Stefanowitsch, Anatol. 2011. Cognitive linguistics as a cognitive science. In Marcus Callies, Wolfram R. Keller & Astrid Lohöfer (eds.), *Bi-directionality in the cognitive sciences*, 296–309. Amsterdam & Philadelphia: John Benjamins.

Cognitive linguistics as a cognitive science*

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Cognitive linguistics is on its way to becoming a cognitive science, but a number of problems remain. The relationship between cognitive linguistics and the core cognitive sciences (psychology and neurology) must be clarified: cognitive linguists can selectively import models and methods from these disciplines as a foundation for their linguistic theories, they can export their own models to these disciplines for empirical testing and integration, or they can transform linguistics into a core cognitive science in its own right. The latter requires a number of changes to the models and practices of cognitive linguistics: it must refocus on its linguistic heritage, adopt a more scientific outlook, gain a higher degree of methodological awareness and restrict its models to linguistic constructs and hypotheses that can be operationalized and falsified.

Keywords: empirical testing, falsifiability, import of models and methods, methodological awareness, operationability

1. Introduction

The social sciences and the humanities are currently experiencing a "cognitive turn" at least as sweeping and profound as the linguistic turn of the last century. Many disciplines are struggling to redefine themselves in light of this development, giving us a host of new research programs referring to themselves as "cognitive anthropology" (D'Andrade 1995), "cognitive sociology" (Zerubavel 1997), "cognitive economics" (Bourgine and Nadal 2004), "cognitive political science"

(Easton 1985), "cognitive religious studies" (Boyer 1994), and, of course, "cognitive poetics" (Stockwell 2002), "cognitive grammar" (Langacker 1987) and "cognitive linguistics" (Lakoff 1987).

In this short, programmatic chapter, I share some of my thoughts on how successful cognitive linguistics has been so far in redefining linguistics as a cognitive science and where it could do better.

2.   What is a cognitive science?

In order to discuss in what way and to what extent cognitive linguistics, or any other discipline, can be regarded as a cognitive science, we need to specify what we mean by "cognitive science". I assume the following broad, and hopefully uncontroversial, definition:

> Cognitive science is the interdisciplinary study of mind and intelligence, embracing philosophy, psychology, artificial intelligence, neuroscience, linguistics, and anthropology.   (Thagard 2008)

I further assume that by "mind and intelligence" we mean processes like perception, imagination, categorization, reasoning, and memory.

It follows that any discipline that considers itself to be a cognitive science must contribute to the study of the human mind. For two of the disciplines in the definition above, that contribution is self-evident: the human mind and its material basis constitute the principal objects of research of psychology and neurology respectively. I refer to these as "core cognitive sciences".

For other disciplines, that contribution is less direct, but still clearly discernible. Artificial intelligence, for example, is concerned with the study of systems that *simulate* some of the outwardly visible behavior of the human mind, and to the extent that this simulation is accurate, the mechanisms behind it may be treated as models of the mind. Whether these models are realistic in the sense that they capture not just the input and the output, but also the internal processes of the human mind, however, is a question that can ultimately be answered only by empirical research in the core cognitive sciences.

Still other disciplines have a much more indirect relationship to the study of mind and intelligence; their principal objects of research are related to cognition only in that they are, in some sense, products of human minds. The disciplines mentioned in the introduction all fall into this category. Unlike the core cognitive sciences, these disciplines have a double task to fulfill if they want to be part of the cognitive enterprise: first, they must put forward scientific models concerning their object of study (language, literature, culture, society, economy, etc.), and

second, they must specify some relationship between that object of study on the one hand and the study of human mind and intelligence on the other.

3.   How to become a cognitive science

There are three main ways in which a discipline can specify a relationship between the human mind and an object of study in the social sciences and humanities, and all of these can be found in the recent history of linguistics.

First, a discipline can draw inspiration from the core cognitive sciences by borrowing from them, more or less selectively, models, perspectives and terminology. I refer to this research strategy as the Import Strategy. There is nothing wrong with this strategy, as long as there is a genuine attempt to import more than just the terminology of the cognitive sciences. But since none of the results of this import of ideas ever flows back to the core disciplines, the potential of this strategy for real progress in our understanding of the human mind is limited.

Second, a discipline can use its domain-specific expertise to build the best (most descriptively adequate, most exhaustive) model of its object of study. This model can then be confronted with models of the human mind from the core cognitive sciences in order to investigate if and how these models may be integrated, i.e what a model of the particular object of study in question may tell us about the human mind and human intelligence. I refer to this as the Export and Integration Strategy. The integration can be attempted by practitioners of psychology and neurology, by adequately trained practitioners of the discipline in question, or collaboratively, by researchers from both fields. There are practical obstacles to this research strategy – diverging terminology, discipline-internal institutionalization, etc. – but I believe that it is, ultimately, more fruitful than a mere one-way import of ideas from psychology and neurology.

Third, a discipline can take its domain-specific expertise and fuse it into the core cognitive sciences, i.e., it can become an integral part of psychology (or, less likely, neurology). In this scenario, a researcher or group of researchers would start out from a domain-specific model of language, economy, literature, etc. and subject it to testing within the theoretical and methodological frameworks of the core cognitive sciences. The results of these tests would then be successively integrated into these models, making them less and less domain specific until they are essentially cognitive science models of a particular sphere of human behavior.

This is unlikely to happen to a discipline as a whole, as not all researchers in the social sciences and humanities take a cognitive perspective in the first place, but it can happen to subdisciplines and to research programs by individual research groups or individual researchers.

4. Cognitive linguistics as a cognitive science

Before Leonard Bloomfield's brief behaviorist revolution in linguistics, connections between language and mental processes were naturally assumed by authors such as Karl Brugmann, Ferdinand de Saussure, Franz Boas, Edward Sapir, Otto Jespersen, Herman Paul, and many others. In this sense, linguistics was one of the earliest disciplines deserving the name "cognitive". However, the behaviorist turn interrupted this tradition and after the idea of linguistics as a cognitive science was reintroduced by Chomsky (1959), it developed in an intriguing, but perhaps ultimately harmful direction.

Chomskyan linguistics adds an interesting twist to the relation between language and cognition. It posits a specialized mental module that contains our linguistic competence, an autonomous language faculty that does not share any representational principles with other aspects of cognition and that interacts with them only in the process of linguistic performance, a process that is explicitly placed outside of the domain of linguistic theory. To be quite clear about it: this is an extremely elegant postulate. It allows Chomskyan linguists to do cognitive science simply by doing linguistic analysis (which in their framework means building models to account for their own acceptability judgments on constructed sentences). A Chomskyan linguist does not have to pay attention to the methods of the core cognitive sciences, nor to anything that they have uncovered about any aspect of human cognition. For a linguistic theory with cognitive aspirations, this is a genuinely ingenious theory-building mechanism: it ensures that any discovery about the structure of language automatically becomes a fact about the human mind.

Despite its elegance, there is a fundamental problem with this postulate: it is not falsifiable. Since linguistic competence in this view is unrelated to anything else, observations about the way that it *interacts* with other cognitive processes cannot tell us anything about its nature or even its existence. That does not mean that the postulate is actually false – language does seem unique among our cognitive skills, and so we cannot dismiss the idea of autonomy out of hand –, but it means that we have no way of knowing whether it is false. This makes it fruitless as a departure point for the scientific study of linguistic cognition. Incidentally, it is also fruitless as a departure point for the scientific study of language itself – there is an open-ended number of theories that are consistent with a convincingly large subset of linguistic data to appear plausible, and because of the autonomy postulate – the idea of an encapsulated linguistic competence that cannot be accessed – there are no competence-external criteria that could distinguish between them.

Cognitive linguistics – the family of theories associated with authors like Ronald Langacker, George Lakoff, Leonard Talmy, and Gilles Fauconnier – avoids such a postulate. This makes its relationship to the core cognitive sciences

potentially more fruitful but also much more complicated. As already mentioned, in cognitive linguistics, we see evidence for all three strategies discussed above.

4.1   Cognitive linguistics and the Import Strategy

A brilliantly executed example of the Import Strategy is found in Langacker's Cognitive Grammar, as developed in the two volumes of his *Foundations of Cognitive Grammar* (1987, 1991). Langacker himself refers to his work, quite aptly, in my view, as "an exercise in speculative psychology" and he summarizes its relation to the study of the human mind as follows:

> I have adhered rather strictly, in developing my proposals, to the dictates of both psychological plausibility and linguistic necessity; I have relied almost exclusively on *seemingly indisputable cognitive abilities* (e.g. the ability to compare two events and register a discrepancy between them), and I invoke them for linguistic constructs that must somehow be accommodated in any comprehensive and explicit analysis.   (1987: 6, my emphasis)

In other words, Langacker builds his linguistic theory entirely on supposedly general cognitive processes, but he is highly selective in choosing the processes he considers relevant: cognitive routinization ("entrenchment"), the ability to recognize similarities and differences, schematization, the ability to track changes over time, and figure-ground perception.

Langacker is not just selective, though. In addition, he characterizes these processes in very general terms not tied to any specific model from the core cognitive sciences. He adopts a kind of informed common-sense perspective on the human mind – informed in that it takes into account some important developments in 20th century psychology (for example, gestalt principles), and common sense in that it defines its concepts in terms that don't require any knowledge in psychology or neurology. Langacker is not alone in this strategy: George Lakoff's *polysemy networks* (Lakoff 1987), Mark Johnson's *image schemas* (Johnson 1987), Leonard Talmy's *force dynamics* (Talmy 1988), and Gilles Fauconnier's *blending* (Fauconnier and Turner 2002) are all examples of such common-sense cognitive processes.

There are good reasons for a selective common-sense approach to the cognitive sciences. Recall that we are talking here about a one-way import of ideas from the core cognitive sciences to theoretical linguistics, with no serious expectation yet that their application to language will yield results that might flow back to the core cognitive sciences. Given this situation, consider the alternative to such a selective approach, i.e. the full-fledged adoption of a particular model of cognition: every time this model is revised or amended, as it doubtless would be, the linguistic theory based on it would have to be revised and amended as well, regardless of

whether the linguistic data call for such revisions. Cognitive linguists would be in a position comparable to that of third-party software developers developing software for the Windows operating system: Every time a new version of Windows is released, they have to change their applications to work with this new system, even if the application was working just fine. On the other hand, these developers have no influence on future versions of the OS, for example by suggesting particu- lar functions that would benefit their application.

In a situation where the relation between the core cognitive sciences and linguistics is a one-way street from the former to the latter, then, the kind of selective common-sense psychology we see in the works of Langacker, Lakoff, Talmy and others is the only viable option. It is not without problems as a basis for interact- ing with psychologists, neurologists, and computational scientists, who do tend to adhere to specific theories of the human mind and who are often exasperated with cognitive linguists because of their fast and loose approach to cognitive science models and terminology. Still, this strategy does have the potential to yield results that will feed back into the core cognitive sciences if and when it is combined with an empirical approach to linguistic data. Such an empirical approach, however, is lacking almost completely in the work of the authors I have mentioned. I return to this issue after discussing the second of the three strategies introduced above.

4.2 Cognitive linguistics and the Export and Integration Strategy

There are a number of examples for the Export and Integration Strategy, where a discipline applies its domain-specific expertise to the analysis of its object of research and then turns the results over to the core cognitive sciences for an investigation of how these results may be accounted for within a general theory of the human mind. I discuss two of them here: metaphor theory and construction grammar.

What is interesting about both of these areas is that they do not start out by importing ideas from the core cognitive sciences in the way that Langacker's Cognitive Grammar or Fauconnier's theory of blending do. Instead, they start out from linguistic analysis. This is not to say that they do not make claims relevant to the cognitive sciences. Take Lakoff and Johnson's Conceptual Theory of Metaphor – it takes them less than one paragraph to get to their central claim:

> We have found [...] that metaphor is pervasive in everyday life, not just in language, but in thought and action. Our ordinary conceptual system, in terms of which we both think and act, is fundamentally metaphorical in nature.
>
> (Lakoff and Johnson 1980: 3)

But if we consider the evidence on which they base these far-reaching claims, we find that it is exclusively linguistic, as they themselves readily admit on the very

next page (Lakoff and Johnson 1980: 4). Essentially, their evidence consists of two facts: first, that metaphor is pervasive in everyday language, and second, that metaphor is best described in terms of general, highly systematic mappings between concrete and abstract semantic domains. Both of these observations are purely linguistic (and neither of them was new at the time when Lakoff and Johnson pointed them out). So, at first glance, Lakoff and Johnson's strategy is very similar to the Chomskyan strategy: they uncover a fact about language and automatically assume that it is also a fact about the mind. What distinguishes their strategy from Chomsky's is that they do not posit an encapsulated language faculty, and that therefore their claims are, in principle, testable. They make predictions about the human mind in general, not just about the part of it that is concerned with language, and thus, behavioral evidence can be brought to bear on the issue.

Based on what we currently know about metaphor in the human mind, I think it is fair to say that the original claims by Lakoff, Johnson and others are too sweeping – matters are considerably more complex. But we can also clearly say that these claims are right in their broad outline: we do have empirical evidence for a correlation between linguistic metaphors and general patterns of thought.

Interestingly, not all of this evidence was adduced by cognitive linguists aware of metaphor theory: it is well-established in Social Psychology, for example, that people associate moral failure with physical pollution: experiments show that people have the urge to wash when they have thought or talked about disagreeable, unpleasant or morally questionable acts (Fairbrother et al. 2003, Zhong and Liljenquist 2006) and, conversely, they have a higher tolerance for such acts if they wash their hands first (Schnall et al. 2008). It is suggestive to explain these results with reference to linguistic metaphors like the following:

(1)   the *stain* of guilt/sin/illegitimacy
           impure thoughts/soul/character
           a *smutty* manner/joke/film/novel
           a *filthy* word/mouth/mood/mind
           an *unclean* thought/spirit/mind
           a *dirty* mind/look/word/secret
           to *contaminate* a relationship
           to *taint* someone's reputation
           to *wash away* someone's sins
           to feel *soiled* by an experience
           to *cleanse* oneself of negativity
           to *pollute* someone's mind/thoughts

What these studies leave open is the causal mechanism underlying such correlations: do we think of disagreeable things as DIRTY because there are linguistic metaphors that make this connection, or are the linguistic metaphors simply an expression of a preexisting mental connection? It is here that the speculative-psychology approach of the leading theoreticians in cognitive linguistics reaches its limits – empirical research is necessary within the field of cognitive linguistics itself.

Before I turn to a discussion of empirical research, let me briefly discuss my second example: construction grammar. Note that, just like metaphor theory, construction grammar was not inspired by models from the core cognitive sciences, but by purely linguistic considerations: authors like Lakoff (1970) and Fillmore (1985) became increasingly aware of the extent to which the grammar of natural languages was suffused by irregularity and idiosyncrasy. Construction grammar was developed as a framework capable of capturing these idiosyncrasies and the generalities that, of course, also exist, by a uniform mechanism: the grammatical construction. Construction grammarians vary in their willingness to make claims about the human mind based on their theoretical considerations, but Lakoff (1987) and Goldberg (1995) clearly assume that their grammatical analyses reflect the way in which grammatical knowledge is mentally represented.

Again, we are a long way from a complete understanding of the nature of grammatical constructions, of how constructions emerge, develop and disappear in language change, of how they are learned, of how they are represented in the mind and of how they are put to use in producing and comprehending language. But, as in the case of metaphor theory, we can safely say that we have empirical evidence of their existence and of their relevance to a cognitively plausible characterization of grammatical knowledge (see the early work by Gibbs 1995; work by Michael Tomasello, Elena Lieven, and their associates, e.g. Tomasello 2003, Dąbrowska and Lieven 2005; recent work by Goldberg 2006; and my own work on negative evidence, Stefanowitsch 2006, 2008).

5.   Empirical research in cognitive linguistics

In the final section of this short chapter, I discuss the issue of empirical research in cognitive linguistics. In my view, the adoption of a strictly empirical mind-set is by far the most important obstacle currently standing between cognitive linguis- tics as a cognitive science and cognitive linguistics as actually practiced.

Currently, cognitive linguistics as a whole cannot be classified as a cognitive science quite simply because it is not a science. Most cognitive linguists are happy to rely exclusively on the Import Strategy: they import, first-hand or, more

typically, second-hand via authors like Lakoff and Langacker, selected perspectives and partial models from the core cognitive sciences, analyze linguistic data in terms of these models, and leave it at that. This unfortunate fact is responsible for an endless series of somewhat dull and repetitive talks at national and international cognitive linguistics conferences, talks about selected metaphors for LOVE in Chinese, Russian, or Old Norse, about the polysemy of the English preposition *over*, about the most visually pleasing way to draw a network for the resultative construction, about the prototypical meaning of this or that Korean verb and about the embodied way in which we talk about the human body. More importantly, the self-suffcient reliance of cognitive linguists on a few conceptual imports and pseudo-imports from the core cognitive sciences is responsible for the fact that very few people in the cognitive sciences pay attention to cognitive linguistics.

Someone following the development of the field closely may be less pessimistic with regard to the role of empirical research: if we look at the conference programs of cognitive linguistics conferences over the past fifteen years, there seems to be a growing interest in empirical research (see also Geeraerts 2006): from the mid-1990s onwards, second-generation researchers in cognitive linguistics began to turn to psycholinguistic methods (and some psycholinguists began to take an interest in cognitive linguistics research issues, such as metaphor and polysemy). And from the late 1990s onwards, second- and third-generation cognitive linguists began to turn to corpus-based methods (see Tummers et al. 2005; Stefanowitsch in press). The results generated by these empirical researchers are often spectacular and they are certainly highly relevant to theoretical considerations at the heart of cognitive linguistics.

In the domain of metaphor, for example, there is now evidence for more than just a correlation between metaphorical language and metaphorical thought: it seems that there is a causal direction from metaphorical language to metaphorical thought. Lera Boroditsky has presented experimental results suggesting that speakers of English, who talk about time as moving horizontally from front to back also reason about time in this way, while speakers of Chinese, who talk about time moving vertically from top to bottom reason about time correspondingly (Boroditsky 2001). In a corpus-based paper, I have uncovered language-specific differences between the metaphors associated with near-synonyms such as *joy* and *happiness* (Stefanowitsch 2004), and Ben Bergen and his colleagues have provided psycholinguistic evidence suggesting that such differences might affect non-linguistic cognition (Tseng et al. 2005).

But there are a number of reasons, both substantial and institutional, why the emergence of an empirical tradition in cognitive linguistics is cause for cautious hope at best. One institutional problem is that the non-empirically-minded

majority of researchers in the field are quite happy to pay attention to empirical results when these results are spectacular, and when they confirm dearly-held beliefs of the cognitive community. But most empirical research is *not* spectacular and just as often as not it contradicts some dearly-held belief.

With respect to the lack of spectacularity, take work by Gerard Steen and his work group on metaphor identification (e.g. Steen 2007), or my papers on metaphorical pattern analysis (e.g. Stefanowitsch 2004, 2006). These papers are not particularly dazzling – and I mean that as a compliment. We are grappling with a difficult issue: how to tell that we are dealing with a metaphor and how to classify a metaphor once we have identified it. Given the soaring heights of abstraction and generality at which the theoretical discourse on metaphor takes place, this issue is bound to seem dull and uninspiring. But it has to be done, if we are to make any progress on the deeper questions concerning the relationship between metaphorical language and metaphorical thought.

With respect to the contradiction of dearly-held beliefs, consider again the question of whether metaphorical language causes metaphorical thought or vice versa. In spite of the encouraging results in Boroditsky (2001) just mentioned, this question has not been conclusively answered. For example, Chen and colleagues (Chen et al. 2007) were unable to replicate Boroditsky's results regarding the vertical metaphor of TIME. However, this fact has received virtually no attention in the field of metaphor research, while Boroditsky's study is still widely cited (at the time of writing, Google Scholar lists a mere eleven citations for Chen et al.'s study, compared to 209 for Boroditsky's – this difference seems too large to be explained merely by the fact that Boroditsky's study was published six years earlier than Chen et al.'s).

A second reason for tempering our optimism regarding the empirical turn in cognitive linguistics is that the growing number of empirical researchers in cognitive linguistics is not due to a large-scale conversion of researchers already active the field. Despite all massive efforts to provide training opportunities in the form of methodology workshops at national and international conferences and textbooks, collections and monographs on methodology (e.g. González-Márquez 2007), the increase in empirical research is almost exclusively a result of new researchers joining the field. It is my impression that this influx of empirical researchers is currently still offset by an even faster-growing group of non-empirical linguists adopting the cognitive linguistics framework. In any case, the empirical researchers are, and will be for the foreseeable future, a minority. And a minority, that is not as widely respected in the field as one might expect, given that they present the best shot the field has for becoming a cognitive science on equal terms with psychology, neurology and artificial intelligence.

This lack of interest is especially unfortunate in light of the fact that cognitive linguistics needs its young empirical researchers more than these researchers need cognitive linguistics. There are, after all, well-established traditions of psycho-linguistic and corpus-linguistic research that precede the emergence of cognitive linguistics by at least thirty years. And cognitively inspired empirical research is generally well-received in these traditions, so that empirically-minded cognitive linguists typically have at least one foot firmly planted in one of these traditions. If theory development in cognitive linguistics continues to proceed largely independently of the empirical research done at the fringes of the field, it seems inevitable that these young researchers will abandon the field, leaving behind a framework that may be inspired by the cognitive turn, but that remains a discipline of the humanities, caught in a hermeneutic circle of intuitions about intuitions.

6.   Concluding thoughts

Summing up the discussion in the preceding sections, we can say that in order to become a cognitive science, cognitive linguistics as a discipline must accomplish at least four tasks.

First, cognitive linguistics must become more linguistic. It must rediscov- er a focus on detailed linguistic analysis, continuing the tradition of linguistic argumentation but replacing intuitive grammaticality judgments by the most advanced corpus-based methods available.

Second, cognitive linguistics must become more scientific. It must ensure that its fundamental notions can be operationalized and that its claims can be phrased as falsifiable hypotheses. The work by its leading theoreticians may serve as an inspiration, but it can be integrated into scientific models in cognitive linguistics only to the extent that it lends itself to operationalization and falsification (cf. Stefanowitsch 2010, Section 3.1).

Third, and as a consequence of the second task, cognitive linguistics must become more methodologically aware. It must adopt strict observational and experimental protocols and state-of-the-art statistical methods (see e.g. Gries 2006).

Fourth, cognitive linguistics must become less theoretically ambitious. As cognitive linguists become more linguistic in their analyses, more scientific in their outlook, and more methodologically aware, they will have to restrict themselves more strictly than is currently the case to linguistic constructs that can be operationalized and research hypotheses that can be falsified. This will place large parts of current models outside of the scope of a cognitive linguistic research

program and it will take years of detailed research to reach scientifically sound models of the same scope (cf., again, Stefanowitsch 2010).

Many individual researchers in the field of cognitive linguistics have already accomplished these feats and are doing cutting-edge research – sometimes dull and sometimes spectacular, sometimes confirming central tenets of the theorists that initiated the discipline, and sometimes disconfirming them. The potential of these loosely connected researchers to transform the field as a whole into a cognitive science is there. Whether it is actualized, remains to be seen.

The above remarks are essentially a recipe for turning cognitive linguistics into a science. What would make this science a cognitive one would be its groundedness in a framework that treats language first and foremost as a product of and a process in the human mind, one that interacts with other processes, such as perception, learning, memory, etc.

Turning cognitive linguistics into a cognitive science can involve both the Import Strategy and the Export/Integration Strategy, as long as the results of both strategies feed into a cycle of empirical testing and refinements of the relevant models on the basis of these results. Thus, the potential for true bi-directionality is built into the process.

In keeping with the topic of the current volume, I would like to conclude my programmatic sketch with a thought on the importance of such a bi-directional approach, returning once more to metaphor theory. Note that metaphor theorists usually assume a directionality from mind to language with respect to the mappings they postulate. For example, Lakoff (1993: 218) argues with respect to the metaphor TIME IS SPACE that

> [i]n our visual systems, we have detectors for motion and detectors for objects/ locations. We do not have detectors for time (whatever that could mean). Thus, it makes good biological sense that time should be understood in terms of things and motion.

Let us leave aside the question of whether we really do not have detectors for time in our brains and focus on the causal relationship postulated by Lakoff: our brains have particular circuits and lack others, so the circuits we have are co-opted for tasks for which we do not have circuits. The fact that we *talk* about time in terms of space is an epiphenomenon of this neurological fact.

Now consider again Boroditsky's results about horizontal and vertical metaphors of time discussed above, that show that speakers of languages with horizontal time metaphors reason about time on the basis of a horizontal model of time while speakers of languages with vertical time metaphors reason about time on the basis of a vertical model. If her results can be confirmed, they would seem to support Lakoff 's general claim regarding the conceptual basis of metaphor.

However, note that Boroditsky's results must be explained in terms of a causality that clearly goes into the opposite direction from the one Lakoff proposes: the fact that we think about time in a particular way seems to be a consequence of the way we talk about it. While Lakoff posits a causal relationship from mind to language, results like Boroditsky's suggest a causal relationship from language to mind.

This is not to suggest that this contradiction could not be resolved in a sufficiently sophisticated model. There are metaphors that clearly suggest a directionality from thinking to speaking. For example, it is at least questionable that the expressions instantiating the MENTAL IMPURITY IS PHYSICAL POLLUTION metaphor discussed above are widespread and frequent enough in English to cause the behavior observed in the experiments I mentioned. Thus, it is likely that our understanding of immorality in term of pollution, like the TIME IS SPACE mapping, is independent of language and that the linguistic expressions instantiating it are a consequence rather than a cause of such a mapping.

Other metaphors are just as systematic, but too language-specific to be explained in terms of independent mental mappings. For example, in English and German, there is a metaphor HEART IS THE SEAT OF EMOTIONS/PERSONALITY (see, for example, Goschler, this volume; Niemeyer, this volume). In Indonesian, the corresponding metaphors see the liver as the seat of emotions and personality (e.g. Siahaan 2008). Clearly, whether speakers localize emotions in the heart or in the liver (or in neither of the two organs) is a purely linguistic (and cultural) issue and is not derived from independently existing mental mappings, just like the question whether time is seen as moving vertically or horizontally.

A model that can integrate both kinds of metaphors would have to be formulated in terms of general, language-independent conceptual mappings and cognitive constraints on possible mappings (best investigated by psychologists) on the one hand, and variation in the presence or absence as well as the precise nature of their linguistic coding in particular languages (best investigated by linguists).

Thus, esearchers from two disciplines would have to work together in order to build a complete model of metaphor in language and mind. This would be true bi-directionality, with each discipline importing and exporting its results to and from the other.

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