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Cognitive Modeling. A linguistic perspective
by Francisco José Ruiz de Mendoza Ibáñez and Alicia Galera Masegosa

Cognitive Modeling

A linguistic perspective

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Table of contents

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CHAPTER 1

Introduction

1. Aims and scope of the book

The present study develops previous insights within cognitive semantics on how knowledge is structured and put to use in specific production and interpretation tasks. Our starting point for this purpose is found in the seminal proposals on *idealized cognitive models* made by George Lakoff in *Women, Fire and Dangerous Things* as far back as 1987. Lakoff (1987a) discusses idealized cognitive models as the result of structuring principles working on conceptual material: predicate-argument relations (e.g. a buyer buying a meal in a restaurant) structure *frames*, as initially discussed in Fillmore (1977, 1982, 1985); topological arrangement (e.g. bounded regions in space, motion along a path, part-whole structure) results in *image schemas*, as originally proposed in Johnson (1987); and conceptual mappings give rise to *metaphor* (e.g. understanding states as locations in *She is in trouble*) and *metonymy* (e.g. using the part to stand for the whole as in *There were many good heads in the meeting*, where the expression *good heads* stands for 'intelligent people') (cf. Lakoff and Johnson 1980).

Lakoff's seminal proposal has stimulated a large amount of research over more than two decades now. In fact, the amount of literature on idealized cognitive models – especially metaphor, metonymy and image schemas – is so impressive that it would be difficult to do justice to it in just a few introductory paragraphs. Interested readers may refer to Dirven (2005), Dirven and Ruiz de Mendoza (2010, 2014), Gibbs (2011), and Ruiz de Mendoza and Pérez (2011), for some critical overviews, together with the references therein, and to Gonzálvez et al. (2011/2013), for updates and developments. One line of development of Lakoff's approach is found in work by Ruiz de Mendoza and Pérez (2003), Ruiz de Mendoza and Peña (2005), and Ruiz de Mendoza (2011). This line, which is of fundamental importance to the present book, is based on the initial realization that metaphoric and metonymic mappings make use of frames and image schemas, which suggests that the two sets of so-called models have a different nature. For example, the metaphor LOVE IS A JOURNEY reasons about love relationships (the metaphorical target) in terms of what we know about journeys (the metaphorical source). The elements of love relationships derive from frame knowledge: it includes lovers that have common goals, the degree of progress and/or

difficulties in the relationship, moments of uncertainty, and so on. For each of these elements, there are corresponding image-schematic notions: lovers in a love relationship are travelers in a vehicle (a propelled object); progress in the relationship is motion along a path, difficulties in the relationship are obstacles to motion, and lovers' common goals are the destination of motion (cf. Lakoff 1993). In a similar way, metonymy may make use of frames (e.g. the customer-order relationship in the context of a restaurant for *The ham sandwich is waiting for his check*) or image schemas (e.g. CONTAINER FOR CONTENTS in *She drank the two glasses*).

While metaphoric and metonymic mappings work on frames and image schemas, the converse is never the case; that is, metaphoric and metonymic mappings, besides being structuring principles, have an operational nature that predicate-argument relations and topological arrangement do not have. In fact, the latter are ways of organizing knowledge arising from our interaction with the world; the former, by contrast, are a matter of re-construal or re-interpretation of organized knowledge by mapping conceptual structure in different ways. In the case of metaphor, the source domain is used to reason about the target domain. With metonymy, the source provides a point of access to the target domain; as a result of this process, the target is seen from the perspective of the source. We shall come back to these issues later on (see Chapter 2, Section 3.1).

From our discussion above, it follows that metaphor and metonymy cannot be ranked on a par with image schemas and frames since the former are constructed on the basis of the latter and the former two involve re-construing pre-existing organized conceptual material rather than just organizing it. In other words, metaphoric and metonymic mappings are cognitive operations whose activity ranges over frames and image schemas. One legitimate question arises now. Are metaphoric and metonymic "mappings" the only interpretive (i.e. non-organizational) operations that people use? If there are other cognitive operations of this kind, how can we know? A plausible answer to this question lies in a careful examination of the meaning implications of other interpretive uses of language, different from metaphor and metonymy. A case in point is provided by *hyperbole*, which is generally described as a "figure of speech" or a "figure of thought" that makes use of ostentatious exaggeration to create a strong impression on the audience. Take the following two lines from Ralph Waldo Emerson's *Concord Hymn*:

> Here once the embattled farmers stood
> And fired the shot heard round the world.

The *Concord Hymn* was sung in 1837 in Concord, Massachusetts, at the dedication of a battle monument commemorating the contributions of the people of Concord to the first battle of the American War of Independence. The shot that was "heard round the world" was fired by the famers at nearby Lexington as a

way to communicate to the whole world that they were not going to be pushed around. It goes without saying that the shot could not possibly be heard "round the world" except in a figurative sense, i.e. by acting as a symbol to the world of the farmers' patriotism and for its global repercussions in terms of the harm that would be inflicted on the vast British empire. The question now is what kind of figurativeness is found here. The farmers literally fire a shot, but the shot can only be heard locally, although it is intended to draw worldwide attention. There is an obvious exaggeration, but there is also a mapping of conceptual structure, although qualitatively different from metaphoric mappings: the source, as described by the linguistic expression, has as a counterfactual scenario, which, if it were possible, would have impacting consequences on a worldwide basis. This counterfactual situation, which is constructed through hyperbole, maps onto a real-life one where farmers fire a shot that initiates a war with global repercussion. Hyperbole is a form of overstatement based on representing a state of affairs as greater than is actually the case. It involves the intensification of a scalar concept, i.e. a distinctly specifiable cognitive operation acting on a specific type of cognitive model.

It is thus possible to identify different kinds of cognitive operation and the cognitive model types on which they can work by looking into interpretive uses of language. This is a first central goal of this book. A second goal is to provide linguistic evidence that cognitive operations can underlie the interpretation of utterances in different domains as well as at different levels of meaning construction. To this end, we have chosen the *Lexical Constructional Model*, a usage-based account of language-based meaning construction that reconciles insights from functional and cognitively oriented constructionist perspectives (cf. Ruiz de Mendoza and Mairal 2008, 2011; and Mairal and Ruiz de Mendoza 2009; see Butler 2009b, 2013, for two overviews).

There are two reasons for this choice. One is the breadth of scope of the Lexical Constructional Model as a meaning-construction account of language and the other is its emphasis on the need to unify explanations across levels of description and explanation when feasible. The Lexical Constructional Model distinguishes four broad levels of meaning representation: argument-structure (level 1), implicational (level 2), illocutionary (level 3), and discourse (level 4). The Lexical Constructional Model then supplies a descriptive apparatus for each level and it specifies the conditions to combine representations within and across levels.

There are other usage-based linguistic accounts, especially functionalist ones, which recognize different representational layers. Three of them are *Systemic Functional Linguistics* (cf. Halliday and Matthiessen 2004), *Functional Grammar* (Dik 1997a, b), and *Functional Discourse Grammar* (Hengeveld and Mackenzie 2008). Here we will only refer to some of the most basic organizational aspects

of these approaches. There are other aspects and other functionalist approaches that make use of layering (see Butler and Taverniers 2008 for a more complete examination). As is well known, Systemic Functional Linguistics distinguishes three dimensions of linguistic analysis that arise from the three great functions (or *meta-functions*) of language: *ideational*, *interpersonal*, and *textual*. The ideational dimension includes the study of transitivity based on an analysis of process, participant, and circumstance types, together with the linguistic resources to combine clauses. The interpersonal dimension includes the study of the personal and interactional aspects of the clause, such as mood, polarity, modality, and speech acts (or functions). Finally, the textual dimension deals with the linguistic mechanisms used to manage the flow of discourse, among them thematic structure (theme/rheme, given/new) and cohesion devices (reference, substitution, ellipsis). Functional Grammar takes a very different perspective because of its emphasis on clause structure and the functions of its elements. Functional Grammar assigns three kinds of function to the various elements of clause structure: syntactic (subject/object), semantic (agent/patient, etc.), and pragmatic (topic/focus). It also recognizes the existence of interpersonal meaning assignment mechanisms for whole clauses (e.g. in terms of modality and illocutionary marking) and of discourse-building mechanisms such as focus constructions and extra-clausal discourse constituents. Functional Discourse Grammar, which is generally considered an expansion of Dik's Functional Grammar, is arranged around four levels of description: phonological, morphosyntactic, semantic, and pragmatic. But these levels are subservient to the speaker's overall communicative intention. This requires a top-down analysis of utterances in terms of discourse moves, which consist of discourse acts, which contain illocutionary force and communicated content based on a combination of referential and ascriptive acts (the former generally corresponding to nominal or pronominal categories and the latter to adjectival or verbal categories), which bear either topic or focus functions.

In contrast with functionalism, Cognitive Linguistics has not produced any layered account of language. One reason for this is a question of focus. Cognitive Linguistics started with an emphasis on the application of notions derived from work in cognitive psychology to linguistic explanation. For example, Talmy (1975) showed that the structure of the complex sentence responds to the principles of gestalt perception such as figure/ground alignment, according to which the figure is the more prominent part of the perceptual field and the ground the less salient part. For this reason, the figure stands out against the ground. In a complex sentence, the main clause acts as figure and the subordinate clause as ground (see also Talmy 1978, 2000). Langacker (1987, 1999), in his *Cognitive Grammar*, would later extend figure/ground relations to other areas of grammar under the label of the two spatial categories *trajector* and *landmark*. For example, in clause structure the

subject is the trajector (i.e. figure) and the object the landmark (i.e. ground). Furthermore, each trajector/landmark relation in the situation described by a finite clause is a figure "grounded" in time and reality on the basis of tense and modality. At the same time, a clause considered from the point of view of speaker-hearer interaction functions as a speech act. In this case, the speech act is the figure and the speech event is the ground.

Evidently, while the focus of Cognitive Grammar is on expanding the notion of motivation to make it include the cognitive impact of perceptual phenomena, there is no disregard of the various domains of linguistic description, including speech acts and discourse. However, cognitive linguists have not explicitly worked on layered accounts that capture the differences and the relations across levels of linguistic description. On the other hand, functionalists, with their special focus on communication to the detriment of cognition (even in those accounts which, like Dik's Functional Grammar, explicitly aim to attain psychological adequacy), generally miss out on finding the full spectrum of motivational factors for linguistic structure and the relations among its elements.

The Lexical Constructional Model shares with functional accounts of language their aim to embed linguistic description within its communicative framework. For this reason, the descriptive and explanatory apparatus of the Lexical Constructional Model is sensitive to discourse and pragmatic categories like topic/focus structure and illocutionary meaning. However, it differs from these models in its stronger cognitive bias. For example, imagine a communicative context in which John has stolen Mary's purse, but the addressee believes that John has actually stolen Mary's watch. In English there are three common ways in which the speaker can convey the correct information while creating a contrast with what the speaker erroneously believes. One is based on giving prosodic prominence to the focal constituent: *John stole* MARY'S PÚRSE. Another is to rearrange the clause constituents in such a way that the correct information is placed first: *Mary's purse, John stole*. A third one is to use a *wh*-cleft configuration: *What John stole was Mary's purse.* From a communicative perspective, the focalization of clausal constituents allows speakers to manage information in terms of its given or new status. In the examples above, presenting as new any information that contradicts what the addressee is supposed to believe is a communicative strategy intended to lead the addressee to cancel out such a belief. But focalization is more than just a communicative process with discourse consequences.

In order to better understand the last point made above, it may be useful to consider some other conceptual prominence phenomena. Take first semantically recoverable unexpressed theme arguments (Lemmens 2006), as in *Tigers kill because they are tigers*. The verb *kill* is a two-place predicate but its object can remain unexpressed when it is a generic one that can be easily retrieved from

world knowledge or the context of situation. In the sentence above it is not only unnecessary to express the theme object but it may also take away part of the communicative impact that the omission has. Thus, in *Tigers kill* the emphasis is on the nature of tigers as natural killers. This meaning implication is lost in *Tigers kill other animals.* Taking away the object of a transitive structure is a linguistic strategy used to endow the predicate with greater conceptual prominence; in other words, it is a focalization strategy. But it works differently from the other three strategies mentioned above, where focalization holds for whole phrases but never for internal phrasal constituents: **John stole Mary's* PÚRSE, **Purse, John stole Mary's*, **What Mary's John stole was [the] purse*. It also has a different function: it is not intended to present information as new, but simply as more important. For this reason, predicate-focalization through object omission is compatible with phrase-based focalization strategies provided that the syntactic operation is workable (e.g. thematizing the verbal phrase through constituent rearrangement is not possible in English; cf. **Kill other animals, tigers*). For example, *What tigers do is kill [other animals]*, and *Tigers* KÍLL *[other animals]* have double focus: one based on the whole phrasal constituent and the other on the special prominence given to the verbal predicate.

Focal prominence is therefore more than a discourse phenomenon. It is a conceptual phenomenon that may or may not be exploited in terms of information management or discourse flow. In fact, giving prominence to part of a concept is essential to produce some cases of metonymy. Consider the use of *window* in *The boy broke the window with a bat*. Generally speaking, a window is an opening in a wall that is intended to allow air and light to come into a room. It is often spanned with glass mounted on a frame to permit opening and closing by operating a handle. Evidently, in this sentence, *window* is metonymic for *window pane*, which designates the most conspicuous breakable part of a window. The metonymy works by foregrounding – and at the same time giving conceptual prominence to – the element *window*, the other elements being backgrounded. Conceptual prominence plays such an important role in the production and interpretation of metonymy that some linguists have argued for a definition of metonymy based on the notion of *highlighting*, which is defined as raising a non-central domain to primary status (cf. Croft 1993). We shall return to this issue in Chapter 2, Section 3.1. Now it is important to realize the following: (1) a communication-oriented explanation of language can be complemented profitably with one that takes into account cognitive issues, as is the case of conceptual prominence; and (2) this complementation enhances the unifying ability of a descriptive and explanatory model.

Another important difference between the Lexical Constructional Model and other functionalist and cognitivist approaches is to be found in its explicit recognition that a linguistic account, in order to be fully explanatory, needs to take

into account the relationship between *coding* and *inferencing* as ways of producing meaningful linguistic expressions in real contexts. In the Lexical Constructional Model meaning representation at any level may take constructional or inferential paths or a combination of the two. Let us have a brief overview of how this works.

At level 1 lexical structure is incorporated into argument-structure constructions (e.g. the ditransitive, resultative, caused-motion, etc.), which then amalgamates with tense, aspect and modality constructions (cf. Ruiz de Mendoza 2013, pp. 260–261). But not all constructional variables need to be realized, as evidenced by the productive use of underspecified representations: *Coming!* (for *I'm coming*, rather than, say, *John's coming!*), *I'm ready* (for *I'm ready for the party*), or *BBC World Service* (for *This is the BBC World Service*).

At level 2, the sentence *Someone has been eating my biscuits* implies that the speaker is upset that someone has eaten his biscuits and that he believes that he can identify the wrongdoer. The implication is obtained through inferencing. However, the first of these two implications is conventionally captured by the sentence *Who's been eating my biscuits?* This is evidenced by the oddity of *Who's been eating my biscuits? I love it when someone eats my biscuits*, which will easily be resolved by interpreting the second sentence as an ironic remark.

At level 3, the sentence *I have a problem* can be used, on inferential grounds, as a way of asking for a piece of advice or any other kind of help. One of several conventional ways of asking for help could be: *Can you help me with my problem?*

Finally, at level 4, *The pizza was too oily and she didn't like it*, also on the basis of inference, sets up a cause-consequence relation between the two coordinated clauses. This inferred connection can be made explicit by means of a discourse marker: *The pizza was too oily; so, she didn't like it*.

According to the Lexical Constructional Model, linguists must be aware of inference-based meaning-making procedures. This is particularly useful to motivate some linguistic phenomena. Let us consider two related cases of directive illocutionary constructions: *Can't/Won't You VP?*, as illustrated by *Can't you be quiet for a minute?* and *Won't you help me at all?* These are requests where the speaker shows irritation or disappointment at the addressee's attitude or behavior. One may wonder about the origin of this extra meaning. One plausible answer arises from thinking of sentences based on *Can't/Won't You VP?* as conventionally capturing meaning implications that were originally obtained pragmatically. Thus, the rationale for a *Can't You VP?* question could well be the speaker's expectation that the addressee, if able to help the speaker, would have naturally done so without being asked to. In the case of *Won't You VP?* the speaker does think that the addressee is able to do what the speaker needs, hypothesizes that the addressee may not be willing to, and tries to verify his hypothesis. In the two scenarios the speaker is bothered by the addressee's inaction. This extra meaning, which

is to be added to the directive illocutionary meaning, was first obtained inferentially and then conventionally built into the overall meaning of *Can't/Won't You VP?* interrogative sentences. This means that, for a linguistic account to be fully adequate, it needs to incorporate a solid description of language-based inferential activity and how meaning obtained through such activity can become a stable part of constructional meaning.

In the Lexical Constructional Model each of these conventional procedures to produce meaning structure at one level or another is considered a *construction*, in a sense that is very close to the one given to this term by cognitive linguists (e.g. Goldberg 1995, 2006), i.e. as a fixed form-meaning pairing whatever its formal or functional complexity. Grammar is thus seen as an inventory of constructions that relate to one another through various extension and inheritance mechanisms. The Lexical Constructional Model recognizes the existence of constructional families. For example, the transitive resultative (*The blacksmith hammered the metal flat*), the intransitive resultative (*The horse went into a gallop*), and the caused-motion construction (*The boy kicked the ball into the garden*) have sufficient elements in common to belong to the same family: there is an event (either instigated or not) that causes an object to change state or location. But the Lexical Constructional Model additionally distributes constructions across levels of meaning representation, which are the equivalent of structural layers in some functionalist accounts, and specifies the conditions that regulate the incorporation of structure from one level into another. We will discuss this second issue again, so here we will only give one example involving the incorporation of verbal structure into a an argument-structure construction containing some fixed elements. Think of the use of the verb *stare* in *Chris stared a hole through the curtain*. Boas (2008) has observed that there are two verb classes that combine with the expression *a hole through*, which he argues is a *mini-construction* representing a particular sense of one or more verb classes (this concept of quite close to Croft's verb-class constructions; cf. Croft 2003). One class contains verbs like *push*, *knock*, *burn*, and *blow*; the other has verbs like *drill*, *make*, and *dig*. With the first class, but not the second, the "through" phrase is necessary (cf. **He knocked a hole*, but *He knocked a hole through the wall*). Boas (2008) identifies a number of constraints that regulate the use of verbs of the first class with this construction:

a. The agent must emit enough energy to affect the physical integrity of the patient (cf. *The wind blew a hole through our brick house* but **The air blew a hole through our brick house*).
b. The patient must have a surface (cf. *The drill bore a hole through bedrock/*the air*).

c. The result of the activity of the agent must be the creation of an opening through all or part of the patient (cf. *The drill bore a hole (midway) through the rock; He bore a hole (halfway) through a wooden ball*).

Given this description, the question is what allows the combination of the verb *stare* with *a hole through*. Evidently, the combination is figurative, but not any verb of vision can be used in this way: **saw/*glanced/*looked a hole through*; but compare *gazed a hole through*. In the context of the Lexical Constructional Model, we find an explanation for this problem. The Lexical Constructional Model postulates the existence of re-construal processes at the highest levels of linguistic activity, as is the case with the integration of lexical and constructional structure (see Chapter 2, Section 2.2). The verbs *stare* and *gaze* can be re-construed metaphorically as if they were verbs like *push*, *knock*, *burn*, and *blow*, i.e. verbs denoting the exertion of physical action on (the surface of) an object with a visible result. The metaphor is possible because *stare* and *gaze* denote fixed attention, which correlates with the "physical energy" element identified by Boas (2008) for *push*, *knock*, *burn*, and *blow*. The metaphor acts as a constraint on the ascription of some verbs and not others to the verb-class-specific construction based on the (relatively) fixed expression *a hole through*.

2. Methodology and data

From its inception, Cognitive Linguistics, following a number of remarks made by Langacker (1987), has produced usage-based approaches to language. A usage-based account of language focuses on the actual use of the linguistic system and what speakers know about such use. There are many different (and largely converging) ways in which this can be done. As evidenced by papers like the collection in Barlow and Kemmer (2000), usage-based approaches to language can focus on frequency of use, on psycholinguistic experimentation that taps into cognitive processes as they occur in speakers and hearers' minds, on how language learning occurs in connection with experience, on the emergence of linguistic representations on the basis of conceptual composition, on the importance of using actual contextualized data to draw adequate linguistic generalizations, on the relationship of usage to synchronic and diachronic variation, and on how the linguistic system is shaped in terms of general cognitive abilities.

Usage-based accounts can thus make use of experimental, quantitative, and qualitative methodologies either alone or in any productive combination. Typically, discussion of conceptual representation and cognitive processes will demand psycholinguistic experiments of the kind reported in Gibbs and Matlock (2008).

Language variation and the contextualization of data usually require quantitative corpus analysis techniques as advocated by Geeraerts (2005). Insights from different kinds of analytical technique can be fruitfully combined as recently shown in Johansson Falck and Gibbs (2012), who combine psycholinguistic experimenting and corpus analysis to substantiate the claim that bodily experiences with objects constrain metaphorical understanding and the way people talk about abstract concepts.

Quantitative analysis can also complement qualitative approaches. For example, in the context of what they call *collostructional analysis*, Gries and Stefanowitsch (2004) show that it is possible to measure the degree of attraction and repulsion that words have for constructions. This has consequences for the study of constructional alternations. When examining the *to*-dative/ditransitive alternation, one of the methodologies of collostructional analysis, called *distinctive collexeme analysis*, shows a very strong preference of *give* for the ditransitive construction, while the to-dative attracts *bring* more than any other verb. Other verbs strongly attracted to the *to*-dative construction are *take* and *pass*. These verbs involve some distance between the agent and the patient that must be covered in order to complete the action. Commercial transaction verbs (*sell*, *supply*, *pay*) are generally distinctive to the *to*-dative, with the exception of *cost*. This finding is difficult to predict on the basis of a different kind of analysis, since these verbs typically involve a physical transfer of the commodity and of money between the buyer and the seller. Other verbs, by contrast, alternate quite freely between the *to*-dative and the ditransitive constructions, among them *lend*, *get* and *write*. These verbs involve both the physical transfer and the possession meanings correspondingly associated with the two constructions.

These findings are consistent with the general constructionist trend within Cognitive Linguistics that considers alternations to be epiphenomenal to lexical-constructional integration (see Ruiz de Mendoza and Mairal 2011). In such constructionist accounts of language, it is postulated that the semantic structure of lexical items can be built into the structure of argument-structure constructions, such as the dative, the ditransitive, the resultative, and others, provided that there is sufficient conceptual compatibility between the two. An argument structure construction pairs core-clausal structure with generic or high-level meaning configurations, such as DO, CAUSE, MOVE, BECOME, HAVE, plus their associated arguments. For a ditransitive sentence like *John gave Mary a book* we pair the syntactic string NPSubj-VP-NPObj$_1$-NPObj$_2$ with the semantic specification X CAUSES Y TO RECEIVE Z (cf. Goldberg 1995, p. 142). If a verb is compatible with a constructional specification, then it follows that its integration into the construction is possible. However, conceptual compatibility predicts all possible cases of

integration, but not the preference of a verb over others for a given construction. Of course, such preferences can be motivated once they are identified.

Within this context of usage-based accounts, our reliance on the Lexical Constructional Model involves the use of introspection and argumentation based on a careful analysis of naturally occurring data. Thus, our approach, which is not experimental or quantitative, is also a usage-based one. The examples used in this book have been mainly chosen from Internet searches through Google. In all cases we have made sure that the utterances selected in order to illustrate a process have been produced by competent native speakers of English. We have ignored sociolectal issues since we are directly interested in what speakers can do in terms of their cognitive abilities without regard to socioeconomic class, age, gender, ethnicity, etc., which would certainly be of interest within Cognitive Sociolinguistics (see Geeraerts 2005; Geeraerts, Kristiansen, and Peirsman 2010).

We are fully aware that linguists generally prefer to resort to well-established corpora like the British National Corpus (BNC) or the Contemporary Corpus of American English (COCA). However, our own experience with such corpora is that, however big, they are still a limited resource to provide a broad picture of how conceptual representation and cognitive processes reveal themselves through language use. This will become evident to the reader as we proceed along the book. But for the sake of illustration, consider briefly the constructional framework *Don't X Me*, as in *Don't honey me!*, which we have related to a cognitive operation that we call *echoing*. Echoing involves the repetition of a thought, whether implicit or explicit in the communicative situation. It has meaning implications that we will explore later. While it would be possible to make systematic searches in a corpus of the constructional framework, the only way to know whether such searches are instances of echoing is manual. And there is no way the corpus will yield instances of echoing with different uses of language. This means that if echoing is to be investigated, once it is detected, researchers can do nothing but trust their intuition and hypothesize, on the basis of its nature, where else it could be used productively by speakers of a language. This requires a flexible search tool that can have access to countless instances of language use in real communicative contexts. Google offers such a search tool, while the amount of manual work remains the same as with standard corpora. Recently, some corpus linguists have noted the advantages of using Internet as a source for the study of language, among them Kilgarriff and Grefenstette (2003), Renouf (2003), Bergh (2005), and Bergh and Zanchetta (2008). The main reason that they give for its use is its intrinsically huge and ever-growing size. Evidently, the greater the amount of material, the greater the possibility of enabling researchers to check whether their intuitions as to what can be said are on the right path. Google is being updated

every day by real language users, in multiple contexts and situations, which facilitates the inclusion in a linguistic study of highly novel expressions that are gaining acceptance in a given language community.

This said, we shall later (Chapter 2, Section 1) come back to methodological issues in connection to our discussion of standards of adequacy and the equipollence hypothesis, which is a heuristic research mechanism that pervades the discussion of cognitive phenomena in this book.

3. A note on cognitive reality

The reader must be warned that our approach is not psycholinguistic, nor is it directly based on any empirical approach to cognitive processes like those coming from the brain sciences. However, it is intended to be compatible with empirical evidence from research within these fields thereby being amenable – at least in relevant areas – to future empirical validation. We shall return to this issue when we address the question of the standards of adequacy in linguistic theory in the next chapter. For the time being, it will be enough to observe that our proposals are not qualitatively different from others made by other linguists, including the three great founding fathers of Cognitive Linguistics: George Lakoff, Leonard Talmy, and Ronald Langacker. Think of the seminal proposals made by Lakoff (1987a) on linguistic categorization. There was some initial evidence coming from preliminary empirical work in experimental psychology on prototypes and basic-level categorization (e.g. Rosch 1975, 1978, 1983). This work was based on simple experiments based on response times, priming, and naming exemplars. For example, experimental subjects responded faster to queries on categorization based on prototypical members of a category than with non-prototypical members (e.g. *A robin is a bird* versus *An ostrich is a bird*). In much the same way, when primed with the superordinate category (e.g. furniture), subjects were faster in identifying if two words are the same when the words were prototypical members of the superordinate category. Also, when asked to name exemplars of a category, the experimental subjects were faster to produce the prototypical members. Other experiments showed that there is variation among different individuals as to where boundaries between categories lie and even the same individual may make different judgments depending on the context for the assessment. In general, these experiments were suggestive that the classical theory of categorization in terms of necessary and sufficient conditions was not adequate from the point of view of how people actually assess category inclusion in their minds. However, although prototype theory has been challenged on a number of fronts (see Croft and Cruse 2004, pp. 87–91 for an overview), many linguists have found it useful

to account for phenomena that are for the time being beyond any psycholinguistic testing. A case in point is provided by Taylor's (1995) discussion of syntactic constructions like the possessive genitive and the transitive constructions in English. For example, in the prototypical possessive construction the possessor is a human being, the possessed element is usually a concrete thing (or a collection of things), there is a one-to-one relation between the possessor and the possessed, the possessor has a right to use and is responsible for the possessed, both being in proximity, and the relation is a long-term one (measured in months and years rather than just minutes or seconds). This whole set of properties is captured by an expression like *John's wallet*, but there can be slightly less prototypical uses. In some, like *a dog's bone*, although the possessor is non-human, the rest of the elements are retained: the dog, which will keep the bone (a concrete object) in its proximity, will have a claim over the bone. In others, like *the secretary's typewriter*, if the typewriter is only used but does not belong to the secretary, there is no possession element. However, the rest of the elements seem to hold: human possessor concreteness and physical proximity of the possessed object, a claim over its exclusive use, and a long-term relation. Others uses are even less prototypical. For example, in *my neighbor's sadness* there is only possession in a very loose sense, which could even be considered figurative: the speaker's neighbor is affected by sadness, which is a state seen as a possession (a metaphor that has been discussed in much of the cognitive-linguistic literature; cf. Lakoff 1993).

Taylor's (1995) discussion of prototypes in constructions is highly illuminating, but it cannot – and it is not supposed to – be regarded as directly empirical. It is mainly argumentative and only indirectly empirical, to the extent that it carries the notion of prototype beyond the domain of concepts arising from words, which is where the psycholinguistic debate has taken place, into the world of grammar, which awaits an empirical assessment of prototype effects.

Even this cursory look at the impact of experimental work on linguistics will have been enough to make the reader aware of the following research pattern:

a. The linguist becomes aware that there is (partial) empirical evidence in the cognitive sciences on some cognitive phenomenon, such as the gestalt organization of perception, the network organization of knowledge, and prototype categorization, to mention just a few cases.
b. The linguist looks for possible evidence of the phenomenon in language on the basis of standard linguistic procedures. Such linguistic evidence should be consistent with the evidence coming from the cognitive sciences.
c. The linguist can then search into other domains of linguistic enquiry that may not have been covered empirically for additional evidence on one or more of the phenomena identified in (a) and (b) above, or on an extension of them.

> However, to the extent that it is possible, the linguist's new postulates have to develop naturally from – or at least be consistent with – the findings that have motivated (b). If a postulate is apparently well grounded in linguistic evidence but is later contradicted by reliable experimental evidence, the linguist should be willing to discard it.

In the present research, we focus our attention on linguistic evidence for cognitive modeling, i.e. the activity of (sets of) cognitive operations on (relevant parts of) cognitive models. Our point of departure is the state of the art, which is coherent with the existing experimental evidence on the topic, but which also extends well beyond what such evidence can tell us at present. It goes without saying that we have strived to make our proposals argumentatively valid while we await further experimental findings in the cognitive sciences. We thus follow Gibbs (2006a, p. 148) in not assuming that our analyses necessarily involve mental representations and in making sure – through careful consideration of possible alternative hypotheses in our line of argumentation – that our own hypotheses can resist a falsifiability test. We are also aware that many of the proposals in the present book are tentative and that they may well need to be complemented with further insights from various other perspectives. However, we trust that our own insights, which are based on authentic data derived from searches into actual language use, have been reasonably argued and evince a satisfactory degree of reliability on linguistic grounds.

4. The structure of the book

The structure of this monograph is as follows. In Chapter 2 we offer some theoretical considerations that frame our research. We tackle the issue of standards of adequacy in linguistic studies and present the Lexical Constructional Model as the most suitable framework for our investigation. This model has a comprehensive meaning-construction architecture that will serve as a backdrop for much of our subsequent discussion. It is not our purpose to discuss the Lexical Constructional Model in all of its detail. Accordingly, we place special emphasis on the aspects of this model that are relevant for the development of our study. This chapter includes a preliminary discussion of figurative uses of language, which we will later integrate into the Lexical Constructional Model as a unified framework of meaning construction within linguistic explanation. Chapter 3 deals with cognitive models. Here we take the taxonomies propounded by Ruiz de Mendoza (2007)

and Ruiz de Mendoza (2011) as our starting point and shed new light on the matter by providing a unifying view and also putting forward complementary classificatory criteria. Chapter 4 aims to supply an inventory of the cognitive operations that we have identified so far. We briefly list, define and exemplify each of these operations, which will be further explored at a later stage. Also, we offer a detailed account of the ways in which some of these operations may interact among one another and the principles that govern their activity. Chapter 5 presents a more exhaustive account of cognitive operations and discusses to what extent they are operational at the various levels of meaning description identified in the Lexical Constructional Model. Furthermore, we explore the combination of cognitive operations in the creation of given meaning effects. Chapter 6 summarizes the main findings of this study and gives an outline of future developments.