilities of another parameter. Thus, it Constrains (Con) that parameter. Third, it is possible that one parameter rigidly Determines (Det) another parameter, meaning that it reduces the possible choices in all situations to one (e.g., the name Peter determines the sex is male). These relationships can be arranged as follows: *Determines > Constrains > No Influence*. Table 2 summarizes the relationships between the parameters using this system. In the table, each column shows the relationship which a particular parameter exerts on the parameters listed as rows within that column.

Table 2: Parameter Interactions

	TA	*SR*	*PO*	*LI*	*FU*	*DM*
TA	---	No Infl	Con	Con	Con	Con
SR	No Infl	---	Con	Con	Con	Con
PO	Con	Con	---	No Infl	No Infl	No Infl
LI	Con	Con	Con	---	No Infl	No Infl
FU	Det	Det	Ind	No Infl	---	Con
DM	Det	Det	Ind	No Infl	Con	---

Given the relationships listed above, we can remove from consideration all those parameters which do not influence each other at all. When no influence is visible, the relations cannot be ordered into a hierarchy. Further, we can remove all symmetrical relations because there is no hierarchy where the influence is mutual. This leaves us with the relationships given in Table 3. Of these relationships, both TA and SR determine DM.

This means that the value of DM must be fixed at a higher level than the values of either of these parameters. We investigate each of the other relationships below.

Table 3. Asymmetrical Parameter Relations

	TA	*SR*	*PO*	*LI*	*FU*	*DM*
TA	---		Con		Con	Con
SR		---	Con		Con	Con
PO			---			
LI			Con	---		
FU	Det	Det			---	
DM	Det	Det				---

3.4.1. Influence of domain mapping (DM)

The domain mapping parameter constrains both TA and SR, both of which determine DM. Thus, DM is higher than both TA and SR. DM has no direct influence on either PO or LI because any specific property is present in multiple domains (or else it would not be truly primitive). It constrains and is constrained by FU, so that neither dominates the other and no hierarchy is available.

3.4.2. Influence of function (FU)

FU constrains and is determined by both TA and SR, so that it is above them in the hierarchy. However, it has no direct influence on any other parameters.

3.4.3. Influence of property overlap (PO)

PO constrains TA, SR, and LI and is constrained only by TA and SR. In other words, any property shared by TA and SR may be the active metaphoric link, but this property must be shared.

3.3.4. Influence of link (LI)

LI has no asymmetric relations with any parameter. Thus, it is the neutral space in which the two concepts, TA and SR, are joined metaphorically.

3.5. <u>Conclusions</u>

Given these asymmetrical relations between the parameters, we can make the following conclusions about their order:
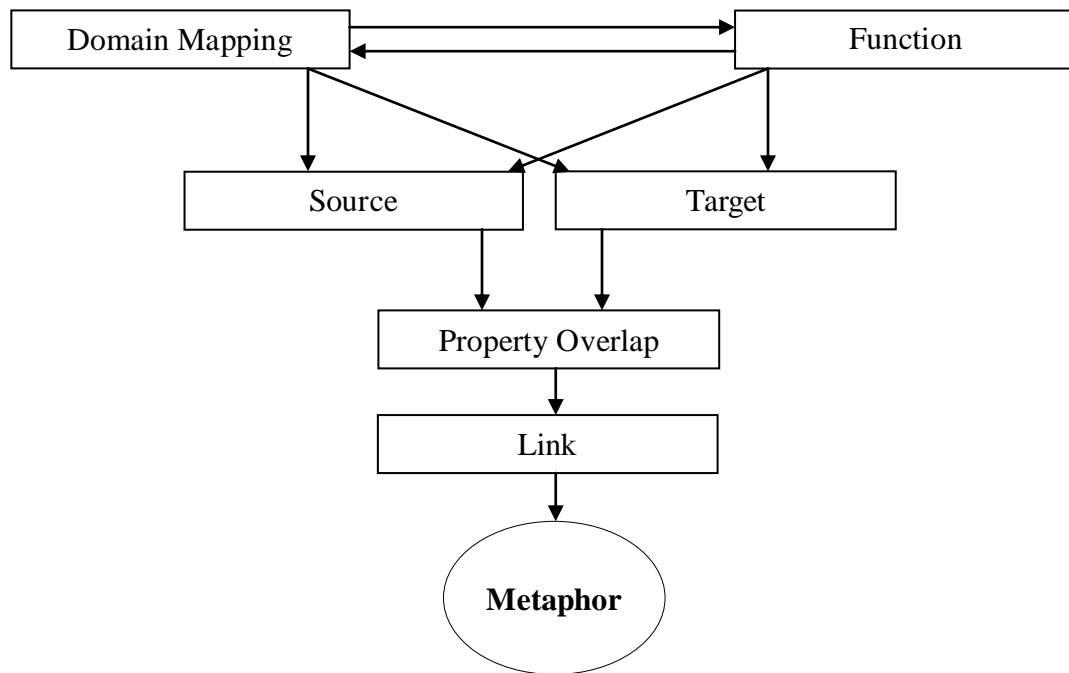
DM > TA, SR
FU > TA, SR
PO > LI

Figure 10. Parameter order

3.6. <u>Future Work</u>

This thesis is, in many ways, a description of the problem instead of an answer. In order to put forward a parameter- and ontology-based theory of metaphor, the following issues need to be addressed:

(1) Formalizing the relationships between the parameters, so that they are strictly defined.

(2) Investigating the inheritance relationship between metaphorically related concepts: what is inherited and from which ancestor?

A computational model of metaphor meant to analyze an input text will have available the Target (TA) and the Source (SR) of the metaphor, with the task of deriving the relationship between the two (DM, PO, FU). Thus, as the relationships between the parameters are more precisely formalized, the goal will be to work backwards from the surface semantic content (TA and SR) and reach the underlying metaphor.

BIBLIOGRAPHY

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Attardo, Salvatore
2008   A primer for the linguistics of humor. In Raskin, Victor, *The primer of humor research*. Berlin, Mouton de Gruyter, 101-156.

Attardo, Salvatore and Victor Raskin
1991   *Script theory revis(it)ed: Joke similarity and joke representation model*. Humor, 4 (3), 293-348.

Black, Max
1993   More about metaphor. In Ortony, Andrew, *Metaphor and thought*. Cambridge, Cambridge University, 19-41.

Cohen, L. Jonathan
1993   The semantics of metaphor. In Ortony, Andrew, *Metaphor and thought*. Cambridge, Cambridge University, 58-70.

Fraser, Bruce
1993   The interpretation of novel metaphors. In Ortony, Andrew, *Metaphor and thought*. Cambridge, Cambridge University, 329-341.

Hempelmann, Christian
2008   Computational humor: Beyond the pun? In Raskin, Victor, *The primer of humor research*. Berlin, Mouton de Gruyter, 333-360.

Lakoff, George
1993   The contemporary theory of metaphor. In Ortony, Andrew, *Metaphor and thought*. Cambridge, Cambridge University, 202-251.

Lakoff, George and Mark Johnson
1980   *Metaphors we live by*. Chicago, University Of Chicago.

Raskin, Victor
1985   *Semantic mechanisms of humor*. Dordrecht, Holland, D. Reidel.

Rumelhart, David E.
1993   Some problems with the notion of literal meanings. In Ortony, Andrew, *Metaphor and thought*. Cambridge, Cambridge University, 71-82.

Searle, John R.
1993   Metaphor. In Ortony, Andrew, *Metaphor and thought*. Cambridge, Cambridge University, 83-111.

Attardo, Salvatore and Victor Raskin
1991   *Script theory revis(it)ed: Joke similarity and joke representation model*. Humor, 4 (3), 293-348.

Gibbs, Raymond W.
1996   *Why many concepts are metaphorical*. Cognition, 61 (3), 309-319.

Gibbs, Raymond W., Paula Lenz Costa Limab and Edson Francozo
2004   *Metaphor is grounded in embodied experience*. Journal of Pragmatics, 36 (7), 1189-1210.

Lakoff, George and Mark Johnson
1980   *Metaphors we live by*. Chicago, University Of Chicago.

Lakoff, George and Mark Johnson.
1999   *Philosophy in the flesh : The embodied mind and its challenge to western thought*. New York, Basic Books.

Lakoff, George
1993   The contemporary theory of metaphor. In Ortony, Andrew, *Metaphor and thought*. Cambridge, Cambridge University, 202-251.

Lakoff, George
1987   *Women, fire, and dangerous things: What categories reveal about the mind*. Chicago, University of Chicago.

Murphy, Gregory L.
1996   *On metaphoric representation*. Cognition, 60 (2), 173-204.

Murphy, Gregory L.
1997   *Reasons to doubt the present evidence for metaphoric representation*. Cognition, 62 (1), 99-108.

Nirenburg, Sergei and Victor Raskin
2004   *Ontological semantics*. Cambridge, Mass., MIT Press.

Raskin, Victor
1985   *Semantic mechanisms of humor*. Dordrecht, Holland, D. Reidel.

Vervaeke, John and John M. Kennedy
1996   *Metaphors in language and thought: Falsification and multiple meanings*. Metaphor & Symbol, 11 (4), 273.

Vervaeke, John and John M. Kennedy
2004   *Conceptual metaphor and abstract thought*. Metaphor & Symbol, 19 (3), 213-231.

Vervaeke, John and Christopher D. Green
1997   *Women, fire, and dangerous theories: A critique of Lakoff's theory of categorization*. Metaphor & Symbol, 12 (1), 59.