Cognitive Effort and Effects in Metaphor Comprehension: Relevance Theory and Psycholinguistics

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Abstract: This paper explores the trade-off between cognitive effort and cognitive effects during immediate metaphor comprehension. We specifically evaluate the fundamental claim of relevance theory that metaphor understanding, like all utterance interpretation, is constrained by the presumption of optimal relevance (Sperber and Wilson, 1995, p. 270): the ostensive stimulus is relevant enough for it to be worth the addressee's effort to process it, and the ostensive stimulus is the most relevant one compatible with the communicator's abilities and preferences. One important implication of optimal relevance is that listeners follow a path of least effort and stop processing at the first interpretation that satisfies their expectation of relevance. They do this by trying to minimize cognitive effort while maximizing cognitive effects. Some relevance theory scholars suggest that metaphors should require additional cognitive effort to be understood, and that in return they yield more cognitive effects than does literal speech. Others claim that metaphors may be understood quickly, as soon as people infer enough effects for the speaker's utterance to meet their expectation of optimal relevance. Our analysis of the experimental evidence suggests that there is no systematic relationship between cognitive effort and cognitive effects in metaphor comprehension. We conclude that relevance theory need not make any general predictions about the effort needed to comprehend metaphors. Nevertheless, relevance theory is consistent with many of the findings in psycholinguistics on metaphor understanding, and can account for aspects of metaphor understanding that no other theory can explain.

1. Introduction

How difficult is it to understand metaphorical language? Does metaphorical language require additional mental, or cognitive, effort to comprehend over that needed to process literal speech? Or might metaphorical language be understood relatively quickly in context? More generally, what is the relation between cognitive effort and the number and kinds of meanings people understand when hearing or reading metaphors?

These questions represent some of the key issues in interdisciplinary debates over metaphor understanding. Our aim in this paper is to evaluate the explicit answers given to these questions by scholars working within the relevance-theoretic

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framework (Carston, 2002; Noveck, Bianco and Castry, 2001; Pilkington, 2000; Sperber and Wilson, 1995). Relevance theory is well known within linguistic pragmatics as a major theoretical approach to understanding communication and human cognition. But relevance theory's ideas on metaphor have not received wide recognition in empirical studies of metaphor understanding. We believe that this situation is unfortunate, and likely to change in the near future. However, some versions of relevance theory embrace certain assumptions about metaphor processing that are not consistent with empirical findings in cognitive science. Quite specifically, at least some relevance theory scholars (but not all—see below) claim that metaphors (e.g. 'Bill is a bulldozer') require more cognitive effort to be understood and that in return they necessarily yield more cognitive effects than does literal speech (e.g. 'Bill is insensitive').

   Our reading of the empirical data on metaphor leads us to question this claim. In fact, the experimental literature suggests that there is no simple, systematic relationship between cognitive effort and cognitive effects in metaphor comprehension. We conclude that relevance theory need not make any general predictions about the time needed to comprehend metaphors. Nevertheless, relevance theory is consistent with many of the findings in psycholinguistics on metaphor understanding, and can account for aspects of metaphor understanding that no other theory can explain. We offer this evaluation of relevance theory in light of psycholinguistic research believing that relevance theory offers a broad, comprehensive perspective on language and cognition which deserves close scrutiny in future empirical studies of metaphor, and psycholinguistics more generally.

2. Background

The traditional view of metaphor understanding assumes that metaphors should be difficult to process, because these utterances deviate from standard, literal expressions. For instance, one general proposal, the 'standard pragmatic view', claims that listeners comprehend metaphors in a series of steps (Grice, 1975; Searle, 1979). First, listeners analyze the literal meaning of the entire expressions. Second, they assess whether this literal interpretation is appropriate for the specific context. Third, if the literal meaning is contextually inappropriate, listeners must then derive the intended metaphorical meaning via the cooperative principle (Grice, 1975) or the rules of speech acts (Searle, 1979). This view suggests, then, that metaphors should be more difficult to comprehend than corresponding literal speech, because metaphors require an additional processing step in which their literal meanings are rejected and their intended figurative meanings are subsequently inferred.

   A large number of experimental studies in psycholinguistics have examined the predictions of the standard pragmatic view, and found that many kinds of figurative language, including metaphors, can be understood as quickly as literal speech when these expressions are encountered in rich linguistic contexts (Gibbs, 1994; 2002). There are various instances when people appear to take longer to

understand verbal metaphors than equivalent literal utterances, such as metaphoric referential phrases like 'The butcher was sued for malpractice' in reference to a surgeon (Gibbs, 1990). But the vast evidence demonstrating the relatively quick understanding of different kinds of figurative language constitutes a falsification of the standard pragmatic view, which again assumes that all nonliteral language must be more difficult to process compared to literal speech (Gibbs, 2002).

3. Relevance Theory

Figurative language scholars continue to debate the question of whether people necessarily analyze the literal meanings of metaphors, or the literal meanings of some of the words in metaphors, as part of their overall understanding of metaphorical language. Relevance theory does not assume that metaphors must be analyzed literally before they can be interpreted metaphorically (Sperber and Wilson, 1995). Contrary to the standard pragmatic model, relevance theory does not maintain that metaphors are indirect, but assumes that metaphors are generally understood similarly to literal speech in that interpretive hypotheses are considered in their order of accessibility with the process stopping once the expectation of relevance has been fulfilled. They specifically define the presumption of 'optimal relevance' (Sperber and Wilson, 1995, p. 270): '(a) the ostensive stimulus is relevant enough for it to be worth the addressee's effort to process it'; and '(b) the ostensive stimulus is the most relevant one compatible with the communicator's abilities and preferences'. One implication of this revised theory of optimal relevance is that there is a trade-off between cognitive effort and cognitive effects such that listeners will attempt to maximize cognitive effects while minimizing cognitive effort. Cognitive effects are achieved when a speaker's utterance strengthens, contradicts, or denies an existing assumption or when a speaker's utterance is combined with an existing assumption to yield some new cognitive effect. Sperber and Wilson (1995) claim that newly presented information is relevant in a context only when it achieves cognitive effects in that context, and other things being equal the greater the cognitive effects, the greater the relevance.

How does a listener know when to stop processing a metaphorical utterance? Relevance theory generally claims, again, that the interpretation of metaphors occurs in the same way as with any other nonmetaphorical utterance. A listener follows a path of least effort in accessing and testing different interpretations, and will usually cease processing when expectations of optimal relevance are satisfied. Consider the expression 'This room is a pigsty' (Sperber and Wilson, 1995, p. 236). Listeners will first access their encyclopedic entry for 'pigsty' and find information such as pigsties are usually filthy and untidy. A strong implicature of the utterance is therefore the assumption that the room is very untidy. Strong implicatures are those which the speaker ostensively intends the listener to recover in order to make the utterance relevant in the intended way. The speaker, however, did not produce a literal utterance, because listeners can expect some extra cognitive effects

in return for the extra processing cost that is incurred by the metaphoric utterance. The extra effects lie in several weak implicatures which the listener does not have to recover in order to confirm the relevance of the utterance. For instance, one weak implicature understood when hearing 'This room is a pigsty' may be that the room is untidy beyond some acceptable norm. Weak implicatures may be recovered and may also contribute to the overall relevance of the utterance, but their recovery leaves a great share of responsibility to the addressee. Thus, listeners may feel encouraged to recover these weak implicatures, but the relevance of the utterance does not depend on any single weak implicature. The metaphoricity of an utterance is seen as being roughly proportional to its number of weak implicatures. Thus, conventional metaphors communicate at least one strong implicature and in addition to that several weak implicatures.

Consider the metaphorical utterance 'My surgeon is a butcher'. Listeners generally have immediate access to stereotypical knowledge about both surgeons and butchers and would normally infer that the speaker here means something like 'My surgeon is crude and sloppy in his practice'. Speaking loosely like this requires that speakers have in mind some further idea or cognitive effect beyond the single thought 'My surgeon is crude and sloppy in his practice'. For instance, the speaker may wish to convey an image of surgeons that is beyond most people's experience and will expect the listener to make some effort toward exploring a wide range of cognitive effects (e.g. having to do with the nature of surgeons, their imprecision, their insensitivity toward dealing with human beings, and perhaps their appearance and demeanor). These implicatures may be relatively weak, but they can be assumed to best resemble the speaker's thoughts about his surgeon. Understanding this range of weak implicatures may require additional cognitive effort on the part of the listener, but this is offset, according to the principle of relevance, by extra effects not achievable by saying directly 'My surgeon is crude and sloppy in his practice'. In general, metaphorical utterances are simply one means of optimizing relevance in verbal communication.

Very creative metaphors do not communicate a strong implicature, but a whole array of weak implicatures, the recovery of which achieves a 'poetic effect'. Consider the metaphorical expression 'His ink is pale' (Sperber and Wilson, 1995, p. 237). This comment by Flaubert on the poet Leconte de Lisle does not convey a single strong implicature. It only communicates several weak implicatures which addressees are encouraged to look for. As Sperber and Wilson (1991, p. 540) correctly point out, 'the surprise or beauty of a successful creative metaphor lies in this extreme condensation, in the fact that a single expression which has itself been loosely used will determine a very wide range of acceptable weak implicatures'.

4. Relevance Theory Responses to the Experimental Evidence

Ten years ago, Gibbs (1994) made the following critical comment about relevance theory: 'The metaphor as loose-talk view may not see metaphors as violations of

communication norms (e.g. the standard pragmatic view), but still incorrectly assumes that metaphors obligatorily demand additional cognitive effort to be understood' (Gibbs, 1994, p. 232). In a review of Gibbs (1994), Blakemore (1995) criticized Gibbs's reading by noting 'Gibbs incorrectly assumed that Sperber and Wilson claim that the hearer of a metaphorical utterance has to reconstruct all the weak implicatures made manifest by a metaphorical utterance. In fact, their claim is simply that the hearer is encouraged to entertain those weak implicatures made manifest by the metaphor for which he is willing to take responsibility' (Blakemore, 1995, p. 434). We agree with this point. Listeners need not infer all the possible meanings of a metaphor, but only those that enable them to understand the speaker's utterance as being optimally relevant in the situation.

Based on Carston (1996; also see 2002), Pilkington (2000) outlined a more elaborate relevance-theoretic account of metaphor processing by noting how poetic metaphors are understood via the creation of *ad hoc* categories (also see Glucksberg, 2001). But he specifically followed up on Blakemore's idea by noting the distinction between conventional and novel metaphor processing. 'In the case of more conventional metaphors, the processing effort may be eased, I suggest, by the fact that a metarepresented set of assumptions is accessed *en bloc* (Pilkington, 2000, p. 111). But 'we do need more time and processing effort to achieve a satisfactory and satisfying interpretation of poetic metaphors—at least the first time round (If we reread, as we usually do in the case of poems, the process of encyclopedic exploration is speeded up)' (Pilkington, 2000, p. 111). The large body of research from psycholinguistics showing that metaphor can be understood as quickly as nonmetaphorical speech is due, according to Pilkington, to the possibility that 'The examples of metaphor used in psycholinguistic experiments are conventional rather than poetic' (Pilkington, 2000, p. 111).

Carston (2002) also offered several comments about Gibbs's (1994) assessment of relevance theory and metaphor. Like Pilkington, Carston noted that many psycholinguistic studies showing that metaphors can be quickly understood used standardized examples such as 'Sally is a block of ice' or 'My neighbor is a dragon'. It is quite possible, Carston suggested, that 'full' understanding of truly creative metaphors may take more time and effort. Furthermore, 'according to the relevance-theoretic account, the interpretation of literal and of loose (including metaphorical) utterances proceeds in the same way (implications are considered in their order of accessibility and the process stops once the expectation of relevance is fulfilled), so the account does not predict that loose (including metaphorical) uses will generally require more processing effort than literal uses. Indeed, it is to be expected on this account that, in appropriate contexts, a metaphorical interpretation of an utterance may be more easily derived than a literal one' (Carston, 2002, p. 373).

Pilkington's and Carston's responses to Gibbs (1994) make very good sense. We again agree that loose uses may not require additional processing effort over that needed to understand literal statements. However, both Pilkington

and Carston still seem to believe that the experimental findings of fast metaphor processing are primarily due to the conventional nature of the metaphors used in these psycholinguistic studies. But the experimental literature includes many studies showing that people understand novel metaphorical expressions as quickly as they do nonmetaphorical equivalents in context (Albritton, Gerrig and McKoon, 1995; Gerrig, 1989; Inhoff, Lima and Carroll, 1984; Ortony, Schallert, Reynolds and Antos, 1978). Therefore, the conclusion that metaphors need not take extra effort to comprehend over nonmetaphorical language holds for both novel and conventional expressions. We quickly note, however, as Gibbs (1994, 2002) has always acknowledged, that there may be cases where novel, creative, poetic metaphors take a great deal of effort to understand. This additional time may not be the result of people analyzing and rejecting the literal meanings of metaphorical utterances, as claimed by the standard pragmatic view, but could be due to all sorts of hidden cognitive processes, such as the effort needed to integrate an easily understood metaphorical meaning with the context at hand (Schraw, 1995; Shinjo and Myers, 1987), as well as the effort needed to infer complex metaphorical meanings, as suggested by some relevance theorists.

Nonetheless, a few scholars working within the relevance-theoretic framework insist that there must be extra processing associated with understanding a well-chosen metaphor. Noveck, Bianco, and Castry (2001) report the findings from two experiments examining both children's and adults' processing of referential metaphors (e.g. 'All toads to the side of the pool') and synonymous literal expressions (e.g. 'All children to the side of the pool') in neutral contexts. Understanding both metaphorical and literal referential sentences requires that readers draw a link between the referring expression (e.g. 'All toads' and 'All children') and a previously mentioned referent (e.g. 'The second-grade pupils'). Participants read stories, line-by-line, ending with either a metaphor or literal expression, and then answered a question about the story they had just read. The results of this reading-time study indicated that reading speed increased with age, and that sentences containing metaphors were read more slowly than those containing the non-figurative control expressions.

These findings replicate the results from Gibbs (1990) on adults' understanding of both metaphoric and metonymic referential descriptions, and are interpreted by Noveck *et al.*, as demonstrating that there is an extra cost associated with processing metaphor. Noveck *et al.*, did not clearly establish if additional benefits are really associated with the extra cost in understanding referential metaphors over the synonymous expressions, although the adults did appear to infer the referent somewhat more successfully having read the metaphorical expressions. Noveck *et al.*, more generally argue that previous experimental studies showing faster reading time for metaphors than for nonmetaphoric control expressions may be mostly due to rich story contexts priming readers' understanding of metaphoric phrases, but not nonmetaphorical control statements. They summarize their findings by saying 'The work reported here shows that metaphors can be

seen to be costly in contexts that are arguably neutral otherwise' (Noveck *et al.*, 2001, p. 119).

Few scholars would disagree with the idea that specific contexts can facilitate quick processing of metaphorical utterances (though this would still be contra the predictions of the standard pragmatic view). But we question the generality of Noveck *et al.*'s experimental findings, and their conclusions about metaphor processing in neutral contexts. First, similar to Gibbs (1990), Noveck *et al.*, only compared non-metaphorical referring expressions (e.g. 'All children to the side of the pool') against metaphorical referring expressions (e.g. 'All toads to the side of the pool'), the latter of which both picks out a referent and expresses a property attribution, unlike the first expression which is only referential. Picking out a referent and making a property attribution may take extra time to understand because of the additional cognitive effects such utterances achieve. Yet metaphorical referring expressions are a somewhat special form of metaphor, and are not representative of the kinds of metaphors studied in most linguistic and psycholinguistic studies. In fact, as mentioned above, many psycholinguistic studies show that metaphors can be processed as quickly, or even more quickly, than their so-called nonmetaphorical equivalents.

Furthermore, contrary to Noveck *et al.*'s claim, most experimental studies comparing figurative and nonfigurative language processing explicitly look to insure that metaphoric and literal expressions, for example, are roughly equally appropriate in the contexts in which they are seen (Gibbs, 1994). Of course, this does not at all imply that these metaphors and their nonmetaphorical, or literal, counterparts are really equivalent in meaning. But the earlier studies have tried to control for the possibility that metaphors and literal expressions may radically differ in their contextual appropriateness. At the same time, the contexts in which metaphors normally appear are not neutral, but include many related metaphorical words and concepts. Several studies show that people use their metaphorical understanding of texts in their immediate processing of some verbal metaphors presented in these texts (Albritton, *et al.*, 1995; Pfaff, Gibbs and Johnson, 1997). These findings, which are often used to support the importance of conceptual metaphors in processing verbal metaphors, are not, in our view, at all inconsistent with the general claims of relevance theory. After all, the metaphorical concepts that have been recently activated when reading texts set up expectations as to what kinds of utterances will be seen as most relevant in a discourse situation. These expectations should clearly enhance people's immediate processing of appropriate verbal metaphors. In fact, there is a cost associated with reading verbal metaphors that differ from the metaphorical concepts previously activated (Langston, 2002; Pfaff *et al.*, 1997).

Our main point here, however, is that metaphors do not necessarily take additional effort to process in neutral contexts, because of the additional effects these examples of loose talk communicate. Moreover, novel metaphors may be understood especially fast in contexts that set up expectations of particular kinds of metaphorical statements. Some interpretations of even novel metaphors may be more accessible given particular contexts.

5. Possible Relations Between Cognitive Effort and Cognitive Effects

The history of relevance theory's response to the psycholinguistic evidence raises several questions about the actual relations between cognitive effort and cognitive effects in metaphor processing. First, is it possible to quantify the notions of 'cognitive effort' and 'cognitive effects'? Relevance theory does not suggest that there is, or can be, any absolute measure for either mental effort or cognitive effects, given the difficulties with quantifying 'the spontaneous workings of the mind' (Wilson and Sperber, 2003, p. 626). But relevance theory does assume that the 'actual or expected of two inputs can quite often be compared' (Wilson and Sperber, 2003, p. 626), which may be critical to how individuals allocate their cognitive resources in both speaking and listening. In this way, relevance theory is best at explaining the choices speakers make in forming the specific utterances they do, and how listeners determine the relevance of any linguistic expression in a particular context.

One difficulty, nonetheless, with experimentally investigating the claims of relevance theory is that the relevance of an input to an individual specifically notes that 'other things being equal, the greater the positive cognitive effects achieved by processing an input, the greater its relevance will be' (Wilson and Sperber, 2003, p. 609). Although this presumption makes excellent sense, we are less confident that there are real-life situations where all 'other things' are indeed equal. At the very least, however, the relevance-theoretic comprehension procedure of following a path of least effort in computing cognitive effects, and stopping when one's expectations of relevance are satisfied, strongly suggests that listeners always weigh the trade-off between cognitive effort and cognitive effects during online understanding.

What are the different ways that cognitive effort and effects interact during metaphor comprehension? For the most part, the psycholinguistic literature has focused more on processing effort and ignored what meanings, or cognitive effects, people infer when understanding verbal metaphors. Yet there is enough evidence available to let us consider several ways that cognitive effort and cognitive effects may interact when metaphors are understood.

5.1 More Cognitive Effort Results in More Cognitive Effects

Metaphor enthusiasts have often noted that metaphors are 'pregnant with meaning' (Empson, 1953). Consider the complex metaphorical statement 'The soul is a rope that binds heaven and earth'. This metaphor suggests a potentially endless stream of entailments as readers ponder the possible ways that the human soul metaphorically connects the transcendent with ordinary reality. Intuitively, inferring many of these complex meanings requires a good deal of effort, and processing time. Readers of poetry, for example, may repeatedly try to interpret these literary metaphors for the new meanings these expressions evoke over time. At a more mundane level, when a listener hears the metaphor 'Juliet is the sun', there is also a sense that generating

the possible complex meanings for this simple statement, only some of which may have been explicitly intended by its author, takes time and effort. Relevance theory is correct, in our view, in claiming that implicit communication of all sorts, including the use of metaphor, establishes cognitive effects that may not be achieved by using explicit messages. Once again, the extra cognitive effects one infers when reading even a simple metaphor like 'Juliet is the sun' is worth the additional cognitive effort needed to understanding these meanings.

We believe that this sort of account nicely explains at least some aspects of metaphor comprehension. Complex metaphorical meanings may indeed require more cognitive effort to understand than simpler metaphorical meanings, or, in our view, non-metaphorical expressions. The surprising fact, however, is that no studies on metaphor comprehension, or any other form of figurative and indirect language, directly support this hypothesis. The reason for this is that nobody has actually ever tried to empirically test this idea! There are several possible reasons for this gap in the literature.

First, most theories of metaphor within the cognitive sciences focus on the process of inferring a single metaphorical, as opposed to a single literal, reading of metaphorical expressions. Although everyone acknowledges that metaphors may produce complex meanings, more so than many literal utterances, experimental psycholinguists have been mainly concerned with describing how source to target domain mappings give rise to a coherent metaphorical meaning for 'A is B' expressions such as 'Some jobs are jails'. Little attention is paid by experimental psychologists to the wide range of meanings that may arise when metaphors are understood. Cognitive linguistic work provides somewhat of an exception to this conclusion, because of their analyses of the probable meanings, or sets of entailments, arising from well-known conceptual metaphors (Gibbs and Steen, 1999; Lakoff and Johnson, 1980; 1999). But apart from the work of Gibbs (1992; 1994), some of which is discussed below, there is not a great deal of evidence to support the idea that these entailments are generated during immediate metaphor comprehension.

A second reason why there is no empirical evidence supporting the 'more cognitive processing = more cognitive effects' hypothesis, is that it is not even clear how to individuate metaphorical meanings. Consider the stock metaphor 'Some jobs are jails'. There are a variety of meanings that people may understand when reading this expression, including that some jobs are poorly paid, confining, stifling, unpleasant, demoralizing and so on. But how does one actually distinguish between these impressions to clearly establish which meanings are independent in order to test the idea that more cognitive processing equals more cognitive effects? This problem is complicated by the possibility that listeners may draw a range of weak implicatures, some of which may result in affective effects (Sperber and Wilson, 1995, p. 224), or perhaps even in non-propositional representations (Carston, 2002, p. 356). These issues highlight the difficulty that researchers face when trying to operationalize the concept of 'cognitive effects' if they are to experimentally measure the trade-off between cognitive effort and cognitive effects. We mention these not to dismiss the 'more cognitive effort = more cognitive effects' hypothesis,

but to note some of the reasons why there has not been any firm evidence collected in support of this idea, despite its intuitive plausibility.

5.2 More Cognitive Effort Does Not Result in Additional Cognitive Effects

It seems obvious to note that people can put a good deal of cognitive effort into understanding a speaker's utterance without gaining appropriate cognitive effects. A listener may simply fail to understand the underlying ground of an 'A is B' metaphor, for example, or a speaker may produce some metaphorical statement that has no clear, apt metaphorical meaning. Relevance theory surely recognizes these situations within its comprehensive account of ostenstive-inferential communication. As far as we know, there are no metaphor scholars who insist that additional cognitive effort alone leads to more cognitive effects. But it is still important to examine this logical possibility, and to empirically demonstrate the problem with any simplistic relationship between cognitive effort and cognitive effects.

Consider the results of a series of studies on authorial intentions in metaphor understanding (Gibbs, Kushner and Mills, 1991). Participants were presented with various comparison statements and were told that these were written either by famous 20th century poets or randomly constructed by a computer program lacking intentional agency. The participants' task in one study was to rate the 'meaningfulness' of the different comparisons and in another study simply to read and push a button when they had comprehended these statements. Readers found metaphorical comparisons, such as 'Cigarettes are time bombs', to be more meaningful when these statements were supposedly written by famous 20th century poets, who are intentional agents, than when these same metaphors were seen as random constructions of a computer program. People also took much less time to comprehend these comparisons when they were told the statements were written by the poets. Moreover, they took longer to reject anomalous utterances as 'meaningful' when these were supposedly written by the poets. Readers assume that poets have specific communicative intentions in designing their utterances, an assumption that does not hold for unintelligent computer programs. Consequently, people make a good deal more effort to try to understand anomalous phrases, such as 'A scalpel is a horseshoe', when they were supposedly written by poets. They more quickly rejected as 'meaningless' these same anomalous expressions when told that they were written by an unintelligent computer program, because computers are assumed to lack communicative intentions.

These findings demonstrate that extra cognitive effort does not necessarily lead to additional cognitive effects. In fact, Gibbs, *et al*. (1991) asked a different group of people to read and write down as many interpretations as they could of the different comparison statements. Not surprisingly, participants produced far fewer meanings for the anomalous comparisons than for the metaphorical statements. As noted above, there are problems with this, or other, methods for counting cognitive effects. But these data crudely suggest that people may spend a good deal of time

trying to understand an utterance, without obtaining many cognitive effects, precisely because they assume that the speaker's utterance may have been intended for relevance purposes. This explanation fits in perfectly with one of relevance theory's fundamental claims, the communicative principle of relevance, which states that 'Every act of ostensive communication communicates a presumption of its own optimal relevance' (Sperber and Wilson, 1995, p. 260), something that experimental participants in Gibbs, *et al.* (1991) clearly adhered to when reading the famous poets (i.e. adhering to the presumption of optimal relevance), but not when reading statements in the computer program condition (i.e. where the presumption of optimal relevance does not hold). In the latter condition the participants did not adhere to the communicative principle of relevance because statements randomly generated by a computer program are not ostensive acts. In situations where we interpret a nonostensive stimulus, we generally seem to be less willing to invest much cognitive effort, because the stimulus does not come with a presumption of optimal relevance. The risk to invest too much effort for not enough benefit when we interpret nonostensive stimuli is much higher than in ostensive communication. In ostensive communication, as shown in the famous poets condition, we are sometimes willing to spend quite a deal of effort in utterances with the expectation of gaining some extra benefits. Obviously, this extra effort does not always and necessarily pay off in terms of additional cognitive benefit. Altogether, the experiments do indeed provide evidence for the communicative principle of relevance.

An additional source of evidence supporting the possibility of more cognitive effort resulting in few cognitive effects is seen in the memory literature. There are studies showing that people better recall, and recognize, metaphorical statements than nonmetaphorical ones (Reynolds and Schwartz, 1983). Scholars sometimes assume that the memorial benefits for metaphors is due to these expressions being more imagistic (Paivio, 1979), or taking longer to process, and producing more cognitive effects, than is the case for nonmetaphorical language (Noveck *et al.*, 2001).

But there is a great deal of memory research showing little relationship between processing effort and memory (Craik and Tulving, 1975). What matters most for memory is the kind of processing that takes place on an item when first encountered. It may be the case that some metaphors require certain processing, or lead to special pragmatic effects, which will enhance memory for these expressions. Yet there is no systematic relationship between processing effort and memory that supports the claim that metaphors should take longer to understand because of the additional cognitive effects they produce.

Once more, our aim here is to suggest that there is no necessary link between cognitive effort and cognitive effects. We hasten to add, however, that in cases where expectations of optimal relevance are fulfilled, listeners will often achieve additional cognitive effects given more cognitive effort. The difficulty we note is in applying this normative idea to describing what people actually do when understanding various kinds of metaphor in various kinds of discourse situations.

5.3 Less Cognitive Effort Results in More Cognitive Effects

There is a good deal of evidence that people can comprehend many metaphors without much cognitive effort. One possibility is that understanding metaphors quickly only produces a small range of cognitive effects, even if these alone may be enough to meet expectations of relevance.

Normal fast-paced conversation makes this possibility quite likely. At the same time, people may also infer complex metaphorical meanings with little cognitive effort, or at least less time than is needed to comprehend corresponding nonmetaphorical expressions.

There are several empirical findings that are consistent with this latter possibility. For instance, Gibbs (1992) showed that people draw very specific meanings quite quickly when processing conventional metaphors, or idioms, that they do not do for literal paraphrases of these expressions. Idiomatic expressions are traditionally thought to be clichéd, dead metaphors, whose meanings are given non-compositionally. But this view is clearly wrong. A large body of research in cognitive linguistics and psycholinguistics demonstrate that many idioms are at the very least partially analyzable and reflect enduring patterns of metaphorical thought (i.e. conceptual metaphors) (Gibbs, 1994; Kovecses and Szabo, 1998; Moon, 1999). Although different from the most novel metaphors, some of which are motivated by pervasive conceptual metaphors, metaphorically motivated idioms provide a good test case of whether complex metaphorical meanings necessarily take more time to process than nonmetaphorical paraphrases. The key experiment from Gibbs (1992) demonstrating quick processing of complex metaphorical meaning had people read idioms (e.g. 'blow your stack') or literal paraphrases (e.g. 'get very angry') at the end of story contexts. As has been repeatedly found, people process the idioms faster than they do their paraphrases. After people read either the idiom or literal paraphrase, they gave ratings of how much they agreed with three statements regarding what they had just read. One statement asserted something about the cause of the event that has just happened in the story, another asserted something about the intentionality of the event, and the third asserted something about the manner in which the event occurred. These specific statements were generated from an independent analysis of the source domains that motivated the conceptual metaphors underlying the particular idioms used as stimuli in these studies (e.g. ANGER IS HEATED FLUID IN A CONTAINER for idioms like 'blow your stack').

For the present purposes, the important findings were that people gave much higher ratings of agreement to the three statements having read the idioms than the literal paraphrases. This suggested that people actually inferred more complex meanings when reading idioms than when they read literal paraphrases, despite the fact that the cognitive effort involved to read the idioms was much less than that involved in processing the literal paraphrases.

One way to interpret Gibbs's (1992) findings is to suggest that people merely accessed all the appropriate cognitive effects for idioms *en bloc* given that these meanings are so tightly associated with conventional metaphors (e.g. Pilkington's suggestion). Within the vast literature on idiomaticity, the only theory that can

predict why these idioms have the specific meanings they do is conceptual metaphor theory (e.g. the meaning entailments arise from the mappings of embodied source domains onto target domains in the conceptual metaphors that motivate the existence and meanings of the idioms studied in Gibbs, 1992). But the above results do not specify whether people simply accessed these specific cognitive effects or computed these online (see Katz, Cacciari, Gibbs and Turner, 1998 for an extended discussion of this issue).

Another set of findings from Gibbs (1992) should be quite interesting to relevance theory. Several experiments showed that people find idioms to be more appropriate and easier to understand when they are seen in discourse contexts that are consistent with the various entailments of these phrases. Thus, people find it easy to process the idiomatic phrase 'blow your stack' when this was read in a context that accurately described the cause of the person's anger as being due to internal pressure, where the expression of anger was unintentional and violent (all meanings that are consistent with the source to target domain mappings of heated fluid in a container onto anger). But readers took significantly longer to read 'blow your stack' when any of these meanings were contradicted in the preceding story context. Although these findings were originally interpreted as support for conceptual metaphor theory, they also fit in nicely with relevance theory's view of how contexts set up expectations that may be violated by speaker's utterances that are less than optimally relevant (see Tendahl and Gibbs, in preparation, for ways in which relevance theory and cognitive linguistics complement one another as theories of metaphor). After all, the relevance of an utterance is largely dependent on how accessible assumptions from the context are that will interact with the assumptions conveyed by the utterance. If the context does not foreground assumptions that can provide the basis for such cognitive effects like contextual implications, strengthenings or contradictions, then this will result in a longer search for a sufficient confirmation of relevance by the addressee. The initial context will have to be expanded until the addressee finally either confirms his expected degree of relevance or rejects the utterance as not being worth the while for him to continue processing the utterance. At any rate, a speaker failing to take these contextual processes into account runs a risk of not being optimally relevant.

Most generally again, a metaphor can be understood more quickly than a 'paraphrase' and still convey more cognitive effects than the paraphrase. But even if a metaphor is processed more quickly and with more cognitive effects than its paraphrase, we agree that the same metaphor could possibly provide even more cognitive effects if it were processed further.

5.4 Less Cognitive Effort Results in Fewer Cognitive Effects

No one would be terribly surprised by the idea that the less effort a listener gives to processing a metaphor, the fewer cognitive effects achieved. Although there are some data supporting this possibility in the early memory literature (Craik and

Lockhart, 1972), we know of no data that specifically suggests this in research on metaphor comprehension. One way of finding such evidence would be to give people minimal time to read different metaphorical and nonmetaphorical utterances (e.g. a rapid serial visual presentation procedure), perhaps as part of some dual-task procedure, and then measure their ability to arrive at even simple metaphorical interpretations for what they had just read.

5.5 Summary

The above review suggests a rather complex picture of the relations between cognitive effort and effects in metaphor comprehension. In general, it is impossible to predict the processing effort needed to comprehend metaphors given the number, or types of cognitive effects that may arise from interpreting these statements. It may be the case, as Noveck *et al.* (2001) argue, that some kinds of metaphors, perhaps novel, creative expressions, may take longer to process than synonymous nonmetaphorical expressions if these are encountered in neutral contexts. But proving this point will require an independent measure of what constitutes 'neutral' contexts, and, quite importantly, some method for assessing, or counting cognitive effects. We suspect that finding solutions to these problems will be difficult to do. Furthermore, it is probably safe to assume that neither metaphors nor nonmetaphors are standardly employed in neutral contexts. It makes little sense, then to construct a theory solely aimed at metaphor understanding in neutral contexts.

6. *Ad Hoc* Concepts and Metaphor Processing

Earlier work in relevance theory claimed that metaphors are instances of pragmatic loosening, and as such, only communicate implicatures, but never explicatures. An explicature is a particular proposition communicated by an utterance. More specifically, explicatures are elaborations of the expression's logical form that respect speaker's intentions and are partly determined by top-down pragmatic processes called 'enrichment'. Consider the following example: 'Robert is a bulldozer'. A traditional analysis assumes that this statement cannot communicate a meaningful proposition because human beings are not machines. In relevance-theoretic terms, the statement does not have an explicature because its proposition is not being communicated. Yet relevance theory claims that the encoded concept for 'bulldozer' may be loosened in a way that its denotation may also encompass human beings like Robert. But whereas narrowings have always been considered important for determining an explicature of an utterance, loosenings, such as the broadening of the concept *bulldozer*, were only treated as contributing to the utterance's implicatures. Consequently, understanding the intended metaphorical meanings of 'Robert is a bulldozer' would only fall under the scope of the utterance's implicatures.

To deal with this inconsistency, Carston (1996; 2002) has recently argued that this distinction between loosenings and narrowings may be incorrect, and that metaphorical utterances may also communicate explicatures, even if metaphors had usually been treated as cases of loosenings. Under this new view, in addition to certain lexical concepts that are simply decoded across contexts, there are conceptual elements constructed as ad hoc concepts (Barsalou, 1987; 1992). *Ad hoc* concepts are loosenings or narrowings that are constructed on-line via inferences from the lexical concepts figuring in the logical form of the utterance. We may inhibit some of the lexical concept's encyclopedic and logical information to make the *ad hoc* concept's denotation larger (loosenings), we may add some constraining information to make their denotation smaller (narrowings), we may employ both of these techniques (simultaneous loosening and narrowing), or we may even create *ad hoc* concepts with a completely disjoint denotation from the lexical concepts. Carston (2002, p. 322) points out that 'the idea [of *ad hoc* concepts] is that speakers can use a lexically encoded concept to communicate a distinct non-lexicalized (atomic) concept, which resembles the encoded one in that it shares elements of its logical and encyclopaedic entries, and that hearers can pragmatically infer the intended concept on the basis of the encoded one'.

In general, Carston's revised account suggests that the lexical concept of the vehicle 'bulldozer' in a metaphor like 'Robert is a bulldozer' is modified into an ad hoc concept *bulldozer** whose denotation possibly includes human beings so that now 'bulldozer' can stand in a subject-predicate relationship with 'Robert'. Consequently, the concept expressed by the vehicle term of the metaphor helps define the statement's explicature, which is part of the total package of meanings communicated by a speaker using this metaphor in context.

This revised view of relevance theory may have important implications for the presumed trade-off between cognitive effort and effects in metaphor understanding, especially given the possibility that some aspects of metaphorical meaning may arise from the fast lexical processes involved in constructing explicatures. These implications are most clear if we first distinguish between two types of metaphor and *ad hoc* concepts.

The first type of metaphor can be illustrated by the expression 'Jennifer is a little princess'. When the speaker and listener both know that Jennifer is not a member of any royal family, the listener must loosen the lexical concept *princess* to form *princess**, a concept that may become part of the utterance's explicature. The derived *ad hoc* concept *princess** must drop, or remove, some of the properties typically associated with the encyclopaedic entry for 'princess'. The definitional information that Jennifer is the daughter of a king or queen would certainly be one of the properties to drop. But some properties that are associated with the concept *princess* can be legitimately predicated of Jennifer, such as princesses come from wealthy families, are beautiful, and may be spoiled. This application of properties from the typical encyclopaedic entry for 'princess' has consequences for the way in which listeners build the *ad hoc* concept according to relevance theory. Most generally, the particular context determines the order of accessibility of various

properties attached to the lexical concept. The listener therefore simply applies the usual relevance-theoretic interpretation strategies and processes the lexical concept until he can integrate this concept into the propositions communicated by the utterance such that his expectations of relevance are satisfied (cf. Carston, 1996, pp. 228–229; 2002, pp. 351–353). Thus, in this kind of metaphor, the *ad hoc* concept is just an adjustment of the encoded concept.

The second type of metaphor is characterized by category-crossings such as seen in our example 'Robert is a bulldozer'. Here, the *ad hoc* account of metaphor comprehension must still wrestle with the age-old problem of describing how the gap between an ordinary lexical concept and an *ad hoc* concept is resolved. How does one go from 'Robert is a bulldozer' to understanding that Robert is single-minded, persistent, insensitive, and so on? Under most people's beliefs, human beings are not bulldozers. As Carston (2002, p. 351) explained, 'according to our (naive) metaphysical understanding of the universe, the entity denoted by the subject just isn't eligible, in any situation, for the property denoted by the predicate'. Therefore, understanding the above metaphorical expression requires the listener to build an *ad hoc* concept *bulldozer** that can enter the propositional form of the utterance and be part of its explicature.

The main problem in this instance of *ad hoc* concept concstruction is that some of the characteristics of the *ad hoc* concept that are created and predicated of Robert do not appear in the encyclopaedic or logical entry of the lexical concept *bulldozer*. For example, there is nothing in one's usual understanding of the mechanical object bulldozer that refers to its being persistent, obstinate, or insensitive, which might be inferred when hearing 'Robert is a bulldozer'. It appears, then, that there is a gap between the ordinary lexical concept and the *ad hoc* concept and a gap between the proposition expressed and the explicature. How might the presence of such gaps influence the amount of processing effort needed to comprehend verbal metaphors?

One might speculate that creating an *ad hoc* concept with insufficient support from the lexical concept should require more processing effort compared to that needed to form an *ad hoc* concept that is achieved by just dropping properties from the encyclopedic entry of a lexical concept, or by adding such properties. But until there is a firmer account for how *ad hoc* concepts like *bulldozer** are constructed, making empirical predictions about the trade-off between cognitive effort and effects is difficult. We suspect that this problem is even more obvious for instances of poetic metaphor.

Carston correctly observed that all current theories of metaphor struggle with the problem of explaining how we actually form the *ad hoc* concept in the category-crossing cases during immediate metaphor comprehension. She suggested that accounts like Gentner's structure-mapping theory (Gentner, 1983; 1989), and Lakoff and Johnson's theory of conceptual metaphor (Gibbs, 1994; Lakoff, 1993; Lakoff and Johnson, 1999) may offer some ways of dealing with this problem. We agree and now offer our own ideas on how this may be done. To do this, we embrace another idea that Carston briefly mentioned in her revised account of relevance theory. She considered the possibility that (a) almost every concept has

to be built *ad hoc*, and that (b) words are only pointers to conceptual spaces (Carston, 2002, pp. 359–364). Under this alternative view, linguistic elements such as words or phrases do not have a meaning *per se*, but only provide clues to conceptual spaces that can be narrowed down or loosened to conceptual elements in context. In fact, many earlier theories of lexical semantics and language comprehension suggest that words serve as pointers or instructions to conceptual knowledge by which language is understood, as opposed to possessing context-free meanings on their own (Bransford and Franks, 1972; Winograd, 1983). But let's see how this may work in practice for online metaphor comprehension.

Consider again the metaphor 'Robert is a bulldozer'. How do we get from properties of machines to properties of human beings, a transition that is required in this instance of *ad hoc* concept construction? To answer this, let's make two assumptions. First, we can suppose that any metaphorical utterance appears in a communicative context that facilitates understanding of its meaning, precisely because of the communicative principle of relevance. Even if a speaker may not always succeed in creating the best utterance for a given situation, she will at least try to achieve this aim in ostensive communication. The constraining influence of different contexts again suggests why it makes little sense to assess the trade-off between cognitive effort and effects in so-called neutral contexts.

The second assumption that is useful in describing *ad hoc* category construction is the idea that words point to conceptual spaces that are partly structured as enduring metaphorical concepts. In fact, there is a great deal of linguistic and psychological evidence showing that people readily access rich metaphorical domains/concepts during many aspects of reasoning and immediate linguistic processing (Croft and Clausner, 1993; Gibbs, 1994, 2006).

We can now combine these two assumptions to describe important constraints on how ad hoc concepts are created during metaphor comprehension. For example, in 'Robert is a bulldozer', the word 'bulldozer' typically points to a set of familiar conceptual metaphors, such as PEOPLE ARE MACHINES, THE MIND IS A MACHINE, THINKING IS A MECHANICAL ACTIVITY, and so on. In some instances, the link between a lexical concept and a specific conceptual metaphor may be so entrenched that a specific metaphorical concept is immediately accessed, and found to help establish a relevant reading of 'Robert is a bulldozer'. In other cases, listeners will need to test various conceptual metaphors in order of their accessibility until finding one that creates an interpretation of 'Robert is a bulldozer' which satisfies the expectation of optimal relevance. Not surprisingly, the more accessible a conceptual metaphor is given a lexical concept, the easier it will be to create an appropriate *ad hoc* concept and to understand a verbal metaphor.

Of course, context also constrains the construction of *ad hoc* categories. Assume that in the case of 'Robert is a bulldozer', the context, as part of the mutual cognitive environment holding at that moment for the speaker and listener, primes the incorporation of the MIND AS MACHINE metaphor. This conceptual metaphor provides many possible mappings between the source domain MACHINE and the target domain MIND. At this point, a relevance-guided sorting process

determines which of the many possible source-to–target domain mappings of the MACHINE to MIND metaphor may be applied to constructing the *ad hoc* concept *bulldozer*★ that meet the expectation of optimal relevance for this context.

Overall, then, the creation of *ad hoc* categories during metaphor understanding incorporates people's tacit knowledge of conceptual metaphors and the processing constraints imposed by the communicative principle of relevance. This account of metaphor understanding is speculative to some degree, but connects two approaches to metaphor and meaning that have independently been studied and confirmed. We see much evidence in favor of such an account and no evidence against it (see Tendahl and Gibbs, in preparation, for a more detailed presentation of this newly combined account).

The above proposal also suggests that it is not necessarily the type of metaphor, for example conventional versus poetic, which determines the amount of cognitive effort involved in understanding a metaphor. Instead, it is the context that determines whether an utterance, be it metaphorical or nonmetaphorical, is processed quickly or slowly, is apt or not, or, in other words, is optimally relevant or not. This position is perfectly consistent with the larger relevance-theoretic framework. For example, Pilkington (2000, p. 103) has argued that 'The success of a poetic metaphor depends not only (if at all) on its originality, but in the creation of a context which encourages and guides the exploration of the encyclopedic entries of the concepts involved'. We suggest that concepts are not structured as well-defined encyclopedic entries, but are created on-the-fly given the context at hand. Again, in many instances, browsing the encyclopedic entries of the concepts involved cannot result in full comprehension of the metaphor.

What remains to be shown by psycholinguistic testing is whether metaphorical utterances of the first kind (e.g. 'Jennifer is a little princess') are processed faster than metaphorical utterances of the second kind (e.g. 'Robert is a bulldozer'). A cautious assumption would be that metaphors of the second kind require more processing compared to metaphors of the first kind when they appear in contexts that have not primed the conceptual metaphors that need to be accessed. However, when the context does not help a lot in determining how much we must loosen the concept *princess* in order to understand the metaphor 'Jennifer is a little princess', then we will need more processing time to understand the metaphor. So ultimately we claim that it will be the context that determines how quickly we can process a metaphorical utterance of whatever kind.

Another interesting issue to look at is whether the new relevance theory account of metaphor processing makes different predictions concerning the processing effort needed for metaphorical utterances compared to the more traditional, implicature-only, account. According to Carston (2002) and Pilkington (2000), metaphorical utterances still seem to be treated as a form of language that is not likely to require more processing effort than literal language. And in fact, at least it cannot be presumed that an account of metaphorical meanings being expressed as part of both explicatures and implicatures versus an account of metaphorical meanings being expressed only in the form of implicatures should result in different

predictions for the amount of processing required. The *ad hoc* concepts that may enter explicatures are constructed in a very natural way, not just in metaphorical utterances. For example, *ad hoc* concept construction has always been viewed as a part of explicatures in the form of narrowings of encoded concepts. We consider the pragmatic construction of conceptual meaning as a process that is not only typical for metaphors, but is part of utterance comprehension quite generally. Thus, we do not believe that the construction of *ad hoc* concepts predicts more processing effort compared to the more traditional implicature-only account of metaphor processing. But, as has been explained in some length above, we do not believe that metaphorical utterances necessarily require more processing effort compared to literal speech.

7. Cognitive Effects and Metaphor Processing

Metaphor scholars have surprisingly paid little attention to how context shapes cognitive effects during metaphor understanding. There is a huge body of literature examining how context may lead people to draw literal as opposed to metaphorical interpretations of verbal expressions. But no published studies have specifically investigated how different contexts give rise to different cognitive effects when reading or listening to linguistic metaphors. Relevance theory, however, provides several suggestions on this. According to relevance theory, cognitive effects are achieved by one of the following three types: (1) new information provided by a contextual implication, (2) strengthening of an existing assumption, and (3) a contradiction and possible elimination of an existing assumption. How might these different cognitive effects be manifested with metaphor? Consider the following three contexts, each of which ends with the metaphorical statement 'Lawyers are sharks'.

    A. Strengthening context
    Tom said to Peter:
    'Lawyers support malicious people'.
    'They don't care about the victims'.
    'They just care about the money'.
    'Do you have anything to add, Peter?'
    Peter replied:
    'Lawyers are also sharks'.

    B. New information context—contextual implication
    Tom said to Peter:
    'Lawyers work in a court'.
    'They went to a law school'.
    'They specialize in different fields'.

'Do you have anything to add, Peter?'
Peter replied:
'Lawyers are also sharks'.

C. Contradiction context
Tom said to Peter:
'Lawyers support people in need'.
'They care about their client's troubles'.
'They are not concerned with money'.
'Do you have anything to add, Peter?'
Peter replied:
'Lawyers are also sharks'.

These different contexts evoke different readings of 'Lawyers are sharks'. Each of these different meanings is related to the basic metaphorical understanding of the comparison between lawyers and sharks. But the cognitive effects one draws from reading this metaphorical utterance in the three contexts nevertheless differ quite a bit. We have just confirmed these impressions in a study in which college students read one of the three contexts and final utterance above (there were 24 contexts and metaphorical expressions presented overall). One-half of the metaphors evoked positive associations for the target concept (e.g. 'Operas are feasts'), and one-half of the metaphor evoked negative associations for the target (e.g. 'Lawyers are sharks'). After reading each story and metaphorical ending, participants rated their agreement with the following statements:

(a) Peter thinks negatively about lawyers.
(b) Peter thinks that Tom thinks negatively about lawyers.
(c) Peter is trying to convince Tom of something about lawyers that Tom does not already believe.
(d) Peter's remark expresses complex meanings.

The findings from this study indicated that college students are quite capable of understanding the general metaphorical meanings of the speakers' final expressions, as well as recognizing that these metaphors convey additional cognitive effects that differ across the three types of contexts. First, participants correctly rated the positive metaphors as expressing positive views about the metaphor topic, and negative views about the topics of the negative metaphors. This shows that people were sensitive to the general positive or negative meanings of the metaphorical statements. Second, participants saw the metaphors in the strengthening contexts as agreeing more with the addressees' beliefs than when new contextual implications were communicated. This was especially the case for positive metaphors. Third, participants recognized in the contradictory contexts that speakers were trying to convince addressees of something they do not already believe about the metaphor topic, but did not make the same assumption when

reading the contextual implication or strengthening contexts. Finally, there was a linear increase in participants' complex meaning ratings across the strengthening, contextual implication, and contradictory contexts for both the positive and negative metaphors.

These new experimental results are both interesting and important. They provide empirical support for relevance theory's assertion that context critically determines cognitive effort and effects. Of course, the rating task does not cover an exhaustive test of the different cognitive effects that participants may receive in response to the different metaphors and different contexts, nor does it provide information on the processing effort needed to understand the metaphors in different discourse contexts (a study we are soon to conduct). However, the results clearly indicate that the cognitive effects of metaphors vary widely according to the context, and specifically show an increase in the cognitive benefit of metaphors from strengthening, via contextual implication to contradiction contexts.

As natural as these results may seem, they point out something important about metaphors that is mostly ignored in theories of metaphor. For instance, psycholinguistic studies, again, traditionally explain understanding of metaphorical versus literal meaning, but do not examine the complex pragmatic effects that arise when metaphors are comprehended. If metaphors are more or less complex according to their context, it will be difficult to say that metaphor as a specific type of language is more or less complex than literal paraphrases. Moreover, psycholinguists often suggest that metaphors should be compared to literal paraphrases in default contexts. But what is a default context? The context in which a metaphor can be understood most easily, which would be a strengthening context, or the context in which a metaphor has the highest communicational value, which would be a contradictory context according to the results of our study? We can only conclude that metaphors do not have meanings *per se* and they do not have an invariant degree of complexity. Instead, metaphors exist in contexts and are more or less complex accordingly, express more or fewer meanings, express stronger or weaker explicatures and implicatures. Relevance theory offers the only theoretical framework that is capable of explaining these aspects of metaphor comprehension.

8. Conclusion

Our examination of the experimental literature in psycholinguistics has generally shown that there is no systematic relationship between cognitive effort and cognitive effects in metaphor comprehension. Although there may be instances where some metaphors are understood quickly with few cognitive effects inferred, and other cases where metaphors take considerable time to process accompanied by rich cognitive effects, these simple relationships do not explain the wide range of metaphor understanding situations. This conclusion is important for debates within relevance theory on whether metaphor understanding necessarily demands

more cognitive effort because of the extra cognitive effects presumably inferred. In our judgment, relevance theory need not make any such claims or experimental predictions. We again hasten to add that not all relevance theory scholars have made the 'more effort = more effects' claim for metaphor understanding. In fact, recent developments in relevance theory on mutual adjustment processes in understanding of explicatures and implicatures suggest that there may be cases in which complex metaphorical meanings are rapidly inferred, depending, of course, on the context and type of metaphor.

Our argument against a simplistic equation of 'more effort = more effects' in metaphor interpretation is not intended as a criticism of the theory of optimal relevance, which is defined as the presumption that a communicator's ostensive stimulus is relevant enough for it to be worth the addressee's effort to process it and the most relevant one compatible with the communicator's abilities and preferences (Sperber and Wilson, 1995, p. 270). In fact, this idea is likely to be a fundamental constraint on linguistic processing, just as relevance theory has always claimed. Good arguments can be made on a case-by-case basis as to how the effort-effect trade-off determines what a person has understood and how much effort went into arriving at these meanings. The difficulty, though, is that it may be nearly impossible to generalize effort-effect trade-offs across particular types or forms of language. Once more, our view is that relevance theory is consistent with this assumption.

The question remains whether it is possible to produce empirical evidence on the effort-effect trade-off in action as people attempt to understand utterances in context. Section 5.4 briefly alluded to one potential way of assessing the trade-off by imposing comprehension deadlines on readers to see if these correspond with the range of meanings understood. Of course, as we noted above, there are tremendous problems with counting the number of meanings in metaphors, because of the difficulty in individuating various propositional inferences and nonpropositional effects. But as the experimental study in section six demonstrated, people may have some rough intuitions about meaning complexity that could be further explored in other empirical studies. We must acknowledge, nonetheless, that experimental tasks in which comprehension deadlines are given are quite different from real-life comprehension where people's individual motivations and goals are critical in determining the exact effort-effects trade-off criteria.

Optimal relevance is ultimately influenced by at least four factors in linguistic communication: (1) the participants (e.g. their abilities, interests, beliefs, motivations, goals), (2) the orienting task (e.g. instructions or directions given), (3) the criterial task (e.g. understanding to solve a problem, make a decision, remember something, be emotionally affected by something said), and (4) the materials (e.g. type of language, modality of presentation). These factors not only have their individual effect on the determination of optimal relevance, but interact in often complex, even nonlinear, ways.

The possibility of higher-order interactions among these factors will make it difficult to simply predict how utterance interpretation in context is constrained by expectations of optimal relevance.

These observations will hopefully serve as a catalyst to psycholinguists to create new tests of the principle of relevance. We also are hopeful that our remarks will generate additional discussion among relevance theory scholars on some of the complexities involved in the effort-effects trade-off, perhaps especially in regard to metaphor comprehension. But relevance theory has already advanced thinking about metaphor interpretation in its arguments about how context enables people to draw different, and maybe additional, cognitive effects when metaphors are understood. Although metaphors do not necessarily demand different cognitive processes to be understood, compared to many kinds of nonmetaphorical language, they surely have various communicative advantages as instances of loose talk. Despite the long history of metaphor research in psychology, there has been surprisingly little attention given to these cognitive effects. Relevance theory offers a superior theoretical framework for describing these inferences, which are, after all, part of the reason why people use metaphors in the first place.

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