

# Meaning and Cognition

Edited by Liliana Albertazzi

Meaning and Cognition

# Converging Evidence in Language and Communication Research

Linguists have taken a broad view of language and are borrowing methods and findings from other disciplines such as cognitive and computer sciences, neurology, biology, sociology, psychology, and anthropology. This development has enriched our knowledge of language and communication, but at the same time it has made it difficult for researchers in a particular field of language studies to be aware of how their findings might relate to those in other (sub-)disciplines.

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## Volume 2

Meaning and Cognition: A multidisciplinary approach  
Edited by Liliana Albertazzi

# Meaning and Cognition

A multidisciplinary approach

*Edited by*

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## CHAPTER 1

**Which semantics?\***

Liliana Albertazzi

**1. Introduction**

In the course of its history, semantics has invariably displayed two faces: on the one hand, as that part of linguistics which concerns itself with the meanings of words and their change; on the other, as a branch of philosophical theory concerned with the signifying function of signs relative to objects. Although these two faces have comprised distinct disciplines, they have often met and merged. Moreover, in more than one respect, semantics has encroached on semiotics, etymology, anthropology, sociology, logic and psychology.

During the 1930s, within the neo-positivist movement and in the wake of the nineteenth-century development of linguistics, philosophical semantics constituted that area of logic which dealt with the coordination between signs and what is denoted by terms and propositions (in relation to the objects of reference) independently of etymological, cultural and psychological considerations. Despite this restriction, semantics achieved notable results in formal logic, but at the price of abandoning the *cognitive* aspects that had constantly accompanied its development, in logical analysis as well, in particular following the advent of the so-called ‘psychologistic logics’ (see e.g. Fries 1837; Benecke 1842; Ueberweg 1882; Mill 1843; Lotze 1874; Erdmann 1892).

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\* This book arises from events organized in Bolzano, Italy, by the *Istituto Mitteleuropeo di Cultura/Mitteleuropäisches Kulturinstitut* as part of the *International Schools in Cognitive Analysis* (scientific board: L. Albertazzi, R. Langacker, J. Petitot, R. Poli and L. Talmy). In particular, the essays collected in the book deal with the themes addressed by the conference *Which Semantics?* held in December 1995, and by the School on *Semantic Fields* held in September 1996, at which scholars from various disciplinary backgrounds met to discuss problems in semantics. I wish to thank the President of the Institute for the support that he provided for these initiatives.

I also take the opportunity to thank Ron Langacker for his fruitful comments on a previous version of this Introduction.



Apart from a certain reading of Frege — in particular of his ‘On Sense and Reference’ (Frege 1892) — mediated by Russell’s logicism, the members of Vienna Circle, on the basis of the thesis of the ‘objectivity of meaning’ (Frege 1918), dismissed the linguistic analyses of the late nineteenth and early twentieth centuries as ‘psychologistic’. Thus prompted was a study of language mainly from the perspective of the formation of an *ideographic* language, according to Frege’s *Begriffsschrift* (Frege 1879). This formal language, logical and mathematical (Carnap 1928 and 1942), shaped subsequent research throughout most of this century while also influencing, in certain respects, linguistic inquiry (on some aspects of semantics from Kant to the Vienna Circle see Coffa 1991).

One of the immediate consequences of this radical shift was the long neglect of the philosophical analysis of *natural* language, on the ground that it was not susceptible to formal treatment (Carnap 1932; Wittgenstein 1922; Tarski 1944).

A second consequence was the separation of strictly linguistic analysis from a philosophical theory of language. Hence the proposals of the Prague school of linguistics, with Jakobson, and of Hjelmslev, and those of structuralism continued to figure large in linguistics, semiotics and literary hermeneutics, although they lost ground in more general epistemological and philosophical inquiry.

A third consequence of the formal analysis of language was the alleged unimportance for semantic analysis of clarification and description of the *genesis* of linguistic structures from perceptive and, more generally, cognitive structures (Albertazzi 1997a and 1998c).

For many decades, therefore, regarded as irrelevant to the science and/or philosophy of language were (i) the endeavour to bring natural language back to its *prelinguistic structure* tied to perception and the physical and common-sense world, and even more so the attempt to relate it to neurobiological activity, and (ii) detailed analysis of the *morphogenesis* and the complexity of the psychic operations, conceptualizations and procedures comprised in linguistic structures, and particularly in natural language.

And yet these topics had been the close concern of both linguistics and the philosophy of language in the second half of the nineteenth century and during the first decades of the new one. In these often interconnected areas, in fact, numerous studies had focused on the role and importance of cognitive operations, at both the macro- and micro-level. These studies ranged from those of *Völkerpsychologie*, with its emphasis on the relationship between language and custom, law, art and religion (Steinthal 1863) to the attempt by comparative grammar to uncover an *inner structure* of languages, to the concept of language as an *organism* propounded by Bopp (1833) and Grimm (1819–1837) which

cast doubt on the mathematical claims of a science of language. Humboldt’s complementary theory of the creative activity and inner form of language had addressed the relationship between *formal* structure and *individual* structure in linguistic expressions (Humboldt 1876–1880).

The various theories were matched by a large body of specific analysis of natural languages. These studies concerned themselves with, for example, eminently grammatical analysis of the inflection of cases (or of the distinctions among the elementary operations of conjunction, disjunction and negation) and examination of the ‘laws of thought’ which govern the associative, judicative, anaphoric, etc. processes of natural language through the architecture and expression of *functions* and *perceptive* and/or *mental contents* (among others, see Humboldt 1836–1839; Wundt 1910; Marty 1908; Husserl 1900–1 and 1994; Bühler 1934. On the topic as a whole see Albertazzi 1986).

Studies of this kind had also characterized much of the *phenomenological* analysis of language. This analysis moved in two directions: on the one hand it envisaged the existence of a *pure grammar* (Husserl 1900–1); on the other, it sought to relate the *genesis* of the grammar, semantics and syntax of language to the world of precategory experience (see Husserl 1939 and 1966). Thereafter, the existentialist and hermeneutic involution in phenomenology, which proceeded in parallel with the growth of the analytic paradigm, undermined the validity and legitimacy of phenomenological linguistic inquiry.

One of the most important theoretical developments after the 1930s, then, was the separation between *language*, *perception* and, more generally, *cognition*. As a consequence a *cognitive* theory of meaning was drastically reduced to a broadly *logical* and/or *linguistic* theory of meaning; a process which is also evident in a great deal of contemporary philosophy, especially that which shares the analytic approach (on the origins of analytic philosophy see Dummett 1988. On the topic, see Poli 1994).

In recent years, analysis from the cognitive sciences has influenced linguistics, logic and research into artificial intelligence. All of these disciplines require not only a calculus but also a *model of the workings of the human mind*, and therefore raise once again, in more general terms, the question as to “why a mind is necessary in linguistic analysis” (see the article by Langacker in this book).

In particular, the theoretical requirements of linguistics and artificial intelligence have given rise to specific research in the *formalization* of speech acts, of non-monotonic reasoning, of reasoning by abstraction, of metatheoretical reasoning, and so on, in concomitance with the construction of computational, modular, cognitive ‘models of the mind’.

However, one of the problems raised by research in the field of ‘knowledge representation’ is the complexity of *commonsense reasoning* (Davis 1990); that is, of all those aspects which formal logic neglected as extraneous to the purposes of a scientific enterprise. Another problem is the understanding by machines of *natural* language, which has prompted new research into systems able to deal with it, like semantic nets, conceptual graphs, etc. (Sowa 1984). ‘Natural’ reasoning involves phenomena such as the free variation of the imagination, creative connections, analogic reasoning, the meaningful use of metaphors, and so on; aspects of thought which have to date been eclipsed by interest in ‘formal logical’ reasoning.

Developments in artificial intelligence research have prompted comparison among various types of *formal semantics*, as well as fostering interest in the more properly *cognitive* aspects of semantics. As a consequence, there has been a ‘return’, almost always unconscious, to themes current at the beginning of this century, also taking into account the findings of psycholinguistics and anthropology (on lexical semantics in particular see Geeraerts 1988; more in general, on a revival of ancient theories, see Albertazzi forthcoming (a)).

Against this general background, the idea of producing the present book was prompted in particular by the recent growth of *cognitive grammar* internally to the more general framework of *cognitive linguistics*. Begun and mainly represented by the works of Lakoff, Langacker and Talmy, this discipline identifies *meaning* with *conceptualization*, and thus seemingly restores a cognitive paradigm to semantics (see Langacker 1983 and 1986; Lakoff and Johnson 1980; Talmy 1988a).

The aim of this book is to present some *significant aspects* of cognitive grammar, and to do so by adopting an *interdisciplinary* approach (see, in particular, the contributions of Albertazzi, Peruzzi, and Wildgen, in this volume). The book therefore does not claim to provide an exhaustive treatment of its subject matter, nor to present the entire panorama of cognitive grammar. It consequently does not include contributions by such leading representatives of the discipline as Cruse, Fauconnier, Johnson, Herskovits, Lakoff, Regier, Rudzka-Ostyn, Sweeters, Vandeloise, or Wierzbicka, whose work has flourished in recent years and has helped to buttress the international reputation of this branch of semantics.

Finally, because of the approach employed, with its consideration of borderline aspects among semantics, linguistics, theoretical reflection and historical analysis, the book marks out a route for a philosophical inquiry complementary to a cognitive approach to the semantics of natural language.

## 2. Formal semantics

From a philosophical point of view, during the twentieth century the formal concepts of semantics were developed largely within the analytic movement (see Violi 1997, esp. 11–24; van Benthem and ter Meulen 1997). The analytic philosophy of language, in fact, gave rise to important developments in *formal analysis* of mainly logical-linguistic type. Even those analytic thinkers who conducted ontological analyses did so from the point of view of a *formal ontology* based on formal logic (Cocchiarella 1976, 1986 and 1996; Zalta 1983. On this see Poli 1993).

It is possible to distinguish two main lines of thought: a *formal semantics* which treats ontology as a theory of individuals and in which the theory of knowledge plays a marginal role; and an *intensional semantics* which starts from the linguistic description of objects and derives its ontology as a sub-product of that description.

In recent decades, a number of analytic philosophers have turned their attention to the phenomenological analysis of language, being especially interested in the themes of *intentionality* (see Searle 1971 and 1983; Chisholm 1976 and 1981; Dennett 1991), *meaning* (see Mohanty 1969; Føllesdal 1972 and 1982; Woodruff Smith 1982; McIntyre 1970; McIntyre and Woodruff Smith 1982; Woodruff Smith and McIntyre 1984; Dreyfus 1981 and 1992. For a criticism see Croft and Wood, this volume, p. 51) and *speech act* theory (Searle 1969; Mulligan 1987). Further typically phenomenological aspects of language analysis have been given analytic development: for example, Husserl’s theory of *pure grammar* and *semantic categories* (Husserl 1900–1, Fourth Logical Investigation) has been developed by Ajdukiewicz and Bar-Hillel, but in this case its Husserlian roots were almost completely lost (see Ajdukiewicz 1935; and on this topic Albertazzi 1991. See also Bar-Hillel 1950, 1957 and 1970. For more recent developments see Lambek 1958; and Buszkowski, van Benthem and Marciszewski 1988). Also the Husserlian theory concerning *contexts* and *states of affairs*, and *mereology* received attention (on the former point see Morscher 1987; Smith 1996; Dreyfus 1981; on the latter point, see Null and Simons 1982. For an improvement of the topic of context, from a cognitive point of view, see Violi, in this volume). Moreover, certain theories of ‘semantic realism’ which address the relationship between *states and situations of affairs* (Smith 1989; Rosado Haddock 1991; Woodruff Smith 1991; Armstrong 1997) have features in common with *situation semantics* and its analysis of real situations. Also this last approach, however, is modelled on set theory and breaks situations down into

‘individuals’, ‘properties’, ‘relations’, and so on (see Barwise and Perry 1983; Devlin 1991. On the topic in general see Seligman and Moss 1997). Further slight convergence between phenomenological themes and analytic philosophy has occurred in the analysis of the relationship between ‘life forms’ and the formal languages that seek to represent them (Schnelle 1973; Kutschera 1975).

The theoretical issues represented by this convergence between more properly ‘analytic’ themes and more properly ‘phenomenological’ ones can be summed up as follows:

1. Whether language has *ontological* significance (the problem of extralinguistic reference).
2. If it does, whether this is a purely *logical-formal ontology* or whether language should in the first instance be related to a *material ontology* of the world and situations of affairs, and then to the psychological and biological sciences, rather than to the logical-formal ones (on this Husserlian distinction see Albertazzi 1996a).
3. The contribution of *cognitive operations* and *contents* to the formation and development of linguistic structures.

However, what has been described thus far is only an apparent convergence, for analytic and phenomenological philosophy take different approaches to the problem of meaning. The distinction between them concerns the problem of *cognitive acts*, their modalizations, and their relationship with sense, meaning and linguistic expression, which Husserl analysed in his *First Logical Investigation* (Husserl 1900–1), and then in *Ideas* (Husserl 1913) and in *Experience and Judgment* (Husserl 1939). In other words, the distinction stems from the strongly ‘anti-psychologistic’ stance of Fregean and analytic philosophy, whose predominant interest is in syntax and in formalized languages, and the principally cognitive concerns of phenomenological philosophy (however, on the syntactic and semiotic aspect of phenomenological inquiry see Husserl 1970. On this topic see Albertazzi 1995b).

Another important point of difference is that, contrary to the classic position of most analytic philosophers, phenomenology considers *language*, and more generally, *predication*, rooted in the *structure of perception*: a feature which, independently, reappears in several ‘families’ of contemporary cognitive semantics (see below).

Of the cluster of formal semantic theories (comprising both model theoretic semantics and others) developed in the twentieth century, here I shall consider the general assumptions of those which, in the 1970s and thereafter, prompted the early analyses of cognitive semantics.

Theories of formal semantics (specific differences among them notwithstanding) share the following assumptions (see Langacker 1988a and 1988b):

1. Language can be described as an *algorithmic* system.
2. The linguistic system is *self-sufficient* and autonomous. No extralinguistic reference is required for its analysis.
3. Grammar, and particularly syntax, is an *independent* level of language.
4. Grammar is *generative* and is able to produce all the sentences of a language.
5. Meaning is objectively describable in terms of *truth conditions* by a logical-formal language (formalist assumption) whose rules are defined according to a principle of univocal coordination (the Tarskian assumption).
6. Semantics is strictly *compositional* (the Fregean assumption) and of substantially less importance than syntax.
7. Phenomena like analogies, *metaphors*, radial concepts, and so on, are to be excluded from the analysis of language.

Within formal semantics, much emphasis has been placed on the conceptions of Chomsky’s generative grammar and Montague’s intensional semantics. One of the main differences between these two types of semantics is that, at least at the very beginning, the former has played a mainly *linguistic* role, and the latter a mainly *philosophical* one, although the two aspects are obviously connected.

More specifically, Montague’s semantics hinges on a number of key and interrelated concepts taken from analytic thought: *objective meaning* as a *mathematical entity* and definable by the parameters of set theory; *intension* as the meaning of a linguistic expression (so that synonymy, for example, becomes identity of intensions); the *compositionality* of units; and *possible worlds*, a notion borrowed from Kripke, as a set of propositions of which intension is a function (Kripke 1959 and 1963. For a criticism see Croft and Wood, this volume, p. 51).

The term ‘Montague semantics’ (or ‘Montague grammar’) refers not only to the specific theories of Richard Montague himself but also to their subsequent development at the hands, amongst others, of Lewis (1970), Parsons (1980) and Cresswell (1973). Also the theories of Cocchiarella (1996) reflect Montague semantics in various ways, with the consequence that semantics links in certain respects with the logical conception of formal ontology, although, in truth, Cocchiarella refers primarily to Montague’s first system of intensional logic, afterwards abandoned by Montague himself (on the internal evolution of Montague grammar see several contributors in van Benthem and ter Meulen 1997).

However, there are aspects of language which Montague semantics is

unable to handle (see Marconi in this book). The immediate consequence of adopting a strictly formal conception of semantics is the impossibility of *lexical analysis*, given that the theory deals only with *logical meanings*. In particular, the meaning of a linguistic expression of natural language often comprises differences due to cognitive valencies like the *subjective mode* of meaning assertion, the *point of view* and the *order of distribution* of contents. These aspects, although they may be eluded by a certain type of *philosophical semantics* which reduces intension to extension devoid of cognitive valency, cannot be excluded from a *linguistic semantics* which concerns itself with the real complexity of natural language.

Chomsky first set out his semantics in *Syntactic Structures*, published in the 1950s, and which set semantics aside to deal with syntax alone. It is probably the linguistic theory that has exerted the greatest influence in academic circles and attracted the largest number of adherents (Chomsky 1957 and 1968).

Chomsky's ideas have evolved over time starting from the 'extended standard theory' (1975). Afterwards, his theory underwent numerous adjustments, comprising 'government and binding', 'principles and parameters', and 'minimalization'. The internal development of the theory aside, the assumptions of classical generative grammar can be summarized as follows:

1. Language (i.e. also a mathematical system) is an *infinite set* of sentences.
2. The sentence is the fundamental unit of language but it is *constructed* from a *finite set* of elements or an alphabet (formal and compositional assumption).
3. This alphabet consists of *primitive elements* (phomenes, morphemes, words, etc.) (elementarist assumption) (see also Bloomfield 1933).
4. Grammar is an *abstract system of rules* which generate only equivalent phrases, in the mathematical sense of the specification and enumeration of structures.
5. Grammar is *independent* of other cognitive systems (the supremacy of syntax).
6. Grammar is *independent* of semantics.
7. There are two *representative levels*, one deep, the other surface, and a series of *transformations* from the one level to the other.
8. The *mental processes* which give rise to grammar are those of *abstraction* and *idealization*.
9. The semantic interpretation of sentences is based mainly on their surface structure.

Chomsky's theories, backed by developments in formal logic (for example, the concept of computability, and that of recursiveness for the combination of primitive elements: see Post 1944), have been widely applied in the field of artificial intelligence and have thus seen the validity of their claims reinforced. The weakness of transformational-generative grammar, however, lies precisely in its treatment of *semantics*.

As stated at point 6 above, unlike Montague semantics, which conceives some sort of *isomorphism* between semantics and syntax, Chomskian linguistics asserts the *autonomy* of syntax from semantics. Partee and Hendriks note in this regard that (Partee and Hendricks 1997: 14):

Montague was aware of Chomsky's innovations in syntax but was puzzled and somewhat put off by the generative grammarians' practice of studying syntax without simultaneous attention to semantics ... While Montague's broad conception of 'universal grammar' was closer to the notion of 'logically possible grammar' than to the Chomskian notion of universal grammar, which is tied to the aim of demarcating the humanly possible languages as a subset of the logically possible ones, linguists such as the present author argued that a linguistic conception of universal grammar could in principle be identified with a constrained theory of Montague's theory, the linguist's task being to identify further constraints on the syntactic and semantic rules and on the nature of the correspondence between them (Partee 1976 and 1979a and b).

Moreover, whereas Montague semantics relies on a philosophical semantics of logical-formal type, the theoretical premises of Chomskian semantics are grounded in biological, anthropological and psychological aspects (native speaker judgement), and also on arguments concerning linguistic usage and questions of *competence*. Competence performs the crucial semantic role, in that it concerns the knowledge of a speaker/hearer — albeit an ideal one belonging to a homogeneous language community — of, for example, the relations among various types of sentences (active, passive, declarative, interrogative, etc.), and it reflects a set of mental processes and operations which are not always conscious. Thus language is viewed as an *internalized system* of constraints (in the neurophysiological sense as well: see Lennenberg 1964 and 1967. On the two types of competence, referential and inferential, see Marconi 1997).

From this point of view, despite the indisputable importance attributed to cognitive operations by Chomskian semantics, it specifically applies to the 'model of the mind' which made it so congenial to subsequent developments by Fodor and Katz (Katz and Fodor 1963. See also Peruzzi, in this volume. For a criticism of Chomskian position see Coseriu 1971; Weydt 1975).

### 3. Cognitive semantics

Cognitive and/or conceptual semantics arose mainly in linguistics and as a reaction against formal semantics. Its initial focus was on problems such as the importance of stereotype (Putnam 1975) and of prototype categorization to natural language (Rosch 1978; Wierzbicka 1989), but its subsequent development was also driven by the interest of artificial intelligence researchers in the analysis of natural language.

Despite their obvious differences of approach, the semantics of cognitive linguistics and formal semantics (of linguistic and/or philosophical stamp) display a number of features in common; they need not be set in radical opposition. Itemizing their various similarities and/or differences serves to distinguish between issues pertinent to philosophy or the theory of language, and those that more properly concern linguistics in the strict sense.

Broadly speaking, both formal and cognitive semantics share the problem of *extralinguistic reference* first raised in classic analytic studies by Kripke and Putnam (see Kripke 1972; Putnam 1975), although they differ in their conceptions of reference and meaning.

In particular, cognitive semantics and Chomskian semantics emphasise the *cognitive input* to the formation of linguistic structures. This shared assumption is manifest, for example, in the importance attributed to certain fundamental categories of linguistic analysis like *part/whole*, *object/relation*, *function* (Chomsky 1968, and in particular 1990; Langacker 1990: 110–111, 189–193; Talmy 1988a. For a development in field semantics see Wildgen, this volume, p. 203).

However, a marked difference between cognitive and formal semantics lies in their different conceptualizations of the *truth* to attribute to linguistic propositions (excluding descriptions by definition, obviously). On the one hand, the notion of truth is restricted to a truth-functional semantics (Montague 1974; Lewis 1970); on the other, it depends on an experiential complex comprising emotions, intentionality and actions, and is essentially metaphorical in nature (Lakoff and Johnson 1980. See also Croft and Wood, this volume, p. 51. But the concept is already in Mauthner 1901–1912).

One consequence of this difference of position concerns the reducibility of language (and of natural language as well) to formal language. If accepted, this reducibility immediately gives rise to the distinction between semantics and syntax drawn by Montague semantics (see Montague 1974; Partee 1979a).

Owing to these shared concerns, and also bearing in mind that certain cognitive linguists like Lakoff and Langacker have Chomskian backgrounds,

their attitude towards formal semantics oscillates between Langacker's more conciliatory stance (Langacker 1991. But see also Jackendoff 1983 and 1987) and Lakoff's less tolerant one (Lakoff 1991).

Before moving to discussion of a special type of cognitive semantics (that associated with the researches of cognitive linguists), it is advisable to dwell briefly on the semantic conceptions of Miller and Johnson Laird, and on the semantics of Jackendoff, since these illustrate the principal features of this type of approach.

These authors refer to a set of fundamental concepts relative to the world of perception, imagination and action, concepts which they consider to be the '*universals*' of interconnected cognitive systems (Jackendoff 1992). Jackendoff — who in other respects subscribes to the prevalently 'modular', 'formal' and 'syntactic' approach of formal semantics — views *syntax* as an instrument able to express the various forms of human conceptualization (Jackendoff 1991. See also Miller and Johnson Laird 1976; Johnson-Laird 1986). His singling out of a small set of fundamental ontological categories (THING, EVENT, STATE, LOCATION, TRAJECTORY, PROPERTY, QUANTITY, and OWNERSHIP), *apparently* patterned on Aristotle, brings analysis of the categories within a vision of the world that is not immediately 'physicalist' but tied to the realm of perception, in which touch, vision, sound, spatiality, kinaesthesia, emotions and language are closely interconnected (on the general Aristotelian trait in cognitive semantics see Geeraerts 1988: 653).

However, the distinction drawn by these authors between ontological and linguistic categories is not always transparent; nor is the reference to Aristotelian theory. The categories variously enumerated — like SOMETHING, ANIMAL, EVENT, AGENT, ONE (see for example Wierzbicka 1996) — are considered to be *semantic primitives* common to all languages. This, however, is a conceptual slide which confuses *morphological primitives* of classification (which are already amply 'linguistic' in the broad sense) with *precategorical primitives* of an ecological type. The latter are determined by the environment itself, which 'offers' salient elements (for a critique along these lines see Eco 1997, who talks instead of '*semiotic primitives*').

Fillmore's (1968) revival of Hjelmselvan case grammar using primitive functional categories like AGENTIVE, DATIVE, INSTRUMENTAL, LOCATIVE and BENEFACTIVE has seemingly brought the debate on cognitive semantics back into the 'European', and indeed in some respects 'psychologistic', tradition of Hjelmslev, Marty and Bühler (see Hjelmslev 1943; Marty 1910; Bühler 1934. For references to Bühler, and Trier, see Wildgen, this volume, p. 203).

The use of formal instruments in cognitive semantics to model natural language varies quite considerably. It is more marked in Jackendoff and less so in the exponents of cognitive linguistics. Indeed, the latter declare that their discipline is still in a state preparatory to a *descriptive foundational analysis* of linguistic phenomena. In other words, although they envisage the possible formalization of the discipline, they are aware that this objective is still far from being achieved or even framed correctly (Langacker 1987).

As specifically concerns *cognitive linguistics* as a whole, Geeraerts has pointed out that its development in recent decades has given rise to a number of different approaches:

The methodological situation in present-day Cognitive Linguistics is characterized by the existence of two methodological extremes. On the one hand, there is the idealistic approach most conspicuously advocated by Anna Wierzbicka in her numerous publications (among which 1985, 1992, 1996). On the other hand, there exist various tendencies to objectivize the methods used in Cognitive Linguistics. Roughly, there are three main tendencies at this end of the methodological opposition: psycholinguistic research (as in Sandra and Rice 1995 or Gibbs 1994), neurophysiological modelling (as in Regier 1995), and quantitative corpus-based analysis (as in Geeraerts, Grondelaers & Bakema 1994; Geeraerts 1999b, Prologue).

Nevertheless, the general features of cognitive linguistics can be broadly summarized as follows:

1. It is a semantics that first arose within a Chomskian framework but which with time has developed an anti-Chomskian (and in particular *anti-transformational*) stance (see Lakoff 1968, 1971 and 1972; Langacker 1978 and 1979).
2. It takes an *anti-compositional* view of meaning and a less rigid approach to the problem of lexical categories (Cruse 1986; Wierzbicka 1980 and 1985).
3. It is *opposed* to the *modelling theory of truth*, in the sense of an external relationship between language and the world.

More in general, cognitive linguistics is particularly critical of the highly syntactic paradigm embraced, for example, by Chomsky and Montague, stressing instead *the role of cognitive operations in the structuring of experience through language* (see Langacker and, also in relation to the different conceptions of Langacker and Talmy, see Croft and Wood, this volume, p. 51).

For cognitive linguists, the main shortcoming of the Chomskian paradigm is its separation of syntax from semantics, and they posit instead a (general) distinction between open and closed classes. They do not assert, however, the existence

of open classes, on the one hand, and closed classes on the other, but (specifically in Langacker's analysis, not in Talmy's) the existence of a *continuum* between open-class and closed-class phenomena.

Thus, cognitive linguistics stresses the richness of the *functions of ordinary language* in relation to the arbitrariness of its reduction to formalized languages. In this sense, cognitive linguistics is one aspect of the breakdown in the classical distinction between syntax and semantics, and prompts discussion of the latter not as a semantics of calculus but as a *cognitive theory which is independent of calculus*. It is no coincidence, in fact, that in their analysis of the structure of language, cognitive linguists makes use — albeit not an immediately derivative one — of *phenomenological* concepts (see Croft and Wood, but also Albertazzi, Peruzzi, Violi, and Wildgen, this volume).

Cognitive linguistics revives the problem of the role of *psychology* in formal language within the overall panorama of contemporary epistemology. And in doing so it highlights the partiality and arbitrariness of certain theoretical operations of formal logic, should they be generalized. From this point of view, logic and mathematics, too, are once again obliged to address the problem of *clarifying the foundations*, beginning with the relationship between the *cognitive* and *linguistic* aspects of the constitution of *symbolic meaning* (see Wildgen's contribute, this volume).

Unlike the considerations that led to the development of formal semantics, the adoption of a cognitive point of view in semantics stems from the need to understand the *dynamics of the construal activity performed by the mind*, or in other words, the ability of the mind to conceive and represent the same situation from different perspectives, or different directions of thought, while shading, modalizing and differentiating meaning within a 'semantic space' as it does so (Langacker 1986). Construal comprises a differentiated and interwoven *series of activities* ranging from specificity, direction of mental scanning, through point of view, to metaphor (see below. See, in particular, Croft and Wood, and Langacker, this volume).

Cognitive grammar raised the following objections to the general assumptions of formal semantics outlined above:

1. More than an algorithmic system, language is a *means to conceptualize* and *express* human experience at various levels.
2. Language is *not* a *module distinct* from other cognitive systems. It reflects the complexity of conceptualization (the so-called 'holistic hypothesis').
3. Lexicon, morphology and syntax are arranged along a *continuum* comprising symbolic structures (an assumption generally endorsed).

4. Grammar is neither generative nor constructive. Instead it constitutes a *stock of symbolic resources* on which individuals draw.
5. *Meaning* is not externally 'directly connected' with states of the world; it is mostly *subjective*, contextual and dynamic.
6. Semantics is conceptual. It depends on the *modes* and *contents* of the mind's processes (as both imagery and as neurophysiological activity).
7. Truth is *not truth-functional*. Rather, it is relative and largely metaphorical, so that metaphors, prototypical concepts, radial categories, and so on, are viewed as closely connected to world knowledge, to perception, to the emotions; they are, that is to say, phenomena constitutive of linguistic conceptualization (the encyclopaedic and semiotic assumption).

As regards point 3 in particular, the positions of Langacker and Talmy do not coincide in cognitive grammar. For Talmy, in fact, the linguistic system consists essentially of two components — lexicon and grammar — where the semantics of the lexicon is substantially codified into open classes (nouns, verbs, adjectives) and the grammatical or structural semantics into closed classes (articles, prepositions, pronouns, etc.).

As regards point 7, it deals with a fundamental concept in cognitive grammar, due in particular to Lakoff, and Johnson (Lakoff and Johnson 1980. For an example of the role of metaphor in language see Kövecses, this volume). Metaphor is first of all a *cognitive activity*, which states an ontological dependence between an entity of a basic cognitive domain and another entity pertaining to a more abstract domain. Specifically, metaphor characterizes mental activity in so far it activates mappings among different domains. To the conceptual metaphorical activity correspond various and multiple forms of verbalizations in language (Lakoff 1987; Lakoff and Johnson 1980 and 1999).

More generally, cognitive grammar is based on the hypothesis that *semantic contents* can be broken down into *meaningful* (that is, not formally void) *traits*, characteristics or aspects (for the origins of this thought see Hjelmslev 1943, but already in Humboldt 1806. See also Violi, this volume). Consequently, it again raises the problem of a *perceptual link* in linguistic expressions, while stressing the richness of the functions performed by ordinary language compared with the arbitrariness of its reduction to formalized languages.

Meaning, therefore, for cognitive linguists is a function of both *content* and *cognitive operations* relative to the various forms of mental presentation; it is not an objective or universal level of conceptual representation (see, in this volume, Langacker, p. 25; Croft and Wood, p. 51). From this point of view a cognitive

linguistics, and more in general cognitive semantics, are *intrinsically phenomenological* as regards the problem of reference (this point already in Eco 1975).

Accordingly, in its analysis of the structure of language, cognitive linguistics makes use — though not merely derivatively — of phenomenological concepts drawn *inter alia* from Gestalt psychology. In other words, it analyses the emergence in the structures of natural language of perceptive fields (as basic domains) against the ground of certain construal operations and cognitive distinctions like continuous/discrete, figure/background, closed/open, and so on, which fit well with a phenomenological theory of perceptive and/or cognitive continua (see, in this volume, Croft and Wood, p. 51; Peruzzi, p. 169; Wildgen, p. 203. See also Langacker 1994; Lakoff 1977. But also Jakobson and Waugh 1979; Jakobson and Pomorska 1983; Albertazzi 1998c. For a general theory see Albertazzi forthcoming (c)).

From this point of view, the contraposition between a formal semantics and a cognitive semantics rests primarily on their contrasting methods and goals: for example, Montague semantics is more a theory of the *semantic effects of composition*, as Marconi maintains in this volume (p. 39), and consequently conceives of very different construal operations from those of cognitive semantics. What Montague semantics essentially does is to assign *truth conditions* to sentences, while cognitive semantics deals with the *multiformity of the meaning* of human experience conceptualized in language. Montague or Chomskian semantics are concerned with *formal* languages and entities like constants, variables, predicates and quantifiers, while a cognitive semantics investigates linguistic meanings as the product of mental activity. *Physically embodied* and *socio-culturally grounded*, these meanings represent conceptualizations of non-linguistic experience (Lakoff and Johnson 1999; Langacker, this volume, p. 25). Also emotions, indeed, are forms of conceptualization and imagery (Kövecses 1990, and in this volume).

Some examples of construals may help to clarify one of the main differences between the two types of semantics (the example is Langacker's).

- (i) The roof slopes steeply upward.
- (ii) The roof slopes steeply downward.
- (iii) Line A intersects line B.
- (iv) Line B intersects line A.

There are no truth-conditional differences in these two pairs of examples; but pairs of sentences like (i)–(ii) have *different linguistic meanings* (relative to the scheme of mental SCANNING in building up a conception of the same static

scene. See below). The same applies to pairs of sentences like (iii)–(iv), which differ only in regard to which participant is construed as the primary focal participant (trajector). See the FIGURE-GROUND scheme below).

The close connection between *semantics* and *thought*, however, does not imply that one can be reduced to the other. As Langacker puts it (Langacker 1988a:7):

I use the term ‘imagery’ to indicate our ability to mentally construe a conceived situation in alternate ways (hence the term does not refer specifically or exclusively to sensory or visual imagery (see Kosslyn 1980; Block 1981). A pivotal claim of cognitive grammar is that linguistic expressions and grammatical constructions embody conventional imagery, which constitutes an essential part of their semantic value. In choosing a particular expression or construction, a speaker construes the conceived situation in a certain way, i.e. he selects one particular image (from a range of alternatives) to structure its conceptual content for expressive purposes. Despite the objective equivalence of the sentence pairs in [a. This is a triangle; a’. This is a three sided polygon], the members of each are semantically distinct because they impose contrasting images on the conceived situation.

On this topic see also the papers by Croft and Wood, and Langacker, this volume).

Notwithstanding specific differences of perspective, all cognitive linguists share a *geometrical conceptualization* of language, their main assumption being that *spatialization* is a necessary condition for the *representability* of objects, both in conceptual and in semantic spaces.

The concept of *scheme* — which in many respects wrought the cognitive revolution in semantics — is not clearly embraced by any of the proponents of cognitive semantics (cf. Johnson 1989. For an approach using the mathematical theory of categories see Peruzzi 1998). Johnson, for example, employs the concept of *image-schemata*, although these are somewhat more abstract than simple mental images (Johnson 1987: 126, 1989): they are not specific images or individual images, nor are they propositional; rather, they are *precategorical*. Johnson lists part/whole, entity, spatial schemes and schemes relative to distance (see also Langacker 1987), as well as schemes relative to force dynamics (see also Talmy 1988b and Sweeters 1990). No author, however, till now, has undertaken analysis of the *procedural nature* of schemes, and this is a specific instance in which semiotics and the philosophy of language have something important to say to cognitive semantics.

In particular, the *Gestalt* schemes that structure cognitive space (as well as

the other fundamental schemes of PATH, SOURCE, UP-DOWN, FRONT-BACK, CENTER-PERIPHERY and CONTAINER) are the following:

1. PROFILE/BASE;
2. SCANNING;
3. VIEWPOINT;
4. DISTRIBUTION OF ATTENTION;
5. FORCE DYNAMICS.

These schemes never appear in isolation in language, although one of them may predominate over the others according to the form of conceptualization. Since the nature and role of these schemes are thoroughly treated in the various studies collected in this book, I shall only briefly review their principal features here (see, in this volume, Croft, p. 51; Peruzzi, p. 169, Albertazzi, p. 123; see also the final glossary).

### 3.1 Profile/base

By profile is meant the entity designated, and by base (or ‘domain’) that part of the scene required for its characterization. Four relations operate within this scheme: inclusion, coincidence, separation, proximity. The figure/ground scheme permits two fundamental cognitive operations: taking the *interconnections* among a set of indices as the base and profiling the region that derives from them; or using a *set of indices* as the base and profiling their interconnections. These two strategies give rise, for example, to the formation of nouns and verbs (Langacker 1990, in part. 74–5. See also Croft and Wood, this volume, p. 51).

### 3.2 Scanning

The scanning scheme comprises a series of conceptualizations to do with *movement*, understood both as movement in physical space and a qualitative change or movement in a conceptual space. Rather than base/profile, involved here are *trajectors* (as primary focal participants in a profiled relationship) and *landmarks* (see the glossary). There are substantially two different types of scanning: *sequential*, where the focus is on the progressive change of one situation into another (e.g. ‘falling’), and *additive*, where all events are considered as coexistent and simultaneous (e.g. ‘fallen’). Scanning also concerns the type of mental procedure and the point of departure characteristic of analysis of a particular situation (see Langacker 1990, in part. 68–9. See also Croft and Wood, this volume, p. 51).



### 3.3 Viewpoint

The viewpoint or vantage point is the spot chosen for observation of the scene. The immediate consequence of adopting a specific viewpoint is the structuring of the scene into a pattern determined by the configuration of the *figure/ground*, the correlated position of the subject determining the orientation, and the directions that regulate the orientation itself of the scene, or in other words, the alignment of the scene with respect to the axes of the visual field (mainly horizontal and vertical) (Langacker 1987, in part. 262–7. See also Croft and Wood, this volume, p. 51).

### 3.4 Distribution of attention

The *distribution of attention* concerns the *modes* of considering the scene: for instance emphasising the part which assumes the role of figure, the various ways of conceptualizing the scene, and so on. This scheme comprises *complex conceptual figures of attention* like the level, centre, range, focus of attention (Langacker 1990, in part. 278–288).

### 3.5 Force dynamics

This scheme concerns the forces exerted by the elements of the scene on each other; forces which may take the form of attraction, repulsion, fusion, inhibition, etc. The primary semantic roles of this scheme are those of ‘agonist’ and ‘antagonist’. By means of this scheme it is possible to account for the *causative* dimensions and origin of *modalities*, which constitute a closed class specified by force concepts. Obviously, this class comprises not only physical forces but also psychological, social, and interpersonal dynamics (see Talmy 1988b. See also, in this volume, Croft and Wood, p. 51, and Kövecses, and Albertazzi).

One of the key issues addressed by this book is indeed the *presence of Gestalt schemes* in linguistic conceptualization: this aspect underlies the various studies that follow, and is evidenced by some of them in particular. For example, the analysis of perceptual space and force fields conducted in Albertazzi’s essay, using tools provided by experimental phenomenology, is an attempt to show that the spatio-temporal and motor structures of perception are embedded in language, thereby confirming the general theses of Lakoff, Langacker and Talmy. In particular, Albertazzi seeks to provide support for Talmy’s FORCE

DYNAMICS on the basis of a spatial mechanics of states of rest and motion (see also Croft and Wood, this volume, p. 51).

Talmy’s FORCE SCHEME is also the core of Kövecses’s study of emotions, which are generally conceptualized as force. Emotion as FORCE is shown to be the generic level metaphor instantiated by all the other metaphors which express different aspects of emotional experience.

A second issue addressed by the book is the following. The first revival of cognitive aspects in semantics took the form of the *psychological realism* propounded by the early linguistic analyses of prototype theory (Rosch 1973; Rosch and Mervis 1975). This approach rested on the idea that it was possible to define the *set of semantic properties* pertaining to a certain concept, and to apply it to *all the concrete instances* of that concept. It was an approach which, though cognitive, still preserved the idea of concepts as *sets of individuals* and as *necessary and sufficient conditions* applied, for instance, to concepts like *square* or *triangle*, which characterized the formal approach to semantics.

Violi’s study stresses the difference between *categorizing* processes and *semantic* processes (which do not strictly coincide, as lexical semanticists would argue) and examines the relationship between words and context from an *internalist* point of view. In other words, more than an external device to select and activate the meaning of a word, *context* is viewed as a mental construal — then, a cognitive operation — *triggered* by a specific *use of a word* in a certain situation. And it operates even in the absence of all its semantic lexical features, which is evidence for a sort of *semantic potential* of words. A similar argument is put forward by Croft and Wood in this volume (p. 51). Violi’s paper also deals with pragmatics aspects of semantics.

From a different perspective, Violi’s point of view is also developed by Wildgen, with his idea of the *fractality* of language based on the non-independence of grammatical categories (object-type, gender, etc., and case, person, number, etc.), as parts of a larger multidimensional fields of grammatical specifications.

Geeraerts’s essay distinguishes between a ‘word-oriented’ *semasiological* approach and a ‘concept-oriented’ *onomasiological* one, or in other words, between two different perspectives in the analysis of *meaning*, the first conceived as the *several concepts associated* with a certain word, the second in the sense of *which words may express* a certain concept. Geeraerts’s analysis of *salience phenomena* in language evidences the difference between the relation that holds *among lexical items*, and vice-versa the relation that holds *between semantic entities* and the *lexical items* which *name* (designate) them.

The importance of conceptualization and of construal operations as a first *intentio*, successively evidenced and expressed by different linguistic forms, at various levels, is emphasised by most of the studies in the volume (see Langacker, p. 25; Croft and Wood, p. 51; Wildgen, p. 203; Albertazzi, p. 123; Kövecses, p. 145).

The nature of lexical and semantic fields is discussed by Wildgen's study, which also makes cross-topic references to Albertazzi's, Kövecses's, and Peruzzi's contributions with regard to topological aspects in perception and language, and in particular the concept of person as a whole of topological fields sharing inner intrapersonal domains of forces (see, this volume, Albertazzi p. 123; Peruzzi, p. 169; Wildgen, p. 203). Wildgen emphasises the function of language as *indirect* locomotion in a semantic space, and leads to the comparison between cognitive linguistics and dynamic theories like synergetics, chaos theory and catastrophe theory. Some of the conceptual tools of these theories may help to explain, for example, the factors of deforming, involved in cognitive mapping, and the dynamic implicit in the metaphorical constructions (see Wildgen, this volume, p. 203).

A distinctive feature of the essays in the book is that they display close links among experimental psychology, Gestalt psychology and phenomenology (Albertazzi, Croft and Wood, Violi), synergetics (Wildgen), mathematical theories such as the theory of categories and Thom's theory of catastrophes (Peruzzi, Wildgen), and semantics. This feature is also evident in the analyses of individual linguistic aspects, for example propositions expressing inner anaphora (Albertazzi, this volume, p. 123), verbs ('to give' related to the topological 'transfer', in Wildgen, this volume, p. 203), nouns mapped on to the structure of a semantic field (geometrical transformation of 'hand', in Wildgen, this volume, p. 203). An example of the insights yielded by the use of mathematical tools in the cognitive analysis of the structures of natural language is provided by Peruzzi's study.

#### 4. Cognitive semantics: A plea for philosophy

As I have sought to show, the effects of a cognitive choice in semantics are not confined to the ambit of linguistic analysis. They have more general theoretical consequences.

Put in terms of a cognitive semantics, the problem is explaining what language *expresses* and *refers to* in its manifold and multiple activation of construals.

The cognitive approach to semantics concerns itself with two structural components of meaning:

- i. The *contents* of concrete, perceptive and/or mental presentations expressed by the lexicon.
- ii. The forms of *cognitive completion* varyingly defined as construals, schemes and cognitive functions expressed by the grammar.

The latter, in fact, together with the representational contents, cooperate in the identification, description and expression of the various types of 'objects' or 'objectualities' of which we speak. Indeed, all the perceptive contents that derive from observing, comparing, putting together and separating objects are in some way, as Kant theorized, *completed* by the mind.

Operating in both language and perception are, in fact, both *figural* functions which concern objects 'perceptively present' as they are conceptualized by the verbs of perception; and *discriminatory* functions of comparison like similarity, difference, etc., which constitute an analogue to the real measurement of objects (on this distinction see Benussi 1923–25; Kanizsa 1991; Albertazzi 1995a. On the verbs of perception see Cacciari and Levorato 1992; Massironi and Levorato 1998). Both the figurative functions and the discriminatory functions exhibit a *cognitive input* by the mind *at a different level* (Albertazzi 1995a).

Obviously, establishing the specificity and interdependence of the various kinds of cognitive completion in the organization of our experience is an arduous undertaking, to which current research in the *cognitive sciences* is devoting great effort. And so too is analysis of the interrelations between the realm of imagery at different levels of abstraction and complexity and the realm of linguistic expression.

This helps to clarify the difference between the concept of *grammar* in cognitive semantics, which is obviously more closely tied to analysis of *objects of commonsense experience*, and the concept in formal semantics, which has more to do with the analysis and classification of *formal objects*, scientific theories or models. In other words, cognitive semantics is more closely bound up with a type of *encyclopaedic* knowledge than it is with a type of *dictionary* knowledge (on this see Eco 1979 and 1984; Violi 1997, esp. Part II, 2).

Also from this point of view, the grammar of cognitive semantics is therefore profoundly different from its counterpart in formal semantics. Unlike generative grammar, it does not hypothesise structures *underlying expression* and not immediately manifest. Rather, it emphasises the presence of *originative*

*semantic structures* — when they are not mere *fragments of schemes* — which are not immediately content-laden, propositional and/or symbolic. A cognitive semantics, in fact, is based on a theory of language which also takes account of its *morphogenesis*. We use language to express mental contents, ideas and judgements formed on the basis of shared experiences. In this sense, it is used above all to *notify, express* and *communicate* something internal to our minds, and which would otherwise not be communicable save in extremely restricted spatial-temporal contexts by means of ostensive deixis (Brentano 1956; Husserl 1900–1, First Investigation; Bühler 1934).

Thus, just as our thought proceeds according to a *certain basic continuity* which displays traits of *qualitative salience* according to shifts of attention, emotional reactions, previous associations, and the like, so natural language flows with a *continuity of expressive forms* displaying *semantic traits of coagulation* (see Croft and Wood, this volume, p. 51). As we think, the contents being formed are ordered, grouped, separated by conceptual operations and modalizations which indicate their direction and establish relations among the parts of an overall meaning created *functionally*. And just as concrete perception comprises phenomena of temporal displacement or functional co-determination among elements, so the overall formation of the meaning associated with it is not linear, nor additive, but dynamic and *Gestalt*-like. From a *morphogenetic* point of view, a meaning is never reversible, by definition, but preserves a *singularity* connected with the uniqueness of the circumstances in which it is formed (also in Winograd 1981).

However, this is not to imply that meaning is ‘subjectively subjective’ and that one must therefore lapse into dreaded ‘psychologism’. The problem raised by this type of semantics, in fact, is the problem of the *constitutive relationship* with the *world* that surrounds us and of which *we* are part. Cognitive semantics does not refer to a ‘universe of discourse’, but primarily to a ‘universe of things’, of bodies, events and *observables*, in the sense given to that term by Gestalt psychology and by the ecological theory of perception (Koffka 1935; Gibson 1979).

Cognitive semantics starts from the simple statement that in perception there is a natural imprinting which informs every kind of (concrete and abstract) meaning whatsoever. As a consequence, its natural presupposition is a *semiosis of perception and cognition* (Husserl 1939; Eco 1997; Violi 1997; Albertazzi 1997b and 1998c).

Before concluding I wish to point out that, given the restrictions of an introduction, I have had to limit my discussion to certain contrasts between formal and cognitive semantics. I have accordingly been obliged to neglect

other important contemporary theories, notably Neisser’s (1976) cognitive maps, Fillmore’s cognitive frames (Fillmore and Atkins 1992. For some considerations see Violi, p. 103, and Wildgen, p. 51, in this volume), Barsalou’s theory of features (Barsalou 1992), the semantics of lexical fields (Lehrer and Kittay 1992), the argument structure semantics of Levin (1985), the conception of Davidson (1967), the procedural semantics which comprises, besides Johnson-Laird, Winograd (Winograd 1972 and 1973) and Woods (Woods 1981), and relevance theorists like Sperber and Wilson (Wilson 1975; Sperber and Wilson 1984).

All these theories examine, in various ways, the relationship between language, semantics and ontological commitment. For example, they address such issues as whether there exist perceptive statements tied to direct observation and which are independent of a system of propositions (which Davidson tends to rule out), or whether the cognitive environment is constituted by the set of facts that are manifest (as argued by Sperber and Wilson), so that the emphasis shifts to a form of generalized consensus.

In general these theories undervalue the need for a philosophical theory of language and meaning (and *a fortiori* the need for an ontological theory) if we are to talk meaningfully about semantic problems. This, in various respects, is a legacy left to us by the twentieth century.

As I have said, the close relationship between analytic philosophy and the formal approach to semantics has often led to formulation of ontological problems in nominalist terms, or at most in those of semantic realism. Perhaps the time has come, also in view of the findings of cognitive linguistics, and especially of cognitive grammar, to consider once again the hypothesis that language, and in particular natural language, makes a *different ontological commitment*. In other words, after reconsidering the relationship between *language, perception, and cognition*, we should seek to *return* to the world of *precategorical* and *prelinguistic experience*, conceiving this world along two dimensions: one connected with operations of mental conceptualization, and the other connected with more strictly perceptive and/or neurophysiological conditions (on this see Regier 1995. See also Albertazzi’s, and Wildgen’s contributions, in this volume).

To tell the truth, some elements of connectionism are already present in cognitive semantics. Langacker, for instance, has sought to interpret *linguistic rules* on the basis of connectionist *state spaces*. He writes:

If mental experience reduces to patterns of neural activation (however complex they may be), then any particular experience — such as entertaining a concept,

or invoking a linguistic structure — can be identified either with a location in a state space or a path (a series of locations). A location, however, can be characterized with varying degrees of precision; it can be point-like or diffuse, depending on whether activation levels are specified quite narrowly or only as falling within a certain band of values. Here we find a natural basis for describing the relation between a schema and its instantiations. In relative terms, a schema corresponds to diffuse location (or series of location) in state space, and each instantiation to a more point-like location within it (Langacker 1991:535–6).

In general, however, the philosophical framework into which this position could be fitted is still unclear. Apart from analyses by Johnson and/or Lakoff, in which they deal with philosophical issues, there is still no ‘philosophical theory’ of cognitive semantics other than treatment of ‘imagination and corporeality’ or the ‘embodied mind’ *à la* Merleau-Ponty (Merleau-Ponty 1945; Johnson 1987). More than a thoroughgoing theory, however, this is a set of general statements contrary to a Cartesian and rigidly ‘mentalist’ view of meaning and, from the linguistic point of view, opposed to a Chomskian semantics (Lakoff and Johnson 1999). There is still no philosophical theory for the results of cognitive linguistics; nor an adequate psychological theory apart from generic declarations in favour of Gestalt psychology. Missing is also an empirical geometry of cognitive and perceptual spaces.

That cognitive semantics must be largely phenomenological seems to be the opinion of most of the discipline’s proponents, regardless of explicit references to Merleau-Ponty or ‘Gestalt schemes’. However, to seriously argue a thesis of kind, recourse must be made to a different phenomenology, one less existentialist and more ‘scientific’; an experimental phenomenology which draws its arguments from science as well, especially from psychology and mathematics (see the essays by Albertazzi, Croft and Wood, and Peruzzi, this volume. For a preliminary philosophical investigation of specific issues see Albertazzi 1996b and 1998c. More in general Eco 1997. From a psychological point of view, see instead Cacciari and Levorato 1992; Massironi and Levorato 1998. On the concept of experimental phenomenology see Albertazzi 1998b and Bozzi 1988). In this manner, too, the foundation of cognitive semantics would heal the breach among linguistics, science and philosophy (even in its metaphysical claims) apparently created by the revolution of the 1930s.

## CHAPTER 2

### Why a mind is necessary

#### Conceptualization, grammar and linguistic semantics

Ronald W. Langacker

This opening essay delineates the conceptual structure of cognitive linguistics and provides a reference framework for the other essays, which address and develop particular aspects of the theory. The two principal conceptual points emphasised by the author are the non-reducibility of linguistic expressions to truth conditions, and the predominant role played by perceptive, mental and even motor conceptualization in natural language.

The essay concentrates in particular on the main forms of construal, or the ability to conceive and portray the same situation in alternate ways (through specificity, different mental scanning, directionality, vantage point, figure-background). In this respect this essay closely relates to Croft and Wood’s contribution. The focal role assumed in cognitive linguistics by the construal of figure-ground also implicitly suggests a theory of semantic categories (profiled relationships through time as ‘verb’ and profiled individual as ‘noun’). Other aspects of this point concern the logical grammatical relations of subject and object. Here Langacker argues the thesis that the critical factors do not pertain to logic, objective truth or strict compositionality: a topic also explored by Peruzzi’s essay later in the book. In his discussion of the various forms of construal, Langacker highlights also the difference between a cognitive and a formal conception of semantics. With particular regard to Montague semantics, Marconi’s essay in the book can be viewed as a complementary treatment of this difference, particularly as regards the relationship between syntax and semantics. Various other issues addressed by Langacker are also considered in Albertazzi’s Introduction (the foundational contribution of perceptive structures to natural language, the spatio-temporal forms of conceptualization, the difference between formal semantics and cognitive semantics). Moreover, his treatment shares with Albertazzi’s and Kövecses’ essays a concern to provide a dynamic description of the scanning of the situation and analysis of fictive motion. Finally, it also has a number of aspects in common with Geeraerts’s discussion of the concept of structure and cross-linguistic distribution.

What kind of semantics is appropriate for the characterization of natural language? It should not be surprising that the movement called *cognitive linguistics* (as represented, for example, by Talmy 1983, 1988a, 1988b; Fauconnier 1985; Lakoff 1987; Langacker 1987a, 1988, 1991) identifies meaning with conceptualization. For various reasons, it is held that an appropriate linguistic semantics has to be a *conceptualist* or *cognitive* semantics. The meanings of linguistic expressions cannot be reduced to truth conditions, nor to direct correspondences between linguistic elements and entities out there in the world. For a linguistic semantics to be descriptively adequate and accurate with respect to the facts of natural language, it is essential that the human mind be brought into the loop.

The word ‘conceptualization’ is understood in the broadest possible sense of that term, essentially including any kind of mental experience. It thus subsumes: (i) both established and novel conceptions; (ii) not only abstract or intellectual ‘concepts’ but also immediate sensory, motor, and emotive experience; (iii) conceptions that are not instantaneous but change or unfold through processing time; and (iv) full apprehension of the physical, social, and linguistic context. In short, linguistic meaning is seen as the product of mental activity on the part of physically embodied, socio-culturally grounded human minds.

Viewing meaning as a mental phenomenon does not render it mysterious or put it beyond the reach of scientific study. To be sure, we cannot at this point hope for a comprehensive or rigorously formalized description. Still, conceptualization is not chaotic or amorphous: structure and organization can be discovered, and specific constructs can be proposed for the description of semantic structure. Particular descriptive proposals can moreover be justified on the basis of varied evidence. Sources of justification for semantic constructs and descriptions include at least the following: (i) grounding in well-established or easily demonstrable cognitive phenomena; (ii) wide applicability to a broad array of diverse data; (iii) predictions afforded concerning distribution and well-formedness; (iv) necessity for the explicit description of grammatical patterns; (v) role in allowing a principled representation of both the similarities and differences among sets of expressions with comparable content; (vi) motivation from cross-linguistic distribution, typological patterns, and paths of grammaticalization; and (vii) intuitive naturalness. Although these kinds of evidence will not be our main concern, most are illustrated in what follows (e.g. the discussion of *profiling* will exemplify points (i), (ii), (iv), and (v)).

A major reason for adopting a conceptualist view of linguistic semantics is *construal* (or ‘mental imagery’), defined as our ability to conceive and portray

the same situation in alternate ways. Linguistic elements — both lexical and grammatical — impose particular construals on the conceptual ‘content’ they evoke. Since linguistic meaning incorporates both content and construal, a viable linguistic semantics cannot neglect the latter. There are many aspects of construal, which cognitive linguists have categorized in alternate ways. Selected here for illustration are specificity, direction of mental scanning, viewing arrangement, background, metaphor, and prominence.

The first dimension of construal to be considered is the level of *specificity* (conversely, the level of *schematicity*) at which a situation is characterized. This is a matter of ‘granularity’ or ‘resolution’, i.e. our manifest capacity to view a scene with widely varying degrees of precision and detail. Thus, the same creature could be described by any of the expressions in (1a), and the same event by any of those in (1b).

- (1) a. cocker spaniel > spaniel > dog > canine > animal > creature > thing
- b. The mean and ugly boy gently stroked the small, frightened cocker spaniel. > The boy stroked the dog. > The person touched the animal. > Somebody did something. > Something happened.

Obviously, the world does not come structured at a particular level of specificity/schematicity. Rather, we choose the level that reflects our knowledge or suits our purposes.

Nicely demonstrating the importance of how a situation is conceptualized are pairs of expressions that describe exactly the same static situation but involve a different way of *mentally scanning* through it. For instance, the alternate expressions in (2a) might be used to describe the same roof (even viewed from the same vantage point). Likewise, the sentences in (2b) have the same truth conditions and could be used to describe the same scar.

- (2) a. The roof slopes steeply {upward/downward}.
- b. The scar extends {from his wrist to his elbow/from his elbow to his wrist}.

In each case the situation described is a static one, yet the contrasting sentences have a dynamic feel and are not semantically equivalent (unless one arbitrarily defines semantics so as to exclude factors that are clearly linguistically relevant). The contrast resides in a kind of *conceptual directionality*, wherein the conceptualizer (i.e. the speaker, and secondarily the addressee) scans mentally through the scene in one direction or the other in building up to a full conception of it. This subjective directionality is not just posited on the basis of intuition, but is

necessary to account for the occurrence of expressions like ‘to’, ‘from’, and ‘upward’, whose occurrence here would otherwise be incoherent.

An important aspect of linguistic meaning is the overall *viewing arrangement* an expression presupposes. The term subsumes a variety of factors, the most obvious being an assumed *vantage point*. In (3a), for example, the choice of *go* vs. *come* depends on whether the speaker adopts a vantage point that is outside or inside the attic.

- (3) a. She {went/came} up into the attic.  
 b. I order you to leave at once! versus Leave at once!  
 c. I was racing toward the tree at 60 miles per hour versus The tree came racing toward me at 60 miles per hour.

More subtle is the contrast in (3b), where the speaker, addressee, and illocutionary force can either be mentioned explicitly or remain covert. I have argued (1985) that this difference correlates with the extent to which the speech event participants are put ‘onstage’ as focused *objects* of conception, as opposed to functioning merely as the implicit *subjects* of conception. We also have the flexibility of either describing a situation in more or less objective terms, or else indicating how it appeared to someone involved in it. Thus a speaker who survived the car crash prefigured in (3c) might opt to retell the event either objectively, as in the first sentence, or impressionistically, as in the second.

Another dimension of construal is the *background* against which we conceive of the situation described. This term also subsumes a number of factors. One kind of background is the body of assumptions, presuppositions, and expectations we bring to bear in apprehending an expression. A classic example is the opposition in (4a): ‘half full’ assumes the baseline of the glass being empty and assesses how far the situation diverges therefrom in the direction of it being full, whereas ‘half empty’ does the opposite.

- (4) a. The glass is {half-full/half-empty}.  
 b. Jack called Jill a Republican, and then SHE insulted HIM.

Expressions are also construed against the background provided by the prior discourse. In 4b, another classic example, the stress pattern in the second clause reflects the interaction of two kinds of background: the discourse context of the preceding clause, and the extra-linguistic assumption that calling someone a Republican constitutes an insult. Reduced stress in English indicates that a notion has already occurred in the recent discourse. Hence the lowered stress on *insult* in the second clause of (4b), relative to that of the pronouns, signals

that the notion of insulting has already been introduced. While it is not mentioned explicitly in the first clause, its presence via the background assumption (about the import of calling someone a Republican) is sufficient for purposes of stress determination.

Another phenomenon involving background is *metaphor*, which cognitive linguistics has firmly established as a fundamental aspect of conceptualization and semantic structure (Lakoff and Johnson 1980; Turner 1987; Lakoff and Turner 1989; Lakoff 1990). In metaphor, a *target domain* is construed against the background of a *source domain*. For example, the target domain involving theories and their adequacy is structured metaphorically by a number of different source domains, including buildings, warfare, and containers for fluid:

- (5) a. My theory collapsed. [a theory as a building]  
 b. S/he shot down my theory. [a theory as an airplane]  
 c. That theory won’t hold water. [a theory as a pail]

Observe that these sentences — with the possible exception of (5c) — are not just literally untrue but literally incoherent. It is only the mental act of construing the target domain in relation to the source domain, i.e. of imposing on the conception of the target (a theory) some of the properties of the source, that creates a ‘hybrid’ conception of the target capable of taking part in the events described.

Within the same conceived situation, elements can be accorded varying degrees of conceptual *prominence*. There are numerous kinds of prominence that have to be carefully distinguished, two of which are especially relevant here. The first is similar to *reference*, but importantly, it is reference *within a conceptualization*, a kind of focus of attention. Within its *conceptual base* (i.e. the array of conceptual content it evokes as the basis for its meaning), an expression selects some substructure as its *profile* — the entity it *designates*. Expressions that evoke the same conceptual content can nonetheless differ in meaning by virtue of what they profile within this common base. For example, the terms ‘iris’ and ‘pupil’ each refer to part of an eye and can hardly be characterized except in relation to the overall eye configuration, sketched on the left in Figure 1a. The semantic distinction between them resides primarily in their alternate choices of profile with respect to this base (profiling is indicated by heavy lines). Another example, sketched in Figure 1b, is the contrast between the compounds ‘apple juice’ and ‘juice apple’. Each evokes as its base the complex notion that an apple (A) can be the source of juice (J). The difference is in the choice of profile: ‘apple juice’ designates juice from this source, and

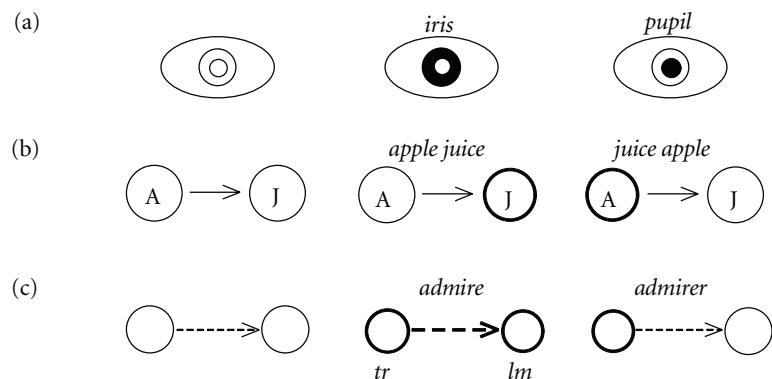


Figure 1.

‘juice apple’ refers to an apple potentially used in this way. It is a regular pattern of English grammar that the second element of a compound imposes its own profile on the overall expression.

Observe that not only *things* but also *relationships* can be profiled (both terms are defined quite abstractly: see Langacker 1987b). The verb ‘admire’, for instance, evokes as its base the conception of one individual having a certain mental attitude toward another (this is represented by a dashed arrow in Figure 1c) and profiles this relationship in its continuation through time. That, I claim, is what makes it a verb. By contrast, ‘admirer’ evokes the same conceptual base but profiles the individual who entertains the mental attitude. Because it designates a thing rather than a relationship, ‘admirer’ functions grammatically as a noun. This exemplifies the general point that an expression’s grammatical class is determined by the nature of its profile; it cannot be ascertained just from the content evoked. This in turn illustrates a basic claim of cognitive grammar, namely that grammatical structure is meaningful by virtue of the many levels and dimensions of construal it embodies and imposes.

As a final dimension of construal, I note that expressions which profile relationships accord different degrees of prominence to the relational participants. Metaphorically, we can think of this in terms of spotlights of *focal prominence* that can be directed at various elements in the scene. The *primary* focal participant (i.e. the entity the expression is concerned with locating or characterizing) is called the *trajector* (*tr*). If there is a *secondary* focal participant, it is called a *landmark* (*lm*). We can see the need for these constructs by considering the distinction between *before* and *after*. Each evokes the domain of time (*t*) and profiles the relationship between two events, one of which precedes the other,

as shown in Figure 2. However, this much is true of both expressions — in terms of the content evoked and the relationship referred to (indicated by the double-headed dashed arrow), *before* and *after* are equivalent. They are not synonymous, however. Where, then, does their semantic contrast reside? The difference is a matter of which event is invoked as a temporal landmark for purposes of situating the event being located (the trajector). Numerous pairs of relational expressions are comparably distinguished semantically just by their alternate trajector/landmark alignments: *above* versus *below*, *in front of* versus *in back of*, *precede* versus *follow*, *invade* versus *be invaded*, etc.

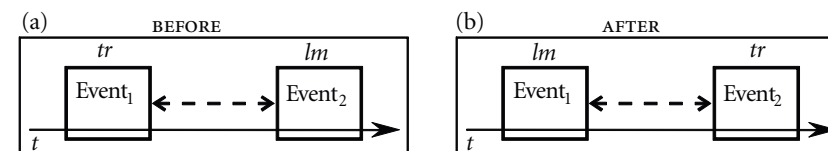


Figure 2.

Let us now turn to the relation between *meaning* and *grammar*. In linguistics, a standard view is that they are quite distinct. Grammar is said to be *autonomous* with respect to both semantics and lexicon. It consists of rules and structures specifying how lexical items combine to form larger expressions, sentences in particular. Lexical items are inserted into syntactic tree structures and contribute specific components of meaning to a sentence. The elements of grammar are not themselves considered meaningful. Syntactic structure is however taken into account by rules of *semantic interpretation*, which compute the meaning of a sentence from the meanings of the lexical items it contains. Moreover, the meaning of a sentence is assumed to be a regular compositional function of the meanings of these lexical items — linguistic semantics exhibits *full compositionality*.

The alternative view I would argue for disagrees with the above on every point. I claim that lexicon, morphology, and syntax form a continuum fully describable as assemblies of *symbolic structures* (form — meaning pairings). Being symbolic in nature, grammatical elements are inherently meaningful (albeit schematic). Grammatical constructions incorporate patterns of semantic integration, as well as patterns of phonological integration which serve to symbolize it. However, linguistic semantics exhibits only *partial compositionality*: the meanings of component elements evoke and constrain the meaning of a composite expression but do not actually constitute it. An expression’s actual

semantic value results from an elaborate process of *meaning construction* that draws upon all available conceptual and contextual resources.

This is obviously not the forum for a full discussion of these issues. Here I can only briefly indicate some of the ways in which grammar, far from being an autonomous formal system, is by its very nature critically dependent on human conceptualization. We have already seen how one aspect of construal, namely profiling, is relevant to compound formation, and more generally, to the determination of an expression's grammatical class. We have further seen, from the examples in (5) and (2), how the very possibility of grammatical coherence is often dependent on such construal factors as metaphor and conceptual directionality. I should emphasise that such expressions are not reasonably regarded as either marginal or even unusual. Indeed, I will try to show that the dependence of grammar on construal is utterly banal.

Let me first illustrate the notion that grammar resides in assemblies of symbolic structures. A symbolic structure is merely the pairing between a semantic structure (i.e. a conceptual meaning) and a phonological structure (either specific or schematic). The minimal instantiation of a symbolic structure is a simple lexical item, e.g. *wolf*. In a complex expression, *component* symbolic structures are linked by *correspondences* (represented by dotted lines). When corresponding elements are superimposed and their specifications merged, the result is a *composite* symbolic structure.

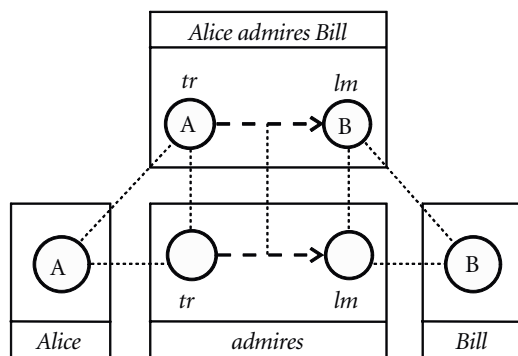


Figure 3.

Figure 3 sketches the integration of the component structures 'Alice', 'admires', and 'Bill' to form the composite expression 'Alice admires Bill'. As nouns, 'Alice' and 'Bill' profile things (represented by circles), with their additional

semantic specifications abbreviated as A and B. 'Admires' profiles a mental process; it is shown as a dashed arrow connecting its two schematic participants, characterized only as an experiencer and an object of experience. Correspondences equate the trajector of 'admires' with the profile of 'Alice', and its landmark with that of 'Bill'. Superimposing the specifications of corresponding elements results in the composite structure shown at the top, which designates a process whose participants are now specific. The nature of their phonological integration — specifically word order — symbolizes that the components are semantically integrated in this fashion.

Grammatical patterns are expressed by means of *constructional schemas*, i.e. symbolic assemblies whose component and composite structures are schematic rather than specific. A constructional schema embodies the abstract commonality inherent in a set of complex expressions and serves as a template for the creation of novel expressions on the same pattern. For instance, Figure 4 sketches the schematic parallelism of 'Alice admires Bill' and countless other expressions instantiating the basic clause type of English in which the subject precedes the verb and the object follows. Observe that the profiling and correspondences in Figure 4 are directly analogous to those in Figure 3.

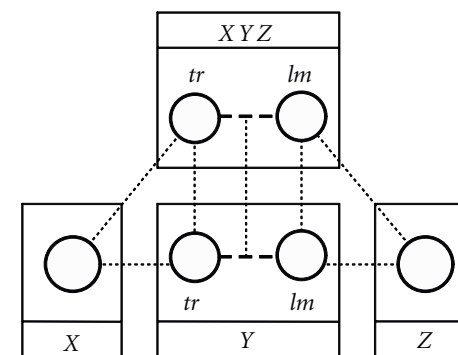


Figure 4.

Basic grammatical notions are definable with respect to symbolic assemblies. For example, a 'head' (at a given level of organization) is the component structure whose profile corresponds to the composite structure profile. The verb is thus the head in a finite clause because, as shown in Figures 3 and 4, the process designated by the verb is identified (by correspondences) as the one profiled by the clause as a whole. Grammatical relations like *subject* and *object* are also



definable in terms of such assemblies. As seen in the diagrams, a subject can be characterized as a nominal component whose profile corresponds to the *trajector* of a clausal head, and an object, one whose profile corresponds to its *landmark*.

The relation between a verb and its subject and object is roughly analogous to that in logic between a *predicate* and its *arguments*. Indeed, linguists often use the latter terms, and also speak of *logical grammatical relations* with reference to subjects and objects at the deep-structure level. In cognitive grammar, however, the definition of subject and object has nothing to do with logic, but is rather a matter of *focal prominence* (trajector/landmark organization). Nothing would seem to be more fundamental to grammatical structure and semantic interpretation than constructs like subject and object, predicate and argument. Yet right here, in the heart of grammar, we find through careful empirical observation that the critical factors do not pertain to logic, objective truth, or strict compositionality. Rather, choice of subject and object correlates most strongly with *cognitive salience* for a human conceptualizer (in the role of speaker or addressee). To the extent that this is so, a characterization of subject and object in terms of focal prominence is highly natural (in addition to being the most workable account from a linguistic standpoint: Langacker 1995; Tomlin 1995).

There is often a discrepancy between the entity explicitly mentioned by the subject or object of a clause — its *profile* — and the entity which most directly and crucially participates in the clausal relationship — which I will call its *active zone* with respect to that relationship (Langacker 1984; 1993a). It turns out on close examination that active-zone/profile discrepancy is extremely prevalent, to the point that it arguably constitutes the rule rather than the exception. At the very least it has to be regarded as a normal linguistic phenomenon and should not be problematic for any theory with claims of empirical adequacy. Its prevalence strongly suggests that cognitive salience has a greater role in determining grammatical structure than does logic or strict accuracy of description.

Active-zone/profile discrepancy is most evident in classic cases of *metonymy*, as exemplified in (6):

- (6) a. I bought **Lakoff and Johnson** for just \$1.50. [presumably the book, not its authors]  
 b. She ate an **apple**. [presumably not the core]  
 c. On this last drive they used a lot of **clock**. [a lot of the remaining time]  
 d. **That car** doesn't know where he's going. [the car is visible, the driver is not]

The nominal expression given in boldface profiles an entity that does not *per se*, as a whole, directly participate in the clausal process. The profiled entity serves instead as a conceptual *reference point* (Langacker 1993b) which, combined with general knowledge, provides mental access to the entity that does so participate (its active zone with respect to the clausal process). To serve this reference-point function, the profiled entity has to be cognitively salient for the language user, at least in relative terms. The examples in (6) respectively illustrate the following salience asymmetries, which have numerous linguistic manifestations: *human > non-human; whole > part; concrete > abstract; visible > non-visible*. Of course, what counts as cognitively salient is contextually dependent. In (7), for instance, the usual asymmetries would make the explicitly mentioned entity low in salience relative to the intended referent:

- (7) The **vasectomy** in room 233 wants a sleeping pill. [one nurse to another in a hospital]

Yet in an impersonal hospital setting, where nurses might know little or nothing about their patients as individuals, the surgical procedures they have undergone could well be the most salient bit of discriminating information available.

Although some of the foregoing examples are striking, they are really not special or unusual in any way. The sentences in (8) are standard means of expression that do not attract any attention, yet they involve discrepancies that are quite noteworthy once they are pointed out:

- (8) a. I'm in the phone book.  
 b. She heard a trumpet.  
 c. The kettle is boiling.  
 d. I can barely make you out in this photograph.

When people are referred to as clausal participants, their active zone with respect to the profiled process is seldom a person as an undifferentiated whole. Thus in (9), each verb selects different facets of Tom for direct involvement in the process it designates:

- (9) Tom {*winked/whistled/meditated/walked/waved/urinated/bled/ate/grinned*}.

The choice of overtly coded participant is clearly motivated by cognitive salience and communicative efficiency, not precision or strict accuracy. We could not be fully precise even if we wanted to be — as a substitute for (6b), even the following is only a rough approximation:

- (10) Her hands, teeth, tongue, throat, and the upper parts of her alimentary canal ate all of an apple except its core, seeds, and stem.

Active-zone/profile discrepancies are not restricted to verbs but can be found with any kind of relational expression. Consider some examples with the preposition *in*:

- (11) a. Sam is in the bathtub.  
 b. Dorothy has a cigarette in her mouth.  
 c. An arrow is stuck in the tree.

None of these sentences would normally be interpreted as indicating complete inclusion of the subject's profile in that of the prepositional object, nor is the latter *per se* the containing entity (cf. Vandeloise 1986, 1992). Presumably Sam is not embedded in the actual substance of the bathtub, but is only partially included in the 'virtual container' defined by mentally projecting a closure on top. Dorothy is no doubt smart enough to put only the unlit end of the cigarette in her mouth, and it is actually only the lips that contain it. In the last example, the relationship of spatial inclusion only holds between the head of the arrow and a small portion of the bark of the tree.

We might also consider the import of a colour term used to modify a noun. In a case like 'red clay', the locus of the colour sensation indicated by the adjective is the substance designated by the noun — active zone and profile coincide. This is rather unusual, however. Normally the colour is observed only on the outer surface of the nominal referent, as in 'red apple', and maybe only part of the outer surface; the phrase *red dress* is unproblematically applied to a dress that is mostly red but has white stripes or yellow polka dots. In looking for a 'red watermelon' I will be satisfied with one that is red on the inside but green on the outside. The expression 'red pen' is ambiguous: it can indicate either a pen that is red on its outer surface, or more likely one that leaves red marks when used for writing. These factors obviously have to be taken into account in evaluating sentences from the standpoint of logic and reasoning. For instance, sentence (12) is perfectly coherent and meaningful, not in any way anomalous or contradictory:

- (12) This red pen is blue.

The key to interpreting such expressions clearly resides in pragmatic knowledge and functionality for the human language user.

Active-zone/profile discrepancy supports the basic claim that the overt elements in a sentence do not give rise to its meaning in any mechanical, fully

compositional way. The meanings of component elements evoke and constrain the meaning of a composite expression but cannot be said to constitute it. An expression's actual semantic value results from an elaborate process of *meaning construction* that draws upon all available conceptual and contextual resources (cf. Fauconnier 1985). In fact, its semantic and even its grammatical coherence may be crucially dependent on elaborate conceptual structures that remain entirely covert. Numerous kinds of examples have now been given, e.g. in (2), (5), (6), (8), and (12). A particularly striking example has been cited by Talmy (1988b):

- (13) There's a cottage now and then through the valley.

On the face of it, this sentence is semantically and grammatically incoherent. Cottages are not the sort of entities that fade in and out of existence, as suggested by the adverbial phrase 'now and then'. Moreover, 'through the valley' describes a path of motion, but nothing overtly mentioned in (13) is construed as moving. The coherence of this sentence is entirely dependent on construing it with respect to a particular kind of viewing arrangement: it presupposes a tacit observer who is moving through the valley (e.g. in a train) and describes the scene that appears in the observer's 'viewing frame' (e.g. the train window) during this journey. Thus, as the unmentioned observer travels 'through the valley', every 'now and then' a cottage can be seen in the viewing frame. It is the travel and the observation that render the adverbs interpretable, but neither is mentioned overtly.

Once again, this is not a particularly unusual or difficult sentence. We understand it immediately, and its striking properties are likely to remain unnoticed unless our attention is specifically called to them. It is reasonably claimed that understanding even the most prosaic and mundane sentence involves an elaborate process of meaning construction that draws on a wide range of general and contextual knowledge. Consider (14):

- (14) The ball is under the table.

Hearing this sentence out of context, we will almost certainly envisage the situation shown on the left in Figure 5. However, it is equally applicable to all the other scenes depicted, any of which might be evoked in the proper context. The specific properties that distinguish the canonical interpretation from the others must therefore be attributed to general world knowledge, which we use to supplement the information provided by specifically linguistic structures.

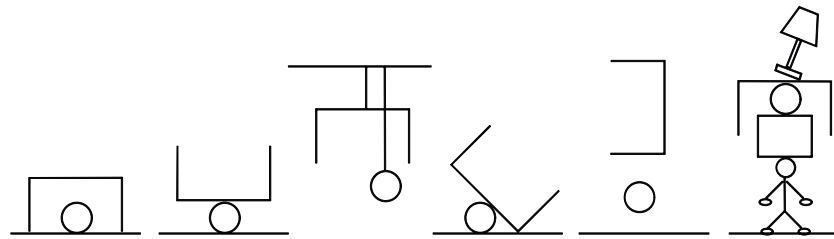


Figure 5.

I have tried to emphasize that all of this is perfectly normal and natural when viewed in terms of human conceptualization and language use. Phenomena such as metaphor, metonymy, active-zone/profile discrepancy, construal, and meaning construction play a central role in every sentence — not only in its meaning, but also in its grammar. Leaving any one of these aside as ‘special’ or ‘derivative’, to devise an account of linguistic semantics based on data in which they do not figure, would be quite arbitrary. In any event, so little data would be left that the description would not be terribly interesting; the problem of linguistic meaning would in large measure still remain unresolved. The phenomena in question have to be considered *foundational* to an adequate and realistic characterization of linguistic semantics, and by their very nature they depend on the vast and variegated resources of the human mind.

## CHAPTER 3

## What is Montague semantics?\*

Diego Marconi

In many respects, this essay is a touchstone for the other papers in the book. While presenting and specifying the characteristics, potential and limitations of Montague grammar, it analyses a number of significant differences between a formal and a cognitive semantics. It therefore deals with many of the issues that have been given alternative treatment in cognitive semantics (structure, syntax and semantics, the compositionality of meaning, competence, and so on). Marconi’s main thesis, in fact, is that Montague semantics is not a theory of meaning for natural language (see also Langacker’s contribution), but a particular, or even complete, theory of an idealization of inferential competence. The essay clarifies in particular the different relationships between semantics and syntax in formal and cognitive semantics, explaining how a Montague grammar is a theory of the semantic effects of composition and how, consequently, it affects meaning.

Is Montague semantics a *theory of meaning* for natural language? The answer to this should be a qualified ‘no’. It is not a theory of meaning in any immediately intuitive sense: it does not provide satisfactory answers to questions such as ‘What is the meaning of sentence  $p$  of language  $L$ ?’ (or ‘What is the meaning of word  $w$ ?’, or ‘What does  $w$  mean?’, etc.). So, if this is what a theory of meaning is, or does, then Montague semantics is not a theory of meaning. Why not? Why are the answers of Montague semantics to such questions not satisfactory? For example, what does Montague semantics say about the meaning of (1)?

- (1) There is a book on the table

It says that the sentence is *true* in a model  $M$  under certain conditions (necessary and sufficient). For purely expository reasons, such conditions are specified

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not in connection with (1) itself, but in connection with a translation of (1) into a formal language. Suppose that the translation is (2) (after simplification):

$$(2) (\exists x_1)(B^1x_1 \wedge O^2x_1(\iota x_2.Tx_2))^1$$

Specification of the conditions under which (2) is true in  $M$  — which amounts to a specification of the conditions under which (1) is true in  $M$  — comes down to something looking very much like the following: (2) is true in  $M$  iff there exists an object  $\mathbf{o}_1 \in \text{Dmn}_M$  such that there exists an object  $\mathbf{o}_2 \in \text{Dmn}_M$  such that:

- $\mathbf{o}_1 \in I(B^1)$ ;
- $\mathbf{o}_2 \in I(T^1)$ ;
- for every  $\mathbf{o} \in \text{Dmn}_M$ ,  $\mathbf{o} \notin I(T^1)$  or  $\mathbf{o} = \mathbf{o}_2$ ;
- $\langle \mathbf{o}_1, \mathbf{o}_2 \rangle \in I(O^2)$ .

where  $\text{Dmn}$  is called the domain (the universe of discourse of  $M$ ), and  $I$  is a function which assigns to the descriptive constants of the language of (2) entities defined over  $M$  of the appropriate types: sets of objects to unary predicates like  $B$  and  $T$ , sets of pairs of objects to binary relations like  $O$ , etc.<sup>2</sup>

Is this information satisfactory? Does it answer, albeit indirectly, the question ‘What is the meaning of (1)?’ It does not, for two distinct reasons: we do not know what model corresponds to the world — the actual world; and we are not told how the function  $I$  works (for example, we do not know what the value of  $I(B)$  is). Any speaker who understands (1) — any speaker who knows what (1) means — knows that it is about *books*, and s/he knows what books *are* (what it is to be a book). But such information is not provided by the above specifications: *for all we are told*, (1) could mean ‘There are apples in the basket’. But (1) does not mean ‘There are apples in the basket’; it means ‘There is a book on the table’. The information which is specified by a standard interpretation procedure in Montague semantics (translation + interpretation) is not sufficient to single out the meaning of the sentences it applies to. Montague, of course, was quite aware of this.<sup>3</sup> The above specification only tells us about the logical (semantic) *types* corresponding to the descriptive constants. However, it takes more than that in order to understand (1); one needs to know what ‘table’, ‘book’, and ‘on’ *mean*; and to know that, whatever it is, is to know more than their logical types.

People — beginning with Carnap (1952) — have thought of filling this informational gap by adding *meaning postulates* to the semantic system. In other words, the semantic theory would consist of a set of interpretation rules (generating specifications of truth conditions like those above) together with a

set of meaning postulates. Essentially, a meaning postulate is a stipulation on the relation between lexical items; more precisely, a stipulation on the relation between their referents or (in Carnap’s terminology) extensions. By setting down a meaning postulate such as

$$(MP) (\forall x)(\text{bachelor}(x) \supset \neg \text{married}(x))$$

we stipulate that whatever individual is in the extension of ‘bachelor’ is not in the extension of ‘married’: and that in all models.

So, suppose we add a set of meaning postulates. Indeed, suppose we throw in a complete set of meaning postulates for the language of (1). What we are adding is the set of postulates that is needed in order to validate all inferences that are accessible to a competent speaker of English; inferences such as

There is a book on the table  


---

There is a physical object on the table  


---

There is a book on the table  


---

There is a piece of furniture

etc. Now we can no longer complain that we have not been told what the individual words mean: we have been told a lot of what a competent speaker knows about ‘table’, ‘book’, etc. Is that enough? That is, can we now say that the meaning of (1) has been fully and satisfactorily specified? Alas, no. For, as B. Partee remarked in 1981, “no amount of such intralinguistic connections [*sc.* meaning postulates] can serve to tie down the intensions with respect to their extralinguistic content. For that there must be some language-to-world *grounding*” (Partee 1981:71; italics added).<sup>4</sup>

This can be taken in three different ways. From the *mathematical* standpoint, what we want to say is that no set of meaning postulates can characterize the intended interpretation from among all logically possible interpretations. Meaning postulates do indeed rule out lots of interpretations, such as those in which, say, ‘table’ is interpreted as synonymous with ‘cup’, or tables do not turn out to be a subset of pieces of furniture. However, they do not single out one interpretation, the one by which ‘table’ refers to tables in the real world, ‘book’ refers to books, and so on. This is simply because of the Löwenheim-Skolem theorem: any consistent first-order theory has an infinity of non-isomorphic models.<sup>5</sup>

On the *semantic* interpretation, the point is that a meaningless (i.e.,

uninterpreted) linguistic symbol cannot be made meaningful by being connected, in any way whatsoever, to more uninterpreted symbols. If you do not know Chinese, a Chinese definition for a Chinese word will not make you understand the word.<sup>6</sup> This is so no matter how many such connections you line up, no matter how many meaning postulates you write, no matter how big your Chinese dictionary is: there is no magic feat called ‘holism’ that can do the trick.<sup>7</sup>

Finally, on the *cognitive* interpretation the point is that there is something which we, as competent speakers of English, know about words such as ‘book’, ‘table’, and ‘on’ which is not captured by the meaning postulates for these words (or, indeed, for all other English words). Consequently, the informational content of (1) is not exhausted by its semantic interpretation-*cum*-meaning postulates. That is, when we understand (1) we get more information than is made explicit by its translation into a well-regimented, interpreted first- (or, for that matter, second-) order language plus the relevant meaning postulates. What we further know is, very briefly, how to apply such words in the real world. We know how to react to the order ‘Keep off the table!’, we can answer the question ‘Is there a table in this room?’, etc. No amount of meaning postulates is going to explicate this ability: to know that books are physical objects, made of cardboard and paper, of a size typically ranging from so-and-so to such-and-such, is not going to enable us to recognize a book on a table — not unless we know how to apply ‘cardboard’, ‘paper’ and many other words. But again, such know-how is not the job of meaning postulates.

So, what *is* Montague semantics, if it is not a theory of meaning for natural language in the above-specified sense? It is *a theory of the semantic effects of composition*.<sup>8</sup> What Montague semantics says, the kind of information it provides, concerns how composition affects meaning: what is the effect of combining certain constituents in a certain way. *In principle*, Montague semantics has nothing to say about the constituents’ meaning; it has a lot to say, however, about the semantic contribution of syntactic structure. Montague semantics is *functional* semantics: the meaning of a linguistic expression is (expressed as) a specific function of ultimately unspecified constituent meanings. Alternatively, it could be presented as a theory of meaning for syntactic classes of linguistic expressions which does not distinguish among individual members of the same class.

In a few cases, the characterization of a syntactic class — or if you like, of a syntactic structure — essentially involves a particular *word*. Thus, Montague semantics deals with the class or the structure [Necessarily S], where S is any sentence and ‘necessarily’ is the *word* ‘necessarily’. Or it deals with the structure

[Only NP], where NP is any noun phrase and ‘only’ is the word ‘only’. As the theory is a theory of the semantic contribution of structure, and in these cases structure is characterized by individual words (as opposed, for example, to the case of the structure [NP VP], where no individual word occurs), then one may say that — in these cases — the theory accounts for the semantic contribution of individual words (though in specified contexts), that is, it explicitly “gives the meaning” of this or that word (‘necessarily’, ‘only’, etc.), limited to such contexts. As said, this only happens in a few cases. In the general case, the characterization of a syntactic class does not involve individual words, and consequently whatever information is provided does not concern words (as opposed to classes of words).

Now, how is this done? How are the semantic effects of composition represented? In the general case, this is done by showing how the semantic value of a complex expression can be computed from the semantic values of its constituents. Let  $\alpha_{\beta_1, \dots, \beta_m}$  be the structure which combines constituents of types  $\beta_1, \dots, \beta_m$  according to modality of combination  $\alpha$ . Typically, a statement of the theory relative to such a structure will take the form

$$V_M[\alpha_{\beta_1, \dots, \beta_m}] = \Phi(V_M[\beta_1], \dots, V_M[\beta_m]),$$

where ‘ $V_M$ ’ stands for semantic value and  $\Phi$  is a specified function of the appropriate kind (i.e., defined over a domain which includes objects of the types of the semantic values of  $\beta_1, \dots, \beta_m$ ). The idea is that  $\Phi$  is only determined by  $\alpha$ , i.e., by the relevant kind of syntactic combination. Thus the semantic value of the whole expression,  $\alpha_{\beta_1, \dots, \beta_m}$ , is computed by an algorithm which only depends on the expression’s structure.

In general, ‘semantic values’ are abstract entities, mathematical constructs that bear no relation to anything intuitively semantic. The connection with semantic intuitions is through the notion of truth conditions. In fact, in the special case in which  $\alpha_{\beta_1, \dots, \beta_m}$  is a sentence, the theory’s statement of its semantic value can ultimately be given the form of a statement of its truth conditions, i.e., the following:

$$\alpha_{\beta_1, \dots, \beta_m} \text{ is true in model } M \text{ iff } R(V_M[\beta_1], \dots, V_M[\beta_m]),$$

where R may have one of several forms, strictly depending on both  $\alpha$  and the  $\beta_i$ ’s: for example,

$$\beta_1 \wedge \beta_2 \text{ is true in } M \text{ iff } \beta_1 \text{ is true in } M \text{ and } \beta_2 \text{ is true in } M$$

(where  $\beta_1, \beta_2$  are sentences,  $\wedge$  indicates concatenation, and ‘and’ is the *word* ‘and’);

$\beta_1 \wedge \beta_2$  is true in  $M$  iff  $V_M[\beta_1] \in V_M[\beta_2]$   
 (where  $\beta_1$  is a singular noun phrase and  $\beta_2$  is an intransitive verb  
 phrase);<sup>9</sup>

etc.

It is essentially statements of truth conditions that are usually taken to represent the intuitive benchmark of such a theory: the theory is regarded as a *semantic* theory because it issues assignments of truth conditions to sentences, and it is considered as a *correct* semantic theory to the extent that such assignments are intuitively plausible. Indeed, all semantic statements in a Montague-like theory tend to be looked at as contributing<sup>10</sup> to statements of the above kind, i.e., to statements of the truth conditions of sentences.

The connection between semantic intuitions and statements of truth conditions is usually motivated by reference to a long tradition — stemming from Frege and from Wittgenstein's *Tractatus* — according to which to know the meaning of a sentence is to know the conditions under which it would be true.<sup>11</sup> However, we saw that statements of truth conditions in Montague-like semantics do *not* really instruct us about the conditions under which a sentence is true. For in order to know under what conditions the sentence 'There is a book on the table' is true, one ought to be told what the words 'on', 'book', and 'table' apply to, and Montague semantics does nothing of the kind. However, statements of truth conditions are not thereby informationally empty: they provide us with *conditional* information. *If* we know the semantic values of  $\beta_1, \dots, \beta_m$  (in a model  $M$ ), *then* we know (i.e., we can compute) what it is for  $\alpha_{\beta_1, \dots, \beta_m}$  to be true (in  $M$ ). For example, if we know what it is for  $A, B$  to be true, then we know what it is for  $A \wedge B$  to be true. Such conditional statements, however, cannot be regarded as directly informative of the conditions under which a sentence is true; and they are not even *indirectly* informative, for the theory *never* tells us what the semantic values of the ultimate constituents are.

On the other hand, I have said that statements of truth conditions can be tested against our semantic intuitions, assessed for plausibility, and so forth. This appears to mean that such statements are compared with our intuitions of the meanings of sentences, and evaluated as to whether or not they accurately represent such meanings. But how can that be, if such statements are not statements of the meaning of any sentence, accurate or otherwise? Against *which* intuitions are statements of truth conditions tested?

Some people believe that the intuitions in question directly involve *truth*, or more precisely, truth-as-correspondence. Under such a view, to test a statement

of truth conditions against our semantic intuitions is to wonder whether the left-hand side of such a statement would indeed be true just in case the specified conditions obtain. Suppose, for example, that in the attempt to capture the meaning of the word 'only' we have issued a statement of truth conditions for sentences of the form 'Only NP VP' to the effect that e.g. 'Only John went to the party' comes out true just in case John went, and nobody else did.<sup>12</sup> In the view we are discussing, to evaluate the proposed truth conditions is to wonder whether those are exactly the conditions under which 'Only John went to the party' is true. How is that effected? Here, people who believe in intuitions of truth-as-correspondence may point (more or less vaguely) to some sort of mental picturing or modelling or imaging:<sup>13</sup> we (sort of) picture to ourselves a situation such that only John went to the party, and (sort of) check whether it is likewise a situation such that he went and nobody else did; and conversely. Now, there is no reason to deny the heuristic role of such mental picturing; however, it seems equally clear that it cannot be taken too seriously (can one really picture to oneself a situation such that *nobody other than John* went to the party?). There is no one-to-one correspondence between sentences and pictures, mental or otherwise.

Some people may then insist that our intuitions of truth are *primitive* (as becomes a primitive, irreducible notion such as truth): we somehow simply *know* what it is for a sentence to be true, or not true, in a situation in which such-and-such is the case (i.e., in which the specified conditions obtain). This is, of course, mysterious; however, my point is not that it is mysterious. What I want to urge is that it is not clear how such an account would be different from an *inferential* account. Suppose we say that statements of truth conditions are checked against our inferential intuitions: what we do is evaluate whether the right-hand side would license the left-hand side, and vice versa. For example, in the party case we would check whether, given the premise that only John went to the party, we would intuitively accept the double conclusion that he went and that nobody else went; and conversely, given the two premises that he went and that nobody else did, we would conclude that *only* he went. This, I surmise, is what we actually do in general, although pictures (mental or material) may help in some cases. Is this any different — mystery aside — from saying that we evaluate whether the left-hand side is *true* in any situation such that the right-hand side is the case, and vice versa, on the basis of our immediate, irreducible intuitions about being true in a situation? If not, then I would go for the less mysterious formulation.

One objection that might arise, but which should not be accepted, is the

following. Surely — it might be objected — nothing is gained by reading the truth conditions inferentially, for the notion of inference is itself parasitic upon the notion of truth. To say that B can be inferred from A is simply to say that B is *true* if A is. However, such theoretical matters are out of place here: we are not deciding which is ‘essentially’ more primitive between truth and inference. The issue is which *intuitions* are relevant in evaluating truth conditions. And it does not seem that intuitions about inferential relations are, as such, parasitic upon intuitions about truth-as-correspondence (or about truth in general). In other words, it does not seem that, whenever we wonder whether B follows from A, what we *really* and *consciously* do is wonder whether B is true in case A is — which question we would then proceed to answer by relying upon our intuitions of truth-as-correspondence. In many cases at least, questions about inferential relations are straightforwardly decided without appealing to intuitions of truth (or, for that matter, to any other intuitions); in other cases, we may use all sorts of heuristic strategies, including recourse to mental pictures; or even — for those of us who are sophisticated enough — model-theoretic methods. But there is no general, inherent dependence of inferential intuitions on separate intuitions about truth, or about conditional truth.

Another objection might point out that we have intuitions of truth-in-a-situation which do not easily reduce to inferential intuitions. For example, we might be led to assert a sentence (such as ‘More than half of the passengers have been rescued’) on the basis of a long and cumbersome linguistic description — a newspaper article, say. In such a case, inferential procedures can of course be assumed to have taken place; however, the notion of inference is here no less mysterious than the notion of truth. The answer to this should be twofold: first, we are not discussing in general the conditions under which one might be led to assert a sentence; we are only discussing the evaluation of statements of truth conditions in Montague-like semantics. Such statements, though often complicated, do not involve newspaper articles or other forms of unregimented linguistic description. Secondly, experience with the mechanization of inference in artificial intelligence has shown that there is nothing particularly mysterious about ‘natural inference’: it is just standard inference with a lot of premises, many among which must be retrieved from ‘world knowledge’ and background knowledge in general (often lending itself to be expressed in the form of meaning postulates). Thus the assertion of a sentence on the basis of a linguistic description, no matter how long and convoluted, can indeed be regarded as based on inference; in fact, no other reasonable account has been put forward so far.

Aside from such objections, there is a case which obviously resists an

inferential account: it cannot apply to statements of truth conditions for atomic sentences, such as, say,

$$(3) \text{ ‘John runs’ is true (in } M) \text{ iff } V_M[\text{John}] \in V_M[\text{runs}].^{14}$$

For, evidently, the right-hand side does not contain any sentence, or sentences which might or might not license the sentence occurring on the left-hand side. It is with these cases that the partisans of truth feel most at home, for — they urge — such statements are grounded in the intuition that ‘John runs’ is *true* in all models in which the *reference* of ‘John’ is a member of the *reference* of ‘run’ (a set of individuals, in this case). As truth conditions for atomic sentences are, in a sense, the basis of the whole construction, it is clear — they would conclude — that the notions of truth and reference loom large in Montague-like semantics. It would be unfair to reply that, indeed, atomic truth conditions are not to be tested against our semantic intuitions in the way more complex truth conditions are, for they are just theoretical tools whose point is to help generate more complex truth-conditional statements, so that they are on a par with *non*-truth-conditional statements of the theory, as far as their relation to intuitions is concerned. For, clearly, statements of atomic truth conditions are *not* on a par with, say, assignments of semantic values to prepositional phrases; we *do* have intuitions concerning their plausibility.

Assessing atomic truth conditions like (3) seems to require referential intuitions of *some* kind. The reasoning behind the acceptance of (3) appears to be something like the following: Suppose ‘John’ applies to a certain object, and ‘run’ picks out certain objects, and the object to which ‘John’ applies is among them; in such circumstances, we would say that ‘John runs’ is true, wouldn’t we? In such reasoning, the objective relations supposedly connecting lexical items to the *actual* world are not involved, first of all, because the actual world itself is not involved. In fact, truth enters Montague semantics as truth-in-a-model, not as plain truth, or truth in the actual world. Models, or hypothetical situations, are theoretical entities; causal connections between lexical items and such entities are out of question. True, (3) derives its plausibility from the fact that truth-in-a-model and reference-in-a-model are somehow conceived on the pattern of simple truth and simple reference (as is clear from the reasoning underlying the acceptance of such atomic statements). That the analogy is tenable may of course be doubted,<sup>15</sup> which would amount to denying that statements like (3) have *any* intuitive plausibility (they would only be justified by their theoretical role). But anyway — secondly — in order to make (3) plausible we do not need the idea of a lexical item *objectively* referring to an

individual or a class: *any* of the intuitions connected with our referential practices will do. The important (and relatively controversial) idea which is captured in atomic truth conditions such as (3) is the extensional analysis of predication: the idea that predication can be reduced to set-theoretical membership. *How* reference is conceived is relatively unimportant, if what is at stake is the *intuitive* plausibility of (3). This can also be seen from the fact that intuitions concerning the particular lexical items involved in statements such as (3) play no role whatsoever in determining their plausibility, contrary to what happens in the inferential case. When we assess the truth condition for ‘A and B’, our intuitions concerning the specific inferential properties of ‘and’ are crucial; similarly with ‘only’, ‘necessarily’, the quantifiers, and so on. Not so with the atomic cases, where it does not make any difference whether we are dealing with John or Paul, with running or driving or being human; only logical types matter. One would imagine that, if objective reference were involved, intuitions about the particular referential attachments of individual lexical items would make a difference.

Let me summarize. Montague semantics is not a theory of meaning; it is a theory of the semantic effects of composition. Such effects are explicitly and informatively stated in theoretical statements which assign semantic operations to compositional structures. Statements having the form of assignments of truth conditions to sentences play a special role, for it is (essentially) through such statements that the theory is checked against our semantic intuitions: the only reason we call the theory a *semantic* theory is that it is in touch with semantic intuitions through assignments of truth conditions. The relevant intuitions, however, do not involve truth-as-correspondence: they are *inferential* intuitions, that is, intuitions about inferential relations among sentences. Non-inferential intuitions play some role in evaluating statements of atomic truth conditions. However, once the extensional analysis of predication is adhered to, any intuitions stemming from our referential practices will do.

To the extent that the *data* of Montague semantics are inferential intuitions, it may be regarded as a partial theory of inferential competence. If one takes the theory together with a ‘complete’ system of meaning postulates, then it may be regarded as a complete theory of (an idealization of) inferential competence. Both ‘complete’ and ‘idealization’ must be taken *cum grano salis*: on the one hand, even a large dictionary contains but a selection of inferentially relevant information; on the other, it may be doubted that the notion of an idealized competence makes any sense at this level — the lexical level. But that is a different story.

But then — one might object — if truth does not really come into the picture, why all the mathematical machinery? Couldn’t one just state the semantic contribution of composition in terms of inferential potential? Does one really need domains, interpretation functions, valuations, possible worlds and all the referential apparatus of Montague-like semantics? Here the answer is easy: we want a *systematic* treatment of the inferential contributions of the several linguistic elements (i.e., structures and, in a few cases, individual words). In other words, we want the *combined* inferential effect of the several elements (say, the definite article and the predicative structure) to be computable according to general principles, rather than specified in each single case. Montague-like semantics, with all its referential apparatus, is an elegant way of achieving that goal. Could it be done otherwise? Perhaps; however, these (Montague-like) methods do work.



## Construal operations in linguistics and artificial intelligence

William Croft and Esther J. Wood

This essay deals with one of the fundamental aspects of the semantics of cognitive linguistics, namely the nature of construal operations, and this entails reference to the conceptualization of the described situation in the mind of the language user. In expounding the conceptualist approach to semantics, the essay highlights its differences with respect to formal semantics and develops the arguments of Langacker's and Marconi's essay by analysing particular forms of imagery (scanning, scalar adjustment, profile-base, attention). In doing so, it also elaborates a number of general points concerning the two different types of approach to semantics made in Albertazzi's Introduction — which like this essay also conducts a critique of the use by artificial intelligence of certain phenomenological concepts. Croft and Wood's use of phenomenological instruments, moreover, displays numerous points of contact with the contributions in the book by Albertazzi (fictive motion), Wildgen (Gestalt concepts), Violi (context and comparison) and Peruzzi (conceptual universals). In dealing with the problem of the universality of construal operations, Croft and Wood also make explicit mention of Langacker's work, with reference both to his essay in this book and previous publications.

### 1. Introduction

In comparing different approaches to linguistic semantics, there are two distinct and logically independent issues that one must treat separately: the relation of (morpho)syntax to semantics, and the nature of semantic structure itself. This paper will concern itself largely with semantic representation.

What sort of semantic structures are to be posited in the analysis of linguistic meanings? Here the central issue, in our opinion, is whether or not meaning is conceptual or real, that is, whether the description of linguistic meaning must

include reference to the *conceptualization* of the described situation in the mind of the language user in some if not all cases.

On this issue, various semantic theories take stronger positions. One of the central tenets of cognitive linguistics (Talmy 1988a; Lakoff 1987; Langacker 1987) is that the meaning of a linguistic expression is more than an objective or universal level of conceptual representation. The choice of words and syntactic structures reflects a conceptualization or *construal* of the experience being communicated by the speaker. Langacker, for example, argues at length that syntactic constructions and so-called meaningless grammatical morphemes actually provide a very abstract construal of the conceptual structure that the sentence stands for (Langacker 1987; 1991). Generative linguists, whose approach to syntax and to the syntax-semantics relationship is often extremely different from that of cognitive linguists, in fact largely agree with cognitive linguists that meaning involves conceptualization (see for example Jackendoff 1983). It is the formal semanticists whose work is descended from research in logic and philosophy for whom the conceptualist approach to semantics is foreign. This chapter offers a new overview of construal operations, further integrating linguistic semantics and general human cognition.

The cognitive linguistic approach to semantics presupposes that there are two levels for the representation of meaning: a conceptual representation, which serves as the input to the construal operations, and a linguistic semantic representation, which is the output of the construal operations. In Section 2 we will briefly outline the argument by Langacker (1976) for this model of the representation of meaning — a model which still holds for Langacker's theory of cognitive grammar (Langacker 1987).

It should be obvious that a central pillar in the cognitive linguistic approach to meaning is the analysis of conceptualization, that is, the construal operations. There are two more or less comprehensive classifications of construal operations: Langacker's focal adjustments (Langacker 1987: Ch. 3) and Talmy's imaging systems (Talmy 1978, 1988a). Lakoff and Johnson's (1980) theory of metaphor is an example of another major type of linguistic conceptualization that is not discussed directly by either Langacker or Talmy. This gap leads us to re-examine Langacker's and Talmy's classifications of construal operations. For example, Langacker's model of cognitive grammar makes use of other construal operations that he does not include as focal adjustments. In Section 3, we present a more comprehensive inventory and classification of construal operations. One explicit aim of this re-analysis of construal operations is to demonstrate the potentially quite close relationship between construal operations

proposed by linguists and psychological processes proposed by Gestalt psychologists, phenomenologists and cognitive psychologists.

The new classification of construal operations in accordance with psychological and phenomenological analysis reveals an important connection between semantic analysis in linguistics and the phenomenological critique of symbolic artificial intelligence (Dreyfus 1981; 1992). In Section 4, we argue that to a large extent, Dreyfus's critique can be reduced to the assertion that symbolic AI ignores the fact that all semantic (knowledge) representation is experience construed in particular ways for the purpose at hand. The pervasiveness of construal operations in linguistic semantic representation is a special case of Dreyfus's general argument, demonstrating the shortcomings of symbolic AI in natural language analysis.

In the conclusion (Section 5), we revisit the issue of semantic universals and semantic relativity in language.

## 2. The relation between language and thought: A cognitive linguistic view

The heart of Langacker's argument for distinguishing (linguistic) semantic and conceptual representation is this. Two plausible hypotheses have been assumed to be incompatible with each other but are not. One we may call the 'Conceptual Universal Hypothesis' or CUH: "cognition is essentially the same for speakers of all languages" (Langacker 1976: 317). The other is one version of the 'Linguistic Relativity Hypothesis' or LRH: the semantic representations for syntactic constructions of particular languages are largely determined by the syntactic construction and are therefore language-specific. This is of course the cognitive linguistic view that was described in Section 1.

Langacker describes the CUH as "basically a denial of the LRH" (ibid.), but it is really a denial of more extreme variants of the LRH. The essential fallacy is that some have assumed that the CUH implies that linguistic semantic representations must be the same for speakers of all languages. This is the claim that Langacker argues against in his 1976 paper. Semantic representations may be — in fact are, according to Langacker — language-specific. But Langacker argues that the claim that semantic representations are language-specific does not imply that conceptual representations are language-specific, that is, defined by linguistic structure.

How is this possible? Obviously, semantic representation must be distinct

from the putatively universal level of conceptual representation. In particular, Langacker rejects the claim that “semantic structure can, in some unclear but hopefully straightforward way, be related directly to thought and cognition, i.e. the structures manipulated in cognition are essentially the same as the semantic structures underlying sentences” (ibid.). Instead, he argues that linguistic semantic structure is not straightforwardly related to thought and cognition. The semantic structures found in language represent conceptualizations of non-linguistic experience not unlike the processes underlying figurative language such as metaphor and metonymy. In particular, a linguistic semantic structure represents some aspects of a larger experience that it evokes. In discussing an example from Whorf, who compares the English ‘He invites people for a feast’ to its nearest Nootka equivalent, which literally translates into something like ‘He goes for eaters of cooked (food)’ (ibid.: 342–44), Langacker suggests that both could be expressing the same cognitive experience, but employs different semantic structures to express the experience. As Lakoff (1987: 310) puts it, “experience does not *determine* conceptual systems, [it] only *motivates* them.”

The same can be argued for semantically transparent but grammatically conventionalized differences in expressions. Such examples are frequent, even in different dialects. For example, in British English the term *point* is used for what an American would describe with a variety of categorizing terms: *phone point* (*phone jack*), *cash point* (*cash machine, automated teller machine*), *power point* (*electrical plug, power plug*), *checkout point* (*cash register*), *help point* (*help window, help desk*).<sup>1</sup> The British English expressions construe the various entities in the same way, in terms of being a locus or contact point for the entity named by the modifier. In contrast, the American English expressions categorize the entities separately in terms of their distinct structural or functional properties.

In telling time, the British and Americans take a more anticipatory view of the onset of the next hour than their Continental brethren. If an Englishman says *half three*, s/he means 3:30, while a German or Dutch person saying the equivalent means 2:30; it is as if the third hour is already upon them by 2:30. Likewise, an American would say ‘a quarter to three’, with 3:00 still on the way, while a Spaniard would say (*Son*) *las tres menos cuarto* ‘(they are) three less a quarter’, with the third hour already upon him/her. These different conceptualizations appear to involve a different conceptualization of the categorization of a time interval: in the Continental conceptualization, temporal proximity to the hour defines the interval named in the expression, while the Anglo-American conceptualization has the interval begin on the hour and no earlier. The underlying cognition of time is probably the same for all of these speakers, but

they employ a different image in their languages to evoke the same concept.

Of course, the more abstract or the more grammatical the conceptualization is, the more interesting it becomes. A simple example used by Langacker (Langacker 1976: 345) is the expression of physical states: English speakers say ‘I am cold’, whereas French speakers say literally ‘I have cold’ and Modern Hebrew speakers say ‘It is cold to me’. In Langacker’s view, “these expressions differ semantically even though they refer to the same experience, for they employ different images to structure the same basic conceptual content” (Langacker 1987: 47).

Langacker calls semantic structures, here and in later work, *conventional imagery*. The semantic representations in *Foundations of Cognitive Grammar* (Langacker 1987) are intended to describe this conventional imagery, not the presumably universal cognitive representations that these conventional images construe. It is not the case that any time we think, we must conceptualize our experience in the way that our language requires us to. But it is the case that any time we express our thoughts in language, we must conceptualize our experience in the way that our language requires us to.<sup>2</sup> Cognition may be linguistically neutral, but language is not semantically neutral.

### 3. A new model of construal operations

Many of the construal operations found in language have been described by a number of cognitive linguists, in particular by Talmy under the name of *imaging systems* (Talmy 1977, 1978, 1988a, and b), by Lakoff et al. in their studies of figurative language (Lakoff and Johnson 1980; Lakoff 1987; Lakoff and Turner 1989), and by Langacker under the rubric of *focal adjustments* (Langacker 1987: §3.3). However, the full range of construal operations has not been organized in a single overarching system. Talmy and Langacker both offer analyses of a large class of construal operations, but not all of the ones found in the cognitive linguistics literature.

Moreover, if the construal operations are truly cognitive, then they should be related to, or better identical with, general cognitive processes that are postulated by psychologists. We will suggest here that in fact most if not all of these construal operations are special cases of general cognitive processes described in psychology and phenomenology. This position is implicit in the work cited above, but direct reference to psychological or phenomenological concepts is only occasionally made. We will briefly describe Langacker’s focal

adjustments and Talmy's imaging systems, and present a classification of these and other construal operations found in the cognitive linguistics literature that differs from both authors, in order to relate them as closely as possible to the general cognitive processes that they represent.<sup>3</sup>

We begin by presenting Talmy's and Langacker's classification of construal operations in Figure 1, and our suggested classification in Figure 2:

**Table 1.** Two classifications of linguistic construal systems

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Imaging Systems (Talmy 1988a)
I. Structural Schematization
II. Deployment of Perspective
III. Distribution of Attention
IV. Force Dynamics (Talmy 1988b)
Focal Adjustments (Langacker 1987)
I. Selection
II. Perspective
A. Figure/Ground
B. Viewpoint
C. Deixis
D. Subjectivity/Objectivity
III. Abstraction
<i>discussed elsewhere by Langacker:</i>
Summary/Sequential Scanning
Entity/Interconnection
Profiling
<i>not discussed by Langacker or Talmy:</i>
Metaphor (Lakoff and Johnson 1980)

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**Table 2.** Linguistic construal operations as instances of general cognitive processes described in psychology and/or phenomenology

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<b>I. Attention (Saliency)</b>
A. Selection (including metonymy)
B. Scalar Adjustment (Abstraction)
C. Schematization
D. Summary/Sequential Scanning
E. Profiling
<b>II. Judgement (Comparison)</b>
A. Figure/Ground
B. Metaphor
C. Categorization
<b>III. Situatedness (Perspective)</b>
A. Viewpoint (Vantage Point and Orientation)
B. Deixis
C. Common Ground and Empathy
D. Subjectivity/Objectivity
<b>IV. Constitution (Gestalt)</b>
A. Entity/Interconnection
B. Structural Schematization (boundedness, plexity, distribution etc.)
C. Force Dynamics (force, resistance, etc.)

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We wish to emphasise at the outset that the classification in Figure 2 is not intended to be a reduction of construal operations to just four processes. The various construal operations listed under the four headings are all distinct cognitive processes. The analysis we propose is that the various construal operations are manifestations of the four basic cognitive abilities in different realms of our experience. The remainder of this section briefly describes the construal operations under these four headings and justifies their classification in comparison to those of Langacker and Talmy.

### 3.1 Attention

The process of *attention* is a well-known basic phenomenon in cognitive psychology. Attention, or focus of attention, comes in degrees and is usually modeled in terms of degree of activation of conceptual structures in a neural network model of the mind. The phenomenon of attention focuses on the human cognitive ability, but there are also natural properties of phenomena in the perceived world that lend themselves to being attended to by human beings,

and these properties are said to enhance the *salience* of those phenomena to human beings.

The focal adjustment of *selection* is our ability to ignore aspects of our experience that are irrelevant to the purpose at hand. This can be illustrated in cases in which the grammatical context does the selecting, as in ‘*Where is the Sunday Times?* [physical object] vs. *Have you read the Sunday Times?* [semantic content]. Selection can be thought of as the focus of attention to only parts of an experience, e.g. the ‘relevant’ ones. The British versus American English examples of compounds in Section 2 illustrate selection: selection of the fact of contact (the British *point* compounds) versus selection of structural and functional properties of the object (the American compounds).

Langacker separates selection from *abstraction*, but both are instantiations of attention. Abstraction represents our ability to take a coarse-grained versus fine-grained construal of the event; for this reason, we will use instead the term *scalar adjustment* instead of the vaguer term ‘abstraction’. For example, compare the following three sentences:

- (1) a. We drove along the road.  
 b. A squirrel ran across the road.  
 c. The construction workers dug through the road.

In (1a), the road is conceptualized as a line (i.e. one-dimensional); in (1b), as a surface or more precisely a ribbon (i.e. two-dimensional), and in (1c), as a volume (i.e. three-dimensional). These construals are again invited by the grammatical context, since these examples are otherwise out of context. Compare also ‘She ran across/through the field’; this example has imagistic consequences too (thick grass versus mowed field; Talmy 1983:238). These spatial examples clearly show that scalar adjustment is going on: each finer-grained view reveals another spatial dimension, while the coarser-grained views ignore the other dimensions. This is a matter of degree of attention, not perspective as Talmy (1988a:194) suggests.

Langacker also relates scalar adjustment to *schematization*. Schematization — that is, viewing something by means of a more encompassing category — is a sort of ‘qualitative’ scalar adjustment. A word or construction which is vague rather than ambiguous with respect to a semantic property is an example of schematization. For instance, ‘polygon’ is vague as to the number of sides it possesses (ibid.:135). The important point here is that possessing an indeterminate or nonrestrictive property is not the same as lacking the property: polygons have sides, even if the concept of a polygon is indeterminate with respect to that

feature. Again, this is a phenomenon of attention: the concept of a polygon ignores the number of sides to any particular subtype of polygon. Languages also differ in this parameter. For example, English ‘river’ is vague as to whether the natural flowing body of water empties into the sea or not; French *rivière* and *fleuve* are not.<sup>4</sup>

There are two basic construal operations that Langacker does not describe as focal adjustments, but certainly are. One construal operation appears to be related to the stative/dynamic distinction, or some interpretation of it. Langacker distinguishes the two in terms of *summary scanning*, a holistic conceptualization of a scene in its entirety, vs. *sequential scanning*, a scanning of a scene in conceived time, which is not the same as objective time. The summary/sequential scanning distinction is relevant to the semantic distinction underlying basic syntactic categories (noun, verb, adjective). For example, when a verb predicates an action as in ‘Boston Bridge collapsed’, the event is scanned sequentially, over time. In contrast, when the verb is nominalized in a referring expression such as ‘the collapse of Boston Bridge’, the event is construed summarily as a whole unit without being scanned through time, even though the event occurred objectively through an interval of time. Summary scanning is the norm for nouns denoting objects when used as referring expressions, such as ‘the tree’ or ‘the lamp’.

Langacker’s distinction between summary and sequential scanning seems to be closely related to a phenomenon that Talmy calls *fictive motion*, illustrated in example 2:

- (2) The road winds through the valley and then climbs over the high mountains.

The road isn’t actually going anywhere, but it is conceptualized as if it is, and thus appears to be an example of sequential scanning. In fact, Langacker argues that summary/sequential scanning underlies the difference between sentence predication and nonpredicated states of affairs, not the static/dynamic distinction, as in Talmy’s example. For Langacker, ‘The road is in the valley’ involves sequential scanning because it is predicated, but ‘The road winding through the valley’ does not because the (fictive) motion of the road is not predicated.

It appears that there are two different cognitive scanning operations, one providing the static/dynamic construal and the other providing the predication/nonpredication construal. Langacker’s description in terms of mode of scanning clearly implies a difference in cognitive processing that cannot be reduced to any of the focal adjustments he describes. However, scanning probably should be included under attention. While selection, scalar adjustment and

schematization represent the static character of attention at any given moment, scanning represents its dynamic employment by the mind.

Langacker identifies another fundamental aspect of conceptual semantic structure that should be subsumed under attention. He argues that the meanings of terms do not exist autonomously but are what he calls *profiles* against a *base* semantic structure, or *domain* (Langacker 1987: 183–89). Adapting one of his examples: the concept RADIUS can only be understood against the base semantic domain of a CIRCLE, that is, our understanding of the concept RADIUS presupposes our understanding of CIRCLE. Likewise, the concept UNCLE can only be understood against (presupposes our understanding of) the base semantic domain of KINSHIP, that is, the kinship network. Langacker’s arguments represent a basic insight found across the cognitive sciences, including Searle’s notion of background knowledge for literal meaning, Fillmore’s notion of a semantic frame for meaning (Fillmore 1982, 1985, *inter alia*), Lakoff’s idealized cognitive model (Lakoff 1987) and the artificial intelligence concepts of frames (Minsky 1981), scripts (Schank and Abelson 1977) and schemas (Rumelhart 1975).

In the above examples, the base domain is a more or less static structure and the concept in question profiles a part of the structure; but the base domain may also be dynamic. For example, the concept PURIFIED profiles a resulting state which can only be understood against the base domain of a complex event sequence of purification involving an external cause, a process and the profiled resulting state. And the concept SCISSORS profiles a thing against the base domain which involves intended events, namely the cutting function of scissors.

Langacker also notes that the base or frame itself can function as a profile. CIRCLE is itself a concept which is profiled against the base domain/frame of (two-dimensional) SPACE. This fact demonstrates that profiling is a construal operation, that is, a conceptualization that is a matter of choice by a speaker. Langacker discusses several possibilities for what sort of focal adjustment profiling is, and tentatively concludes that it is an attentional phenomenon (that is, level of activation; *ibid.*: 188): it is a matter of degree, and represents what the speaker and addressee are focusing on in a linguistic expression. We concur with this conclusion, and adopt it here.

### 3.2 Judgement (comparison)

Kant describes *judgement*, which he considers a fundamental cognitive faculty, as a particular kind of *comparison*: “judgement in general is the faculty of

thinking the particular as contained under the universal” (Kant 1790/1952: 18). Husserl, generalizing over the Western philosophical tradition from Aristotle, gives judgement the more general meaning of a comparison between two entities: “the most general characteristic of the predicative judgement is that *it has two members*: a ‘substrate’ (*hypokeimenon*), about which something is affirmed, and that which is affirmed of it (*katégoroumenon*)” (Husserl 1948/1973: 14, emphasis in the original). Thus we may link the fundamental philosophical concept of judgement to the cognitive psychological process of comparison.

A linguistically important type of comparison is *figure/ground* alignment. Figure/ground alignment appears to be strongly determined by objective properties of the scene, although they can be overridden in various ways. The figure/ground terminology is derived from Gestalt psychology, but Langacker’s immediate intellectual predecessor is Talmy (Talmy 1983 is the most recent detailed discussion on this topic). Talmy used the figure/ground relation to account for the expression of spatial relations in natural language. The figure and ground are asymmetrical, as suggested by the following contrast (Talmy 1983:231):

- (3) a. The bike is near the house.  
b. ?The house is near the bike.

Talmy identifies the following “objective” properties that distinguish figure and ground, in the narrower meaning of spatial relations:

Figure	Ground
location less known	location more known
smaller	larger
more mobile	more stationary
structurally simpler	structurally more complex
more salient	more backgrounded
more recently in awareness	earlier on scene/in memory

Figure 3. Properties that influence figure/ground choice (from Talmy 1983: 230–31)

Langacker subsumes under perspective (see Section 3.3 below) figure/ground asymmetry, but it is quite distinct from the others. The figure/ground asymmetry actually has little to do with perspective. In fact, Langacker himself gives an argument to show that figure/ground alignment is conceptually independent of

foreground-background perspective (see Section 3.3 below). Langacker also argues that figure/ground is conceptually distinct from focus of attention, which suggests that the figure/ground distinction does not belong under the general category of attention either (contra Talmy 1988a: 195). Langacker also explicitly relates his notion of figure/ground to comparison, arguing that the typical figure/ground alignment falls out of his model of comparison as cognitive events of scanning a scene (Langacker 1987: 121–22). Comparison, which Langacker describes as a fundamental cognitive property, appears in many other parts of his cognitive model of language (see the index entry in Langacker 1987: 506–7). Figure/ground is most appropriately subsumed under the philosophical notion of judgement, that is, an act of comparison that leads to an evaluation (e.g. assigning an entity to a particular category).

It is likely that another fundamental construal operation, *metaphor*, is an instantiation of judgement or comparison. Metaphor involves a relationship between a source domain, the source of the literal meaning of the metaphorical expression, and a target domain, the domain of the experience actually being described by the metaphor. There is some debate in linguistic circles (probably a variant of similar debates in literary and philosophical circles) as to the exact relationship between the two domains: what concepts can be mapped, what to do with incompatibilities between the domains, whether the relationship itself is a mapping in the mathematical sense (as advocated by Lakoff and Johnson 1980 and Lakoff and Turner 1989), some sort of superimposition of one domain on the other (as suggested by Jackendoff and Aaron's (1991) review of the latter book), or a blending of domains/spaces (Fauconnier and Turner 1994, 1996). It seems clear that however the metaphorical relationship is established, a relationship of comparison or judgement is involved between the source and target domains. Likewise, it seems clear that metaphorical relations are pervasive in linguistic imagery. For example, the example of 'I have cold' mentioned in Section 2 probably represents an interpretation of a physiological state as the metaphorical possession of a physical object (or perhaps a body part) by a person. Another pervasive metaphor is that between size and verticality (*MORE IS UP, LESS IS DOWN*), as in 'the stock market rose/is high/fell', 'a large salary', 'a small increase in inflation', etc. (Lakoff and Johnson 1980: 15–16).

Finally, the very act of *categorization* involved in applying a word, morpheme or construction to a particular experience involves comparison of the experience in question to prior experiences and judging it to belong to the class of prior experiences to which the linguistic expression has been applied. Categorizing something is clearly a construal operation since an experience can

be categorized in different ways; compare for instance 'the 1987 stock market correction' to 'the 1987 stock market crash'. The involvement of construal in categorization is also evident in marginal members of a category, such as 'beanbag chair', 'genetic mother' and 'school holiday'. In these examples, the difficulties in judging the entity in question as a member of the category is manifested in the special noun-noun compounds coined for these experiences (cf. Lakoff 1987: 83). The flexibility of categorization in actual usage is illustrated in this statement by the pilot of the airplane which brought the first author to the conference where this paper was presented. Upon entering a holding pattern over Milan airport, the pilot said "We'll be on the path they call a racetrack; that's essentially a circle with two straight sides" — a significant reconceptualization of the category *CIRCLE*.

We have focused on categorization as a cognitive process, where some new experience is categorized in comparison with past experiences and linguistically expressed accordingly. This judgement/comparison aspect of categorization often goes under the name of *prototype-extension*, particularly in the case of a new instance (the extension) which is not clearly subsumed under the old (the prototype). Langacker describes the comparison process between the current instance and the category to which it is assigned as *sanction* (1987: 66–71): full sanction is "unproblematic" subsumption of the new instance and partial sanction is an extension from the prototype. Lakoff's *radial category* (1987: 91) is a description of conventionally established patterns of prototypes and extensions. The 'beanbag chair', etc., examples in the preceding paragraph are examples of the prototype-extension pattern.

Other analyses of categorization focus on the prior cognitive structure, the category definition under which the new instance is subsumed. This aspect of categorization is assumed to involve a schema, that is, semantic features which form necessary and sufficient conditions (or often just necessary conditions) for category membership. Schematization is an attentional phenomenon, as we argued in Section 3.1 following Langacker: the necessary and sufficient conditions are attended to, and other properties are ignored. Even the process of categorizing a new experience involves attention as well as comparison: in comparing the new experience to prior ones, we attend to some characteristics and ignore others. Hence it may be better to describe categorization as involving both comparison and attention.



### 3.3 Situatedness

Viewpoint, deixis and subjectivity are quite different from figure/ground. All of these construal effects result from the relation between the conscious subject and his/her object of experience, i.e. what they are looking at, referring to and/or conceiving of at the time. In other words, they are most purely manifestations of our *situatedness* in the world in a particular location — where location must be construed broadly to include temporal, epistemic and cultural context as well as spatial location. This broad interpretation of location is certainly closely related to what Heidegger calls Being-in-the-world. Heidegger argues that Being-in-the-world is more than simple spatial inclusion; rather, it is the fundamental situatedness of existence in all respects (Heidegger 1927/1962:79–80; cf. Dreyfus 1991:40–5).

*Vantage point* and *orientation*, which give rise to foreground/background relations, indicate the perspective taken by the speaker most literally, that is, spatially. Vantage point can be illustrated with spatial prepositions such as *in front of/behind*<sup>5</sup> or *across*: the choice of the preposition depends on where the speaker is located relative to the object being situated. The foreground/background relations differs from the figure/ground relation, which is a property of objects having to do with the mental process of comparison, and from attention, which is a different kind of mental process entirely, one under more subjective control than foreground/background (assuming a fixed vantage point and orientation). Langacker uses clear spatial examples (e.g. *in front of/behind*) to illustrate foreground/background, but the terms have also been applied to the function of certain grammatical constructions in discourse, and the same concept, not just a metaphor, is intended.<sup>6</sup>

*Deixis* is the phenomenon of using elements of the subject's situatedness — more specifically, the subject *qua* speaker in a speech event — to designate something in the semantic structure of an expression. This shift from the subject as a solitary perceiving individual to the subject as the central entity in the speech event is only apparent; these two facets of our situatedness in the world are both always present in language. Construal of vantage point and orientation involves the speaker relating to the hearer as well; the speaker must coordinate his/her viewpoint with that of the hearer.

Again, the spatiotemporal notion of deixis is argued to be only a single example of a general construal operation. Langacker describes the set of beliefs taken as the *common ground* (Clark 1993) as an instance of epistemic deixis (what Langacker calls the *epistemic ground*). As Clark points out in many

different contexts, what we choose to express in utterances is determined to a great extent by what we assume is or is not part of the common ground; the common ground provides us with an epistemic perspective situating the speaker and the hearer. Kuno and Kaburaki's (1977) concept of *empathy*, which they argue is involved in the semantics of a number of grammatical constructions, is another instance of deixis of the operation of situatedness beyond physical spatial and temporal location. For example, the choice of describing Bill as 'John's brother' instead of 'Bill' implies empathizing more with John than Bill. Likewise, choosing the passive 'Bill was hit by John' implies empathy with the subject referent, namely Bill. Hence, the oddity of 'Then John's brother was hit by him' is due to using a description of Bill which implies empathy with John combined with a grammatical voice which implies empathy with Bill (Kuno 1987:203–6).

Some linguists have argued that the distinction between the grammatical relations of subject and object is one of deixis or empathy. DeLancey (1981), in his analysis of split ergativity and subjecthood, argues that the unmarked subject category involves construing the orientation of the speaker towards the temporal and causal beginning of the event. On the other hand, Langacker (1991) defines subjecthood in terms of the most prominent figure, which combines the construal operations of attention (most prominent) and judgement (figure). Whatever is the correct analysis — and it is possible that different languages use different construals for subjecthood — they lead to the differences in the conceptualization of the experiencer in the linguistic expressions for bodily states illustrated by the examples 'I am cold' versus 'It is cold to me' given in Section 2.

Finally, *subjectivity/objectivity* in Langacker's sense refers to how one conceptualizes a scene including the subject herself/himself. That this is a matter of some choice (and hence construal) on the part of the speaker is demonstrated by the following examples (from Langacker 1987:131–2):

- (3) Don't lie to your mother! [said by mother to child; cf. *Don't lie to me!*]
- (4) That's me in the top row. [said when examining a photograph]

The first example represents objectification, a displacement of the speaker's perspective so as to allow a non-deictic objectifying expression (*your mother*) to refer to the speaker. The second example represents the opposite process of subjectification, where something that is not the speaker, namely the image in the photograph, is described using a deictic expression (*me*), as is in fact common in so-called picture noun contexts. Langacker argues that many



grammatical expression, and also the process of grammaticalization in language change, crucially involves shifts in subjectification (Langacker 1985, 1990).

### 3.4 Constitution

In the physical sensation example referred to in Section 2, a difference not yet discussed is that between ‘cold’ as an adjective in ‘I am cold’ and ‘cold’ as a noun in ‘I have cold’. A number of linguists, including Langacker, Bolinger, Wierzbicka and Croft, have argued that even the major syntactic categories represent a conceptualization of experience which differs depending on the syntactic category of the word. We will focus here on the difference between nouns and adjectives as described by Wierzbicka (1986) and Bolinger (1967). Wierzbicka and Bolinger argue that adjectives construe a concept as a unidimensional property which is only a single feature of a person or thing, while nouns construe the same concept as a multidimensional Gestalt that defines or categorizes the person or thing in question. Wierzbicka compares the adjective ‘blond’, which simply describes one feature of a person, namely their hair color, to the noun ‘a blond’, which categorizes someone as possessing a whole constellation of features or connotations as they are called (and is moreover restricted to women in this use).

Langacker argues that there are two properties that are necessary for distinguishing nouns, verbs and adjectives as conceptualizations of experience. One property is sequential versus summary scanning; this distinguishes verbs from the others. We have already argued in Section 3.1 that this is a construal operation having to do with attention. The other property is *relationality*. A relational concept inherently implies the existence (that is, the concomitant activation) of another, participating concept. For example, the adjective *round* implies the existence of a thing which is round. A non-relational concept does not imply the existence of another participating concept, e.g., the noun ‘circle’. Adjectives are relational; nouns are not (verbs are always relational as well as involving sequential scanning). Langacker’s definition of relationality rests on his definition of nounhood (*things* in his terminology). He argues that nounhood construes a concept as a region or “set of interconnected entities” (Langacker 1987: 198); entities are non-relational. However, when contrasting nounhood with adjectivehood, he describes a relational concept as profiling the interconnections between entities while a noun profiles the entities that are interconnected (ibid.: 216). For example, one can think of the (non-relational) noun ‘circle’ as profiling the points (entities) that make up the circle, while the

(relational) adjective ‘round’ profiles the interconnections which define the circle’s curvature.

Langacker’s definition of relational versus nonrelational suggests that a region is really a better definition of a concept than of nounhood. A verb or adjective such as ‘round’ involves a region also; but they profile the interconnections instead of the entities. Moreover, Langacker’s example of ‘circle’ versus ‘round’ also reveals that entity and interconnection are not givens, but instead involve conceptualization. The noun ‘roundness’ does not profile the points/entities making up a round thing; it does not mean the same thing as ‘circle’, or even ‘round object’. Instead, it construes the shape as an entity, rather than as interconnections as the adjective ‘round’ does. Langacker notes that anything can be construed as an entity, including interconnections (ibid.: 198). Conversely, one might argue that a predicate nominal construction like ‘be a circle’ — which in many other languages is simply the word ‘circle’ inflected more or less like a verbal predicate — construes the set of entities as an interconnection, namely the relation of being an instance of the type defined by the noun (cf. Croft 1991: 69–70).

Is there any psychological or phenomenological process to which the entity/interconnection conceptualization can be assigned? We believe that it represents the most basic level of *constituting* experience and giving it structure or a *Gestalt* that is discussed by both Gestalt psychologists (Koffka 1935; Wertheimer 1923/1950) and phenomenologists such as Husserl (who uses the term ‘constitution’ in a similar context, cf. Husserl 1948/1973). For example, many of the principles of Gestalt psychology such as proximity, bounding and good continuation are accounts of how human minds construe a single complex object from seemingly fragmented perceptual sensations. (The figure/ground distinction discussed in Section 3.2 is only one aspect of the Gestalt analysis of perception.) We have devoted several paragraphs to discussing this conceptualization because it is the foundation for more elaborate construal operations that have been discussed in some detail by Talmy. Two of the imaging systems that Talmy describes, structural schematization (discussed in detail in Talmy 1988a) and force dynamics (Talmy 1988b), represent more complex structures of experience that presuppose the analysis of experience into parts that are entities or interconnections.

*Structural schematization* involves the individuation and topological and meronomic structure of entities and their component parts. That this is a matter of construal is found for example in the choice of a count noun, mass noun or *pluralia tantum* form for the conventionalized image or construal of

certain objects in different languages. Wierzbicka (1985) provides numerous very interesting examples of the grammatical and conceptual differences among nouns that differ in countability.

Structural schematization interacts with the conceptual processes described above, in particular attention. For instance, Wierzbicka compares Polish *widly* ‘garden fork’, *grabie* ‘rake’, and other *pluralia tanta* to their singular English counterparts, noting that the object itself lends itself either to the English countable conceptualization (because it is an individuatable object) or to the Polish *pluralia tanta* conceptualization (because they are ‘objects with several similar and symmetrically arranged parts’ (Wierzbicka 1985:332)). Either conceptualization involves selective attention to those respective properties of rakes and garden forks. The difference in construal between ‘straw’ (a mass) and ‘a straw’ (an individuatable unit) in English can be characterized as a difference in scalar adjustment (attention): the count noun is a more fine-grained conceptualization of the experience than the mass noun. A more abstract scalar adjustment — that is, one not based largely on visual scale — is the difference between ‘a chair’ and ‘furniture’. The mass noun represents not only a scalar adjustment in terms of multiple individual pieces of furniture, but also a coarser-grained adjustment in schematization so that different types of furniture (chairs, tables, sofas, etc.) are subsumed under a single concept. The same is true of dynamic interconnections among entities. The stative expression ‘Harry is a fool’ describes a general property of Harry that abstracts away from individual instances of foolish behaviour on Harry’s part; the dynamic expression ‘Harry is being a fool’ or ‘Harry was a fool again last night’ provides a finer-grained focus of attention that can individuate particular instances of Harry’s behaviour.

Talmy’s *force dynamic* model of events (a generalization of causation) demonstrates how processes can be conceptualized as involving different kinds of forces acting in different ways upon the participants of the event. In Croft (1991, 1997), following Talmy 1976 and 1988b, it is argued that the force-dynamic structure of events largely determines the encoding of subject, object and oblique arguments of predicates. For instance the choice of ‘for’ in ‘I baked brownies for Mary’ versus ‘with’ in ‘I beat the eggs with a fork’ is determined by the fact that Mary is the endpoint, the benefactor of the baking event, while the fork acts upon the eggs and is therefore an intermediate participant in the force-dynamic chain. Different choices of verbs, or different voice forms, or different argument-linking constructions, express different conceptualizations of the force-dynamic structure of the event. For example, ‘The bowl was on the table’

construes the event as having little force-dynamic value (being a static situation), but ‘The bowl stayed on the table’ construes the event of having a force-dynamic value of resisting the effects of some (unspecified) force-applying process.

#### 4. Construal operations and the phenomenological critique of artificial intelligence

The construal operations that link linguistic semantic structure to cognitive structure are actually manifestations of general construal operations that have been studied in cognitive psychology and phenomenology. A linguistic semantic structure is itself a relation between a cognitive experience and the conceptualization(s) implied by its syntactic structure. The construal operations depend on the position that human involvement in a situation and context is involved in structuring language. Construal operations all interact with each other. For example, in applying a metaphor the comparison made depends on which features of an experience are relevant and salient, i.e. on attention. In any use of language a huge number of construal operations are applied. In selecting what to encode and how, processes from all four of the major operations — attention, judgement, perspective and constitution — are involved. What is relevant for the speaker in the situation and what linguistic structures the language provides together determine the ultimate semantic structure. The use of language is an active process; a speaker applies structures available in language according to his/her current purpose and assessment of the situation.

The conclusions reached by cognitive linguists regarding the construal operations presuppose a view of the relation between cognition and human action and situatedness in the world which is closely related to phenomenology. Dreyfus (1981 and 1992) presents a critique of symbolic artificial intelligence (AI) based on evidence from human intelligent behaviour, which closely mirrors and supports the cognitive linguistic viewpoint. We argue here that Dreyfus’s critique draws largely on the necessity and pervasiveness of construal operations in cognition.

The underlying philosophical assumption of symbolic AI is that understanding and reason involve the manipulation of a huge number of facts about the world, as represented by objective, context-free symbols. In this view, symbols have meaning due to their relation to the world. This meaning is therefore independent of human involvement. Various statements of this position have been made in philosophy (Dreyfus terms it *representationalism*;

Dreyfus 1992:xvii) and psychology. Köhler (1929) describes this as *machine theory*: the idea that our perceptual representations are the product of a collection of context-free parts straightforwardly combined, with no reference to properties of the whole. Symbols with constant values are combined to produce a representation of the world. If correct, this Cartesian view of reason would permit disembodied intelligence and the possibility that all human knowledge could be specified along with rules for manipulating it.

Gestalt psychologists have presented a wide range of evidence, specifically on visual perception, opposing machine theory as a plausible description of the way basic experience is structured (Köhler 1929) and emphasising that the properties of a whole affect the meaning or properties of its parts. Dreyfus's phenomenological critique of symbolic AI examines the assumptions of objectivist philosophy in symbolic AI research and the problems this approach has come up against. The critique draws on characteristics of human behaviour and reason to suggest that these problems are insoluble and to propose an alternative view of intelligence. This alternative view critically rests on the pervasiveness of conceptualization in human cognition.

Basic problems which have arisen, and which research in the symbolic AI paradigm has tried to resolve, involve the representation and use of background knowledge. It is clear that the human ability to understand and communicate depends on a huge range of background knowledge about the way the world works. In order to produce artificial intelligence (for example the ability to understand natural language), this knowledge must be made explicit and represented in symbolic form. However, attempts to carry out this task have been largely unsuccessful up to now.

Dreyfus proposes reasons for this failure based on the way in which humans appear to be able to use and acquire background knowledge. An essential difference between human intelligence and any symbolic program is the interaction of humans in the world. Much knowledge is, Dreyfus argues, in fact "know-how" (Dreyfus 1992:xi). We learn to deal with the world through our physical situatedness in it (see Section 3.3 above) and our interaction with it. Is there a reason to suppose that the skills developed in this way can somehow be symbolically represented? Dreyfus (1981:191) suggests there is no justification for the assumption that "all human practice and know-how is represented in the mind as a system of beliefs constructed from context-free primitives and facts" on which attempts to represent background knowledge are based.

The other problem encountered in the representation of background knowledge is that of relevance. If knowledge is represented in the form of

context-free facts and humans have a huge quantity of knowledge at their disposal, how is this knowledge organized and used in order to bring relevant information to bear in a situation? Facts do not have context-free relevance. How do humans attend to relevant knowledge in any situation, make relevant comparisons in order to categorize situations and use knowledge of similar situations to deal with the present one, and how can these abilities be represented in terms of context-free symbols? How is it possible to account for the human ability to extend understanding on the basis of our current knowledge, to relate our current situation to relevant aspects of past situations in order to make deductions, and to form expectations of the development of a situation based on an awareness of the regularities of the world?

Dreyfus (1992:xxi) describes the difficulties in accounting for these abilities by means of the manipulation of context-free symbols. For humans, determining what knowledge is relevant in a specific situation becomes easier as more information about the situation is available. However, for a computer relying on context-free facts and rules, any increase in information increases the number of facts which must be searched through in order first to categorize the situation and then to retrieve any facts which could be relevant based on this categorization. An increase in the knowledge base of a program therefore increases the time taken to search through the listed facts. Given the vast quantity of knowledge humans have about the world, symbolic representation models of intelligence seem implausible in this respect.

But an even greater problem than working out which facts are relevant is categorizing a situation in the first place (cf. Section 3.2 above). This in itself requires knowledge of which features of a situation are relevant to its categorization, since more than one categorization is possible of the same factual situation. Dreyfus cites an example from Bobrow and Winograd:

A single object or event can be described with respect to several prototypes, with further specifications from the perspective of each. The fact that last week *Rusty flew to San Francisco* would be expressed by describing the event as a typical instance of *Travel* with the mode specified as *Airplane*, destination *San Francisco*, etc. It might also be described as a *Visit* with the actor being *Rusty*, the friends a particular group of people, the interaction warm, etc. (Bobrow and Winograd 1977:8, cited in Dreyfus 1981:195)

As Dreyfus points out, "etc. covers what might, without predigestion for a specific purpose, be a hopeless proliferation". (ibid.)

Thus some other explanation is needed for the way in which humans deal with situations as they arise. Dreyfus suggests humans have a sense of *holistic*

*relevance* (1992: xi) as a result of involvement and interaction in the world, and that the nature of meaning and reason are dependent on this. Humans have purposes and goals which direct activity in any situation. The symbol-manipulation model of intelligence implies that purposeful behaviour involves working out an explicit plan based on specified rules governing a domain. However, Dreyfus suggests that “when a person has enough experience to make him or her an expert in any domain, the field of experience becomes structured so that one directly experiences which events and things are relevant and how they are relevant” (1992: xxviii).

How is holistic relevance manifested in human actions and behaviour? In his critique, Dreyfus identifies features of human behaviour and particularly of natural language understanding which suggest that the problems above may not be solvable. The characteristics of behaviour he examines support a view of human action and reason which is similar in many ways to the view supposed by cognitive linguists as a foundation for the construal operations. Examples he uses can be compared directly as instantiations of the same cognitive construal operations described above.

Relevance can be related to the construal operation of attention. Humans in an everyday situation do not actively consider the sum of experience at any one time. The selection of what aspects of experience are to be encoded in language is just one manifestation of the selectiveness of our attention in any domain. Given a mass of stimulus information, we are unable to consider all of it actively at any one time, and this is also unnecessary. We deal with the subset of our experience which is most relevant in a situation at a given time. Dreyfus gives as an example the straightforward experience of entering a room:

We know but do not appeal to the sort of facts that can be included in a room frame [...] Instead, our feeling for how rooms normally behave [...] gives us a sense of relevance. We are skilled at not coping with the dust, unless we are janitors, and not paying attention to whether the windows are open or closed, unless it is hot [...] Our expertise in dealing with rooms determines from moment to moment what we cope with by using and what we cope with by ignoring (while being ready to use it should the appropriate occasion arise). This global familiarity maps our past experience of the room onto our current activity, so that what is appropriate on each occasion is experienced as perceptually salient or simply elicits what needs to be done. (Dreyfus 1992: xxviii–xxix)

Our experience of the world depends on past experience and our understanding of the current situation, both of which determine what is relevant at any moment. This enables us to deal with the subset of experience which is significant

for the purpose at hand. Attention is therefore not something which is representable in terms of rules about a situation and what behaviour is appropriate, but is dependent on our sense of situation and goals, and our active involvement in the world.

Relevance can also be linked to the construal operation of judgement or comparison. Comparison may be made between two aspects of a situation (as in figure/ground construal), or between an experience and prior experiences which are judged to be similar. But an infinite number of similarities between experiences may be found. The example given above from Bobrow and Winograd highlights this problem in categorization. Without human situatedness and goals, what basis is there for preferring any one categorization or comparison over any other? If all knowledge is represented and stored as a set of facts, then in order to make judgements there must be some way of determining which facts are relevant to a comparison, and some finite set of standards to judge them against (Dreyfus 1981: 195). Categorizing an entity in terms of finitely representable knowledge requires a necessary and sufficient list of features defining the category’s membership. However, as Dreyfus points out, “the significance of any fact, indeed what counts as a fact, always depends on context” (*ibid.*: 196); and

Everything is similar to everything else in an indefinitely large number of ways. Why should we suppose that any two items should be compared? Even if two frames have many slots in common, why should we think these are the important similarities? (Dreyfus 1992: xxvi)

Searle discusses the same problem with regard to metaphors: “there are whole classes of metaphors that function without any underlying principles of similarity [...] I don’t know any better way to describe these abilities than to say that they are nonrepresentational capacities” (Searle 1983: 95–96, cited in Dreyfus 1992: xxvi–xxvii).

Lakoff and Johnson (1980) in their work on metaphor, and Lakoff (1987) in his work on categorization, emphasise the links between construal operations in language and human behaviour and physical situatedness. Lakoff and Johnson discuss the relationship between metaphor and way we act in the world, suggesting the pervasiveness of metaphorical structuring in our everyday lives. They claim that not only language but human thought processes in general rely on metaphorical structuring: “our concepts structure what we perceive, how we get around in the world, and how we relate to other people” (Lakoff and Johnson 1980: 3). This view matches that of Dreyfus’s critique. Processes such as metaphor and categorization are motivated by experience.

Lakoff and Johnson suggest that the basis for these processes is bodily experience, i.e. that language and cognition are inherently situated and related to the nature of human action in the world.

Another approach referred to by Dreyfus as an alternative to the rationalist view of comparison describes analogy “in terms of extrapolation of a style” (Dreyfus 1992:xxiv). But whether based in bodily experience or extrapolation of a style, judgement is based on acquired understanding of what is relevant or appropriate. This general pattern applies both to physical experience and to social understanding. Dreyfus uses the example of gift-giving (ibid.:xxii), the practice of which depends on participation in a culture and its practices. The assessment of what constitutes an appropriate gift seems better described as a skill, requiring know-how rather than following facts or rules. The appropriateness of a gift varies according to situation, but members of a culture respond to a situation appropriately due to their participation in and experience of the same norms and values, without recourse to explicit rules governing the giving and receiving of gifts.

Equally in the everyday physical world, Dreyfus suggests that we simply learn by experience how things behave and how we can interact with them with no need of context-free facts or rules to account for our understanding. Dreyfus proposes an essential distinction between ‘knowing-how’ and ‘knowing-that’ (Dreyfus 1992:xviii). Symbolic AI can only ever represent ‘knowing-that’ and hence according to Dreyfus cannot produce intelligent behaviour. Intelligence must necessarily be situated in order to make judgements in the way humans can, with their “somatic and stylistic background sensitivities” (ibid.:xxix); “The hope that these background conditions can be analyzed in terms of the features whose isolation and recognition they make possible is, on the face of it, implausible” (ibid.). Dreyfus gives examples of this implicit situatedness in language use, for example in interpreting pronoun reference in the example ‘Mary saw a dog in the window. She wanted it’:

[Determining whether the referent of ‘it’ is the dog or the window] seems to appeal to our ability to imagine how we would feel in the situation, rather than requiring us to consult *facts* about dogs and windows and how a typical human being would react. It also draws on know-how for getting around in the world, such as how to get closer to something on the other side of a barrier [...] We need to be able to imagine feeling and doing things in order to organize the knowledge we need to understand typical sentences. (Dreyfus 1992:xix)

The essential role of situatedness and involvement in the world in such an example can be related to the construal operations classified under the heading

of situatedness. The type of human physical, emotional and cultural experience required to interpret the above example is also central to the use and understanding of forms which explicitly encode the relation of a speaker and/or hearer to the description of an event. In the use of deictic forms, the scene is located with respect to speaker or hearer and is thus fundamentally dependent on human situatedness. In foreground/background distinctions, the speaker’s position in the world determines how things are perceived in relation to each other. A communicative act is relevant to its participants and their respective situations, and experience is frequently overtly construed in terms of these relations.

This dependence on situatedness is not only involved in linguistic construal, but in conceptualization in general. Dreyfus notes that

in our everyday coping we experience ourselves not as subjects with mental representation over against objects with fixed properties, but rather as absorbed in our current situation, responding directly to its demands [...] Thus, to take a Heideggerian example, I experience a hammer I am using not as an object with properties but as in-order-to-drive-in-the-nail.  
(Dreyfus 1992:xxxix)

Our interaction with the world and experience of objects around us is dependent on their relation to us, and construals involving situatedness are one manifestation of this dependence. Purely objective representations entirely overlook the fact that humans cannot be objective in their view of and understanding of the world, since they are necessarily situated within it and thus have a particular perspective on it, physically and culturally. Dreyfus’s gift-giving example of extrapolation of a style is an effect of cultural situatedness. Explicit encoding of the subject’s relation to the world in construal operations such as deixis is one reflex of our unavoidable situatedness.

As the results of both Gestalt psychology and cognitive linguistics emphasise, even the basic division of experience into substances and objects, states and processes, causes and effects, and even entities and relations is not fixed. Dreyfus’s critique opposes the representationalist attempt to construct a database ontology to account for all human knowledge in terms of context-free symbols which have meaning in their relation to the world and its objective properties. However, if the same objective experience or stimulus can be structured as different entities or relations in different contexts, there is no straightforward correspondence of symbol-to-world. The basic entities of which the world consists therefore cannot be established in the first place as a finite list

of context-free symbols. Compositional, symbolic views of reason and representation cannot succeed in accounting for human intelligence. The constitution of a scene by a human subject depends on context, the interaction of prior knowledge and expectations and the subject's assessment of the current situation. These factors determine what is relevant, as in the entity/interconnection distinction described above, in which alternative construals are possible given the same objective stimulus.

Phenomenology, Gestalt psychology and cognitive linguistics all provide accounts of the problems in the objectivist view of structure in cognition, and thus the difficulties faced in symbolic AI. Construal of experience, whether in perception, language or any other cognitive domain, depends on human action and situatedness in the world. The structure of conceptual representation is determined by the entire context of an experience, a subject's prior knowledge and assessment of the current situation. Any attempt to reproduce human reason or intelligence symbolically can at best approximate a limited set of circumstances and possible responses. However, without the ability to interact with the world in a human manner, any deviation from a prototypical case cannot be responded to. Due to their ongoing sense of situatedness and constant assessment of the context and what is relevant to the goals and circumstances, humans are able to deal with deviations from the prototypical, to retrieve relevant information, make relevant comparisons: "our everyday coping skills and the global familiarity they produce determine what counts as the facts and the relevance of all facts" (Dreyfus 1992:xxix).

The construal operations analysed in cognitive linguistics, which describe the types of structure we impose on conceptual content in language, clearly support the same view of cognition as the phenomenological view, and account for the failures of symbolic AI in creating programs which can use and understand the most simple examples of natural language. The analyses in cognitive linguistics and phenomenology thus support each other, contrary to traditional views of reason and natural language semantics in AI.

## 5. Conclusion

The analysis of construal operations and their role in human cognition implies two general conclusions. First, the construal operations are universal. That is, they underlie the cognitive processes of conceptualization for speakers of all languages. The fact that construal operations can be understood as instances of

general cognitive abilities described by psychologists and philosophers strongly suggests that they are fundamental human mental abilities. Lakoff suggests that "people share a general conceptualizing capacity regardless of what difference they may have in conceptual systems" (Lakoff 1987:311).

What, then, is language-specific about semantic structures? It is the combination of a particular sort of conceptualization, embodied in a particular lexical category or grammatical construction, with the particular class of human experiences which the category/construction encodes. This certainly varies across languages, as can be seen in any cross-linguistic survey. However, it also varies in a single language. Any language has many alternative ways of encoding the same experience (Lakoff 1987:306). A simple universalist hypothesis such as the Conceptual Universal Hypothesis is invalid as a model of linguistic semantics, since languages — even a single language — do encode the same experiences in different ways. But as cross-linguistic typological research demonstrates, the variation in the linguistic encoding of experience is patterned, certain encodings being common for particular classes of experience and others being rarer. Many alternative conceptualizations are unattested, being either impossible or highly dispreferred, which suggests that human beings across cultures do converge on certain conceptualizations of particular experiences. It is the range of variation in semantic structures — that is, conceptualizations of experience found in grammatical constructions — that manifest semantic universals, not any particular conceptualization of any particular experience.

Second, the same construal operations are found in other cognitive processes where linguistic behaviour is not involved, since they appear to be manifestations of basic properties of attention, judgement, situatedness, and the constitution of experience. It is highly unlikely that attention, etc., do not play a role in other aspects of human cognitive behaviour. In fact, many of the construal operations discussed in Section 3 were developed in psychology to account for phenomena in visual perception. Langacker and Talmy in particular were strongly influenced by the psychology of visual perception in their analyses of construal operations (Langacker previously called his theory of cognitive grammar 'space grammar'). Lakoff's work on metaphors and categorization is clearly oriented towards conceptual systems in general, not just language. The thrust of Section 3 was to argue that the construal operations in language and other cognitive modalities are basically the same. This conclusion is strongly supported by phenomenology and its critique of the symbolic AI paradigm of human cognition, as discussed in Section 4 above.

What, then, is the relationship between semantic representations and conceptual representations, that is, the conceptual structures that are used in non-linguistic cognitive modalities? The two are not identical. There is no reason *a priori* to expect a particular human experience to be conceptualized in the same way in language and outside of it, inside a single speech community or even inside a single individual. After all, linguistic constructions and their corresponding semantic structures are social conventions and cultural artifacts, unique and distinct from other culturally-transmitted conceptual structures (compare Clark's (1996) description of cultural conventions). But non-linguistic cognition, even perception, involves conceptualization as much as linguistic cognition does (see footnote 2). Different though they may be, linguistic and non-linguistic cognitive representations are essentially built in the same way, using the same conceptualizing capacities, out of the same font of human experience.

## CHAPTER 5

### Saliency phenomena in the lexicon

#### A typology

Dirk Geeraerts

As essentially an analysis of the various types of saliency, this essay develops an original notion of structure as constituted by the interplay between the semantic and the pragmatic perspectives. The distinction drawn by the author between semasiology and onomasiology clarifies the difference between an analysis of saliency conducted on the basis of words and one conducted on the basis of concepts. Since onomasiological research has largely concerned itself with lexical fields, Geeraerts's analysis relates closely to Wildgen's essay in the book; while his discussion of semasiological saliency — which involves the polysemy and vagueness pertinent to the problem of prototypicality — links with Violi's treatment of the same topic. In many respects, in fact, the essays by Geeraerts and Violi represent two complementary approaches to the problem of conceptual universals. The emphasis placed by Geeraerts on the linkage between the naming function in onomasiology and perception relates to several aspects discussed in the essays by Albertazzi (the perception-based foundational approach to semantics), Croft and Wood, Wildgen (Gestalt aspects in imagery) and Peruzzi.

#### 1. Saliency as a lexicological variable

When one considers the question of the impact of cognitive semantics (in the sense of Langacker 1990; Lakoff 1987; or Taylor 1989) on the field of lexicological research, it is probably correct to say that systematic attention to saliency phenomena is one of the major innovations of the cognitive paradigm. As an inquiry into language as a system of categories, cognitive semantics has received a major impetus from the prototype-theoretical insights into the structure of linguistic categories developed in psycholinguistics and anthropological linguistics. And prototype theory is basically concerned with saliency phenomena: it shows how the various semantic applications that exist within the boundaries



of one particular category need not have the same structural weight within that category.

The cognitive semantic attention to salience, however, has not yet been as systematic as it might have been. There are forms of salience phenomena that have not yet been investigated as thoroughly and completely as prototype-based salience. The purpose of this paper, therefore, is to provide a tentative overview of the various forms of salience effects that may be usefully distinguished. A typology of salience phenomena will be presented, based on a distinction between the following basic types: *perspectival*, *semasiological*, *onomasiological*, and *structural* salience.

Although terminological hair-splitting and taxonomic overabundance are real dangers for an endeavour such as this one, there is one overriding reason why the present exercise may be useful: salience is the place where structure and use meet. Consider lexical semantics and prototype theory. Traditional semantic analysis is concerned with describing the various meanings of lexical items and the structural relations among those meanings. Katz and Fodor's *bachelor*-example, for instance, describes the readings that 'bachelor' may possibly yield in actual text, and at the same time describes the conceptual relations among those readings, in the form of a hierarchical structure based on shared semantic features (Katz and Fodor 1963). Such an analysis is basically a structured list of possibilities: it specifies the space of possible readings that language users may choose from in actual communication. The study of those communication processes, the actual choices made by the language users, is not envisaged. Prototype theory, on the other hand, does incorporate aspects of use in the structural description of the lexical categories: the fact that some readings are more salient than others in the structure of the category reflects the fact that they are more readily chosen when using that category. Admittedly, frequency of occurrence is not the only factor determining prototypicality, but next to conceptual coherence, it is certainly an important one.

It should be clear that the combination of structure and use in the study of salience phenomena is essentially also a combination of *semantics* and *pragmatics*: semantics as the study of structure, and pragmatics as the study of use, combine when salience is seen as the *structural reflection of pragmatic phenomena*. This interlocking combination of the semantic and the pragmatic perspectives implies a slightly different conception of the notion of 'structure' than is customary: whereas linguistic structures would traditionally be seen merely as ordered sets of *possibilities*, adding pragmatics-based salience implies introducing *probabilities* rather than just possibilities.

## 2. **Perspectival salience**

The first step to take involves a definition of the concept of perspectival salience — a type that more or less stands apart from the other cases to be treated, and which will only be mentioned briefly here. Perspectival salience is represented in cognitive semantics by such terminological pairs as *profile* and *base*, or more generally, *figure* and *ground* (for definitions and applications of these concepts, see Langacker 1990 or Talmy 1978, among many other publications). To mention just the simplest of examples, the lexical item *hand* evokes a particular body part, but it primarily does so against a particular conceptual background, namely, that of the arm. The arm is presupposed in the concept of the hand, but it is the hand itself that is highlighted against the backdrop of the arm. Crucially, this is a matter of perspectivization: a particular chunk of reality (the hand and the arm) is perspectivized in a particular way.

The fundamental distinction between this perspectival type of lexical salience and the ones to be mentioned later, resides in the fact that the other types defined below invariably involve differences of salience among lexicological alternatives (where the alternatives may be meanings, syntagmatic contexts, lexical forms, lexical categories, or distinctive dimensions). In the perspectival type of salience, on the other hand, the salience phenomena involve just one of these lexicological alternatives (and specifically, one particular lexical meaning); within such a single meaning, particular aspects of the extra-linguistic situation referred to receive more weight than others. *Perspectival* salience, in short, involves differences of perspectival attention within one particular construal of reality, whereas the other type (which we will call *variational* salience) involves preference relations among different construals of reality. Perspectival salience is defined between the different aspects of the extra-linguistic situation (in the broadest possible sense of 'situation') invoked by a linguistic expression: 'hand' invokes the entire arm as the background of the conceptualization, but it is only the terminal part of the arm that is saliently conceptualized by 'hand'. Variational salience, on the other hand, is defined between different linguistic expressions or properties of those expressions: the semantic property of 'hand' that it may mean 'the terminal part of a human arm' is more salient than the property that it may also mean 'manual worker' (as in 'hired hand') — which is then the less prototypical reading.

Confusion should be avoided in particular when the linguistic expressions to be compared from a variational perspective each embody a different perspectival construal of the same chunk of reality. Choosing to describe a commercial



transaction by either the verb ‘to buy’ or the verb ‘to sell’ involves an onomasiological choice. If one of both terms is the more obvious alternative, there is a difference of variational salience between both verbs: we would then say, for instance, that ‘to buy’ is a more salient way of talking about a commercial transaction than ‘to sell’. On the other hand, each of the two verbs separately attaches perspectival salience to different aspects of the commercial transaction scene. In the case of ‘to buy’, the person buying is more salient than the person selling, and the reverse is true in the case of ‘to sell’. In examples such as these, comparing the differences in perspectival salience of two linguistic expressions is not the same thing as comparing the onomasiological salience of the linguistic expressions themselves, that is, the likelihood that one rather than the other will be used in situations where both are applicable.

### 3. Semasiological, onomasiological, and structural relations

As a further step in the construction of the classification, a distinction must be drawn between semasiological salience and onomasiological salience. Now, the conceptual distinction between semasiology and onomasiology may require some background information, because it involves a terminological pair that has — unfortunately — not made its way into the standard set of linguistic terms to be found in introductory courses. It is a terminological distinction that was introduced at the beginning of this century, at the time of the birth of structural methods of semantic analysis. The terms were coined by the Swiss romanist Karl Vossler in 1919. Terminologically speaking, the distinction is still much alive in those branches of (continental) European lexicology that preserve the heritage of structuralist semantics (such as the Coseriu school in Germany). In the Anglo-Saxon world, however, the terminology is hardly known. Basically, the distinction involves two ways of perspectivizing the structuralist link between *signifié* and *signifiant*. This terminological pair itself, to be sure, is not without having problems of its own, but for present purposes it may be sufficient to equate *signifiant* with a word form, and *signifié* with the concepts associated with that word form.

A semasiological perspective takes the word as its starting-point and investigates how several concepts (meanings, if one likes) are associated with that word. This is, of course, the regular type of semantic analysis in which the meanings of a word are listed and the semantic relationship between them indicated. Onomasiological research, on the other hand, reverses the perspective,

and takes the concepts expressed as its starting-point; it investigates, basically, which various words may express a given concept, and what the structural links between those words are. In actual historical practice, the onomasiological perspective has been realized primarily in the form of lexical field research. Bruno Quadri’s bibliographical overview of onomasiological research, published in 1952, for instance, reads as an overview of various types of lexical field analysis (Quadri 1952). Kurt Baldinger (again a Swiss romanist) has succinctly described the difference in the following way: “Semasiology [...] considers the isolated word and the way its meanings are manifested, while Onomasiology looks at the designations of a particular concept, that is, at a multiplicity of expressions which form a whole.” (Baldinger 1980:278).

An even more succinct way of putting things would be to say that semasiology involves processes of *meaning*, whereas onomasiology involves *naming*. Baldinger’s formulation, however, also makes clear that there is a certain ambiguity in the definition of onomasiology. On the one hand, when onomasiology is conceived of in terms of “designation” (or naming), it involves the relationship between semantic entities and the lexical items that name them. If, on the other hand, onomasiology is conceived of in terms of “a multiplicity of expressions which form a whole”, it instead involves the mutual relations between related lexical items. In this conception, onomasiological research will tend to coincide with lexical field research as a purely structural endeavour — that is, as an approach in which the actual choices from among the set of alternatives present within the lexical field are barely envisaged, but in which most if not all of the attention is directed towards an analysis of the relations between those expressions. In actual practice, in fact, so-called onomasiological research has been basically restricted to lexical field research of the kind just described.

It may be useful, therefore, to impose a terminological distinction between both kinds of onomasiological research, because it will help us to distinguish between the purely structural and the pragmaticized conception of onomasiology: if the term *onomasiology* is reserved for the pragmatic approach in which the relationship with actual referents is explicitly envisaged, the other approach may then be called *structural*.

The differences between the three perspectives defined in this way, may be presented schematically by starting from two semiotic triangles as in Figure 1. If we maintain a distinction between word (or lexical item, W in the figure), concept (C in the figure), and referent (R in the figure), then *semasiology* investigates how a particular lexical item may express various concepts, or alternatively (putting things extensionally rather than intensionally), how it

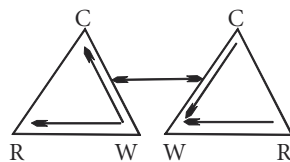


Figure 1. Semiotic relations between the major groups of salience phenomena in the lexicon

may designate various types of referents. This is expressed by the arrows in the left hand triangle. *Onomasiology* in the restricted sense defined a moment ago describes how referents or concepts may be designated by various expressions; this is indicated in the right hand triangle. A *structural analysis*, finally, studies the semantic relationship between expressions. In the figure, this is indicated by the arrow in between both triangles. The arrow actually connects the lines going from C to W rather than just both W's or both C's alone, because the structural analysis involves expressions as combinations of forms and meanings, rather than just word forms or semantic concepts alone. (The double directionality of the arrow between the triangles, therefore, does not indicate a one-to-one correspondence; it merely represents the fact that the structural analysis is a reciprocal one: it looks, so to speak, at one item from the perspective of the other, and vice versa.)

Given the distinction between semasiology and onomasiology, and the double interpretation of onomasiology, concepts of semasiological salience, onomasiological salience, and structural salience may now be defined.

#### 4. Semasiological salience

Semasiological salience is a relationship among the various semantic possibilities of a given lexical item. A lexeme/morpheme may express various semantic values, as when *in* expresses containment ('the apple *in* the bowl') or inclusion/surrounding ('the village *in* the desert'). Some of the values expressed by the lexical element may be more central than others, for instance because they occur more frequently within the range of application of the lexical element, or because they are a semantic centre in a network or family resemblance structure from which the other values are extensions. For example, containment seems to be more central in the structure of *in* than inclusion (see Vandeloise 1994). Practically speaking, then, semasiological salience coincides with prototypicality.

As prototypicality effects constitute the best known type of lexicological salience, it is not necessary to recapitulate the literature here (see Geeraerts 1989 for an introduction, and Taylor 1989 for an extensive overview). Two things require clarification, though, in preparation for the following discussion of onomasiological salience.

First, prototypicality may be defined both as a relationship between a lexical item and its meanings, and as a relationship between a lexical item in one of its meanings and the referents corresponding with that meaning (compare Kleiber 1990). In the former case, it is pointed out for instance that the 'biological species' sense of *bird* is more common than the slang sense in which *bird* refers to a girl. In the latter case, it may be pointed out that robins and sparrows are more central members of the 'biological species' sense than, for instance, ostriches and penguins. This distinction between the two possible definitions of prototypicality hinges crucially on the distinction between polysemy and vagueness: of all the multiple applications of a lexical item, some constitute true meaning differences (and hence involve polysemy), while others should merely be considered referential specifications (and hence involve vagueness rather than polysemy). It has recently been suggested (Taylor 1992; Geeraerts 1993a) that the distinction between polysemy and vagueness may well be less stable than is traditionally assumed; if this is correct, the distinction between two different levels of prototypicality (the semantic one and the referential one) marks the endpoints of a continuum, rather than a clear-cut dichotomy.

Second, it may be useful to distinguish between the paradigmatic and the syntagmatic aspects of lexical meanings. To begin with, let us note that each of the values expressed by a relational lexical element may occur in a specific syntagmatic frame. For relational spatial concepts, cognitive semantics describes such a frame in terms of a 'trajector' and a 'landmark' (see Langacker 1990). For instance, the landmark of a containment relation has to be a recipient with, say, 'containing potential', whereas the trajector has to be something 'containable' in relation to the landmark. The containment relation itself is a paradigmatic value, whereas the containing potential of the landmark is a syntagmatic phenomenon. These restrictions on syntagmatic contexts resemble the selection restrictions of old, except that they now explicitly involve (groups of) referents and not just words.

For a more extended example, we may turn to a word that more or less functions as a classic example in cognitive semantics, namely the preposition *over* (see Lakoff 1987). In Geeraerts (1992) it is argued that there are basically three spatial relations to be distinguished in the semantic structure of the Dutch

preposition *over*. They are defined and illustrated under a–c below (*lm* stands for ‘landmark’, *tr* for ‘trajector’). The range of application of *over* is not restricted to these cases, amongst other things because the spatial relations may show up in situations involving real motion, in situations involving fictive motion, and in examples involving stative relations.

- a. Extending from a point or region at one side of *lm* to a point or region at the other side of *lm*, while crossing *lm*

(1) De bal rolt over de lijn  
‘The ball rolls over the line (to the other side of it)’

- b. Extending from one point or region within the space defined by *lm*, to another point or region within that space (without going outside of it)

(2) De agent kuiert over het marktplein  
‘The policeman strolls over the market-place’

- c. Situated at the other side of *lm*, relative to the position of an observer

(3) Over de rivier deed de atleet zijn oefeningen  
‘Across the river, the athlete was exercising’

The relevance of a separate analysis of the syntagmatic restrictions on trajector and landmark becomes clear, for instance, when one compares the selectional restrictions holding for these three basic relations. Without going into all the details, let us briefly note that there are hardly any restrictions on the trajector and landmark of semantic value (a): both trajector and landmark may be one-dimensional (points), two-dimensional (lines), or three-dimensional (objects), in any combination. In the case of (b), however, both trajector and landmark are subject to restrictions.

On the one hand, because the spatial relation referred to by *over* must remain within the boundaries of the landmark, the prepositional object must have a line- or surface-like extension: it should be possible to conceive of it as a line or a surface. This shows up quite clearly when considering three-dimensional objects. Whereas (4) and (5) are straightforward cases of lines and surfaces, (6) is an example of a three-dimensional object whose third dimension (height) does not prevent it from having a bounded surface that allows for an *over*-relation. In (7), however, the three-dimensional object’s vertical dimension is so important that no surface for aimless or random wandering can be imagined. As (8) shows, reading (a) of *over* does not impose this restriction. This does not mean, however, that an object such as *schutting* ‘fence’ could not

occur at all with reading (b) of *over*. Example (9) shows that the relevant feature is not the objective horizontal or vertical orientation of the surface, but rather the functional characteristic of ‘treadability’: something that could hardly be a surface for free movement for human beings may be a natural path for insects.

On the other hand, because the trajector of an *over*-relationship according to (b) must remain within the boundaries of the landmark, it will typically be smaller than the landmark — small enough, at least, to move about on the surface or along the line constituted by the landmark. Specifically in the case of line-like landmarks, however, this does not imply that the trajector has to be smaller than the landmark in all directions. Taking into account that real lines are never merely one-dimensional, but always have a certain width as their second dimension, the trajector does not have to be narrower (but it does have to be shorter). As example (10) shows, the moving object may be wider than the actual line. (The train is wider than the rail.)

(4) Jan fietste over het pad  
‘John rode his bicycle along the path’

(5) Jeanne kuierde over de markt  
‘Jane strolled over the market place’

(6) Mark dwaalde over de berg  
‘Mark wandered over the mountain’

(7) \*Marie dwaalde over de schutting  
‘Mary wandered over the fence’

(8) Karel klom over de schutting  
‘Carl climbed over the fence’

(9) De spin kroop maar door over de schutting  
‘The spider kept on crawling over the fence’

(10) De trein glijdt over de monorail  
‘The train glides over the monorail’

Now, the syntagmatic frame of each semantic value may have typical and less typical instantiations. For instance, ‘the apple is in the bowl’ would probably refer to a typical containment relation, whereas ‘the jelly pie is in the suitcase’ is an untypical one (even though the containment relation itself is the same as in the typical case). Such typicality relations illustrate the concept of *syntagmatic saliency*. In the *over*-example, those instances of reading (b) that more readily invoke a line-like or surface-like landmark will be syntagmatically more salient than the others. In the sample sentences, for instance, (4) and (5) are more

typical than (6) or (9). Along the same lines, examples in which the trajector is not entirely contained within the boundaries of the landmark — as in sentence (10) — are syntagmatically less canonical.

## 5. Onomasiological salience

Turning now to onomasiological salience, there is a possible misconception to be discarded first. From a very general point of view, salience on the onomasiological level involves a preference for one expression over another as the name for a particular referent or type of referent. The existence of such alternative names would therefore seem to coincide with the kind of formal variation that is customarily studied in sociolinguistics and dialectology. Consider Table 1, which specifies a number of lexical patterns from the clothing terms project described in Geeraerts, Grondelaers and Bakema (1994). In each of the cases in Table 1, there is a different naming pattern in Belgian Dutch and in Netherlandic Dutch; the clothing types themselves, however, are the same. The choice between *legging* and *caleçon* as a designation for leggings, for instance, therefore acquires the same value as the distinction between, for instance, different pronunciations of the same phonological form in different geographical regions or social strata of a linguistic community. This type of onomasiological variation may be called ‘formal’ or ‘synonymy-based’, but it is useful to point out that these terms are not ideal in all respects. Terms like *legging* and *caleçon* are denotationally synonymous, but they are not absolute synonyms, because they have a different geographical distribution. The two terms have the same meaning in a narrow, denotational sense of the word, but they clearly have a different sociolinguistic value (in a broad sense of ‘sociolinguistic’). In a similar way, the term ‘formal’ variation (to which I shall adhere in the rest of the paper) might suggest that the variation in question is trivial or irrelevant, in the sense that it could be taken to involve mere ‘notational variants’. Again, however, the alternation between *legging* and *caleçon* is not a question of free variation, but signals a specific stratification of the linguistic community.

The misconception, then, consists of restricting onomasiological variation to this type of ‘formal’ variation. Next to the synonymy-based variation meant here, there are, obviously, cases where the choice of an alternative name carries a semantic load. Consider the following distinction between Belgian Dutch and Netherlandic Dutch.

Table 1. Differences of naming patterns between Netherlandic Dutch and Belgian Dutch

Items	Belgian sources	Netherlandic sources
<i>caleçon</i>	40 (38%)	–
<i>legging</i>	26 (24.7%)	91 (100%)
<i>leggings</i>	39 (37.3%)	–
<i>blouson</i>	13 (46.4%)	–
<i>jack</i>	15 (53.6%)	85 (100%)
<i>jeans</i>	64 (97%)	38 (70.4%)
<i>spijkerbroek</i>	2 (3%)	16 (29.6%)

- (11) Hij kwam *langs* de deur naar binnen  
‘He came in through the door’ (Belgian Dutch)
- (12) Hij kwam *door* de deur naar binnen  
‘He came in through the door’ (Netherlandic Dutch)

In Belgian Dutch, the usual preposition is *langs* ‘via’, where the semantic focus is on the path as such. In Netherlandic Dutch, the usual preposition is *door* ‘through’, which adds the notion of a passage that is penetrated and crossed. Although the preference for one or the other construction is conventional, it is not conceptually neutral: there is a different perspective involved in the choice of one over the other. This implies that next to the formal salience of synonyms that is at stake in the *leggings/caleçon* example, we have to distinguish a form of onomasiological variation that is semantic or conceptual in kind: it involves the choice of one semantic category (and not just one lexical item) rather than the other for talking about a particular real-world situation (such as coming through the door). In contrast with the ‘formal’ kind of onomasiological variation, we will call this type the ‘categorical’ type of onomasiological variation, because it involves the choice of a different category.

To be sure, the existence of such a preferred categorical choice is not an entirely novel idea, as it is part of the foundation of the basic level model of taxonomical structure formulated by Berlin and colleagues (see Berlin 1978). There are, however, various points with regard to which the basic level model of onomasiological salience may be refined. At least the following two points may be considered.

To begin with, the basic level model attaches onomasiological salience to hierarchical levels in the taxonomical tree, rather than to individual words.

Table 2. Differences in onomasiological salience among co-hyponyms

Item	Onomasiological salience
<i>broek</i>	46.47
<i>short-shorts</i>	45.61
<i>bermuda</i>	50.88
<i>legging-leggings-caleçon</i>	45.50
<i>jeans-jeansbroek-spijkerbroek</i>	81.66
<i>t-shirt</i>	70.61
<i>blouse-bloetze-bloes</i>	61.52
<i>overhemd</i>	31.45
<i>topje</i>	29.62
<i>shirt</i>	29.06
<i>hemd</i>	22.31
<i>overhemdblouse</i>	12.74

However, it may be argued (Geeraerts, Grondelaers and Bakema 1994) that the notion of onomasiological salience should not be restricted to levels, but should be extended — generalized, if one wishes — to individual categories. It may not be necessary to repeat all the arguments here, but Table 2 gives a sample of relevant observations.

The data in the figure are based on the following operational definition of onomasiological salience: the onomasiological salience of a lexical category is the frequency of the lexical element naming the category divided by the cumulative token frequency in the database of the semantic values expressed by that lexical element. The rationale behind this definition is as follows. For each semantic value (concept, or type of referents) expressed by a lexical element, there may exist alternative terms (co-hyponyms, hyponyms, hyperonyms). A lexical category is onomasiologically highly salient if it is a likely choice for the semantic values it expresses, that is, if it is stronger than the alternatives. Thus, given a corpus of language use, the onomasiological salience of an item like 'skirt' can be calculated by counting how many times skirts (i.e. the potential referents of 'skirt') are named in the corpus, and then checking how many times these are actually referred to with the lexeme 'skirt', rather than alternative ones. Such alternative terms could be hyponyms like 'miniskirt' or 'wrap-around skirt', or hyperonyms like 'garment' (although the choice of the latter term seems quite unlikely in the case of 'skirt'). The definition of onomasiological salience also takes cases of synonymy into account, but this aspect of the matter need not be spelled out here.

The point about Table 2, then, is simply this: the onomasiological salience of different categories on the same taxonomical level may differ considerably. For instance, in the upper part of the figure, 'short', 'bermuda', 'legging', and 'jeans' are co-hyponyms, as they all fall under the hyperonymous category *broek* 'two-legged garment covering the lower part of the body, pants'. However, the onomasiological salience of the different categories differs considerably: that of the *jeans*-category, for instance, doubles that of the *legging*-category. This means that a potential member of the category *jeans* is twice as likely to be designated by an expression that names the category *jeans* than a member of the *legging*-category would be likely to be designated by an expression that names the category *legging*.

The second point about the conceptual kind of onomasiological salience involves the recognition that the referential starting-point for the determination of onomasiological salience values is subject to variation. The salience figures given so far represent the likelihood that one specific category, such as *legging* or *t-shirt* will be chosen as the name for a particular referent, in those cases where that referent is a potential member of the category. The calculation, to be precise, is made for the category as a whole, that is, for the overall set of referents of the category. However, the calculation may also take its starting-point in a particular subset of the entire range of application of a lexical category. The question asked so far boils down to questions of the type: what is the probability for the set of leggings as a whole that its members will be named with an expression that precisely identifies the category 'legging'? The modified question now reads: given a specific subset of the set of leggings as a whole (for instance, leggings that do not reach down to the ankles but are not longer than the calves), what is the likelihood that it will be named with the item *legging* or one of its synonyms?

Obviously, the answer to the question will be determined by the overall salience of the category *legging* as calculated a moment ago, but it may also depend on the structural position of the subset under investigation within the semasiological structure of *legging*. The 'local' onomasiological salience introduced here may be called the 'cue validity' of a particular subset of the range of application of an item: it indicates how good a cue that subset is for triggering the name of the category. The suggestion, then, is clearly that this onomasiological cue validity and the semasiological properties of the subset exhibit a positive correlation. Put more simply: an expression will be used more often for naming a particular referent when that referent is a member of the prototypical core of that expression's range of application. When, for instance, a particular

referent belongs to the core of item  $x$  but to the periphery of  $y$ , it is to be expected that  $x$  will be a more likely name for that referent than  $y$ . (At the same time, of course, the choice for  $x$  will be a function of the global salience of the category represented by  $x$ , but that is a factor we have already dealt with).

A brief and rather impressionistic example may suffice to illustrate the idea (for more detailed, quantitatively elaborated examples concerning clothing terms, see again Geeraerts, Grondelaers and Bakema 1994). The kinds of usage that are structurally peripheral in the semasiological structure of Dutch *over* are more readily replaced by alternative terms than the central cases. For instance, in the examples illustrating reading (c) of *over*, the expression *aan de andere kant van* ‘to the other side of’ is more natural. In the same way, there is an extension of (c), defined and illustrated below sub (d), for which the alternative expression *tegenover* ‘across, facing’ is by far the more natural one.

- d. Situated at the end of a virtual path that extends from *lm* in a straight line across an open space.
- (13) Martha woont over het museum  
‘Martha lives across the museum’.
  - (14) Aan tafel zat Marianne over Ariane  
‘At the table, Marianne sat facing Ariane’.
  - (15) Het museum bevindt zich over de rechtbank  
‘The museum is situated across the magistrates’ court’.
  - (16) In de erehaag stond Samuel over David  
‘In the double row, Samuel stood facing David’.

The notion of local onomasiological salience may be subject to two different interpretations, involving the same distinction between polysemy and vagueness that was discussed above in connection with the concept of prototypicality. The referential subset from the range of application of a lexical item that is taken as the starting-point for a calculation of local onomasiological salience may or may not correspond to a meaning, in the traditional sense, of that item. There is no reason to restrict the investigation of onomasiological salience to subsets that actually correspond with ‘meanings’. This is not only because (as mentioned before) the distinction between meanings (underlying polysemy) and mere referential subsets (representing vagueness) may well be unstable, but also because prototype-theoretical research has established beyond doubt that even referents that do not constitute a ‘meaning’ in the strict sense (for instance, central members of the category), may play an important role in the

semantic structure of a lexical item. The meanings whose local onomasiological salience is calculated need not necessarily constitute denotational meanings: any lexically expressed semantic concept (whether it be of a denotational, emotive, stylistic, or discursive kind) can be subjected to the approach.

## 6. Structural salience

We may now turn to the third major perspective distinguished above. Remember that a purely structural conception of onomasiological lexical relations involves the mutual relationship between lexical categories. Salience effects along this perspective, then, will have something to do with the weight of the distinctive dimensions that distinguish various categories from each other. A semantic feature or a semantic dimension will be structurally salient when it often occurs in the structure of the lexicon; the structure itself, in fact, coincides with the totality of distinctive relations in the lexicon.

For an example, let us consider the lexical field of names for beer current in Belgium (see Geeraerts 1993b). The methodology can be summarized as follows: the more a particular feature is expressed in the names of beers, the more it is cognitively salient. When, for instance, the presence of fruit flavours never surfaces in the names of the beers that have such a flavour, it is unlikely that fruit flavour is a preponderant feature of beers. Of course, we have to be more precise about what it means for a distinctive feature or a distinctive dimension ‘to be expressed in the names of beers’. In most cases, there is no problem: when you find a reference to *kriek* in a name, and when you know that *kriek* is the name for a type of cherry, there is no difficulty in concluding that the addition of cherry juice is mentioned in the name of the beer. In other cases, the reference is more indirect. A striking example is the following: in the French speaking part of Belgium, a peach-flavoured beer is produced with the name *La pécheresse*, which translates as ‘the female sinner, the sinning woman’. When you realize, however, that *pêche* is the French for ‘peach’, it will be clear that the name contains a pun with an indirect reference to the presence of peach flavour.

In general, a feature is expressed by a name (or part of a name) when that name (or the relevant part of it) only occurs in connection with that feature. Some more examples may further illustrate the point. The fact that a particular beer is low on alcohol may be expressed directly by expressions like *alcoholarm* ‘low on alcohol’ or *alcoholvrij* ‘without alcohol’. Indirectly, however, the item *tafelbier* ‘table beer’ also signals the light character of beer, to the extent that it



Table 3. Salience characteristics of sample referential features in the field of Belgian beer names

referential feature	referential frequency in the corpus	number of characteristic names
wheat (instead of rye)	139	91 (65.5%)
very light, low alcohol	110	25 (22.7%)
seasonal beers	86	86 (100%)
added herbs	59	4 (6.8%)
raspberry flavour	40	38 (95%)
cherry flavour	19	18 (94.7%)
trappist beer	16	16 (100%)

only occurs within the group of very light beers. Similarly, *lambiek* and *geuze* can be taken as expressions of the ‘spontaneous fermentation’ character of beers, to the extent that they only occur in names for beers with that characteristic.

Following these guidelines, we can show that not all features of beers are equally important. There are clear differences in the extent to which specific characteristics are expressed in the names. Table 3 presents a sample to demonstrate the kind of differences in salience that occur. The table should be read as follows. The first column of figures indicates the number of beer brands in the data set that has the feature mentioned to the left. The rightmost column indicates how many of those beers actually carry a name that refers directly or indirectly to the feature in question. The relationship among the figures mentioned to the right gives an indication of which features carry distinctive weight. Beer brewed in Trappist monasteries, for instance, seems to be highly valued, while the addition of herbs is not an especially individuating feature.

In the spatial realm, the featural salience that is at stake here would involve, for instance, the distinctive weight of dimensions like shape, or movement, or geometry, or the role of the observer across items (or even across languages). (see Taylor 1988 for an overview of potentially relevant dimensions).

## 7. A typology of lexicological salience

In the following overview, each of the seven major cases of lexicological salience as presented before is defined. Also, a shorter name is suggested for each of the various types; of course, these names are just suggestions that should be treated with care as long as there is no uniform lexicological terminology.

1. *Perspectival salience: highlighting*  
= the differences of perspectival attention attached to different parts of the overall chunk of extralinguistic reality evoked by a particular concept.
2. *Paradigmatic semasiological salience: prototypicality*  
= the preponderant structural weight of specific senses or members within the semasiological range of application of a lexical category
3. *Syntagmatic semasiological salience: canonicity*  
= the dominant occurrence of specific selection-restrictional frames within the syntagmatic range of a paradigmatic reading of a lexical category
4. *Formal onomasiological salience: sociolinguistic prevalence*  
= the preference for a lexical item, in comparison with its synonyms, in a specific language variety or a specific pragmatic context
5. *Global categorial onomasiological salience: entrenchment*  
= the preference for a specific lexical category as a designation for its range of application, taken as a whole
6. *Local categorial onomasiological salience: cue validity*  
= the preference for a specific lexical category as a designation for a subset of its range of application
7. *Structural salience: distinctiveness*  
= the preponderant recurrence of a semantic dimension or a semantic feature as a distinctive dimension or feature within the semantic structure of the lexicon

By way of summary, the seven types of lexicological salience are brought together in their mutual taxonomical relations in Figure 2.

At this point, we may try to chart the seven types against the background of the semiotic triangle used in Section 3. However, the inadequacy of the semiotic triangle for dealing with more complex linguistic relations is well-known; see Hofmann (1993) for a brief history of the matter, and compare Geeraerts (1983).

An attempt (but certainly no more than attempt) to graphically represent the six variational types of salience may be based on Figure 3.

In Figure 3, three levels of analysis are distinguished: the level of words W, the conceptual level of meanings C of those words, and the level of the referents R corresponding to those meanings. The word W<sub>2</sub> is polysemous; W<sub>1</sub> and W<sub>2</sub> are synonymous with regard to meaning C<sub>1</sub>. The referential range of words may overlap in yet another case besides synonymy: R<sub>4</sub> may be conceptualized either as C<sub>3</sub> or as C<sub>4</sub> (as when a short wrap-around skirt might be called either a ‘miniskirt’ or a ‘wrap-around skirt’). The referential range of C<sub>5</sub> is represented

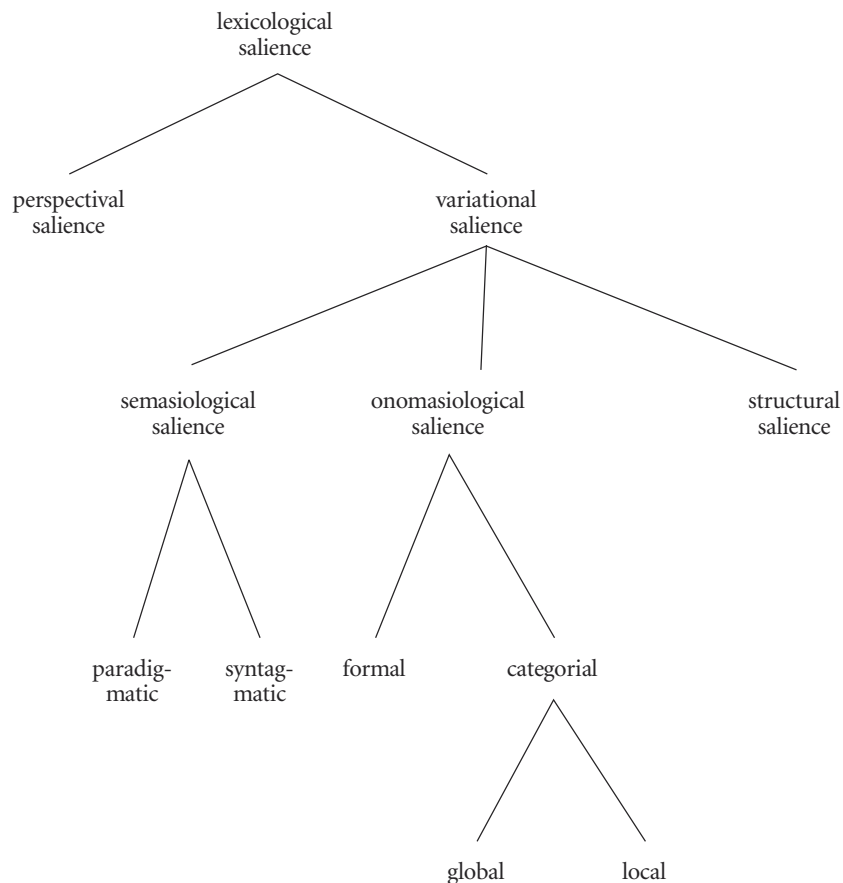


Figure 2. Taxonomical relations among the various types of lexicological salience

in a special way to highlight the syntagmatic contexts S in which the referents of C5 occur. The horizontal arrows represent the features that distinguish between the concepts C. Salience effects may now be represented by using bolder lines; the differences between onomasiological and semasiological salience are expressed by having bottom-up and top-down arrows respectively.

In Figures 4 to 9, the six types of variational salience are represented graphically against the background of Figure 3. (The parts of the figure that are irrelevant are represented by dotted lines.) Figure 4 indicates that C2 (rather than C1 or C3) is the prototypical meaning of W2, and that R3 (rather than R2 or R4) is the prototypical type of referent of C2. Figure 5 shows that R-S1 is the

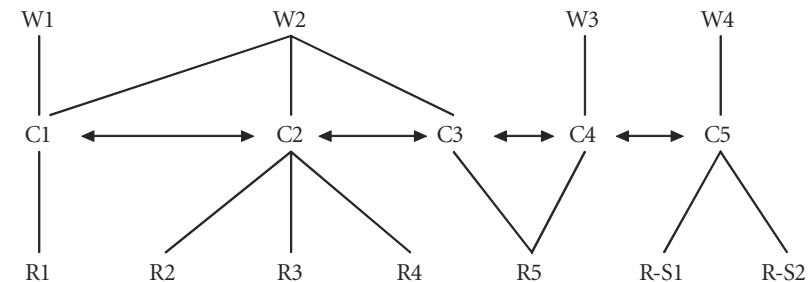


Figure 3. Sample network for representing salience phenomena

canonical syntagmatic context for C5. Figure 6 represents a sociostylistic context in which W2 is the prevalent synonym for C1. Figure 7 indicates that W4 is a more highly entrenched category than W1, in the sense that W4 is more likely to be used (in those cases where it can in principle be used) than W1 is likely to be used (in those cases where it is a relevant category); Figure 7 does not contain cases in which W1 and W4 overlap, but obviously a comparison of entrenchment values could just as well be applied to such a situation. Figure 8 expresses that R5 has a higher cue validity with regard to C4 than with regard to C3, that is to say, W3 is more likely to be used to categorize R5 than W2. Figure 9 indicates that the dimensions or features that distinguish C3 from C4 are structurally more important than the others (for instance, because they recur elsewhere in the lexicon).

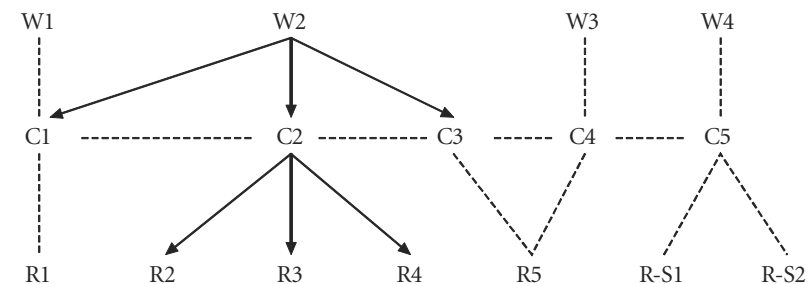


Figure 4. Schematic representation of paradigmatic semasiological salience



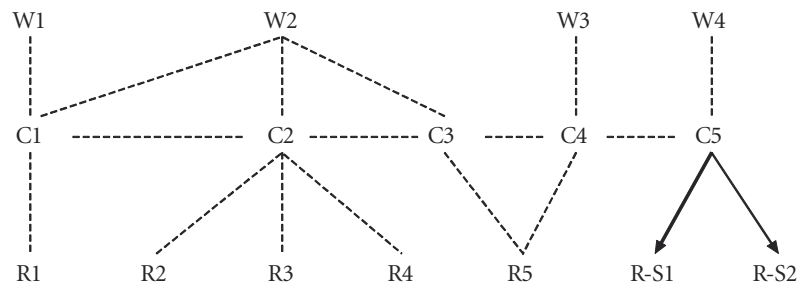


Figure 5. Schematic representation of syntagmatic semasiological salience

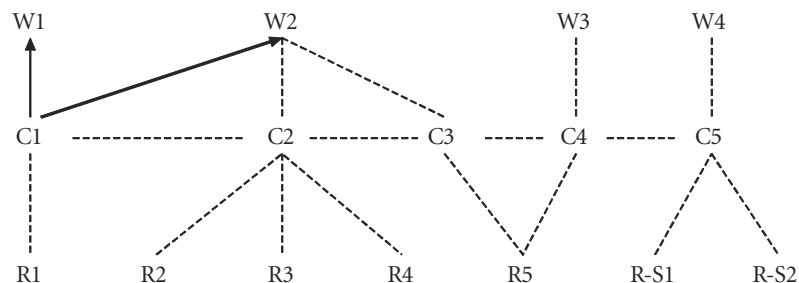


Figure 6. Schematic representation of formal onomasiological salience

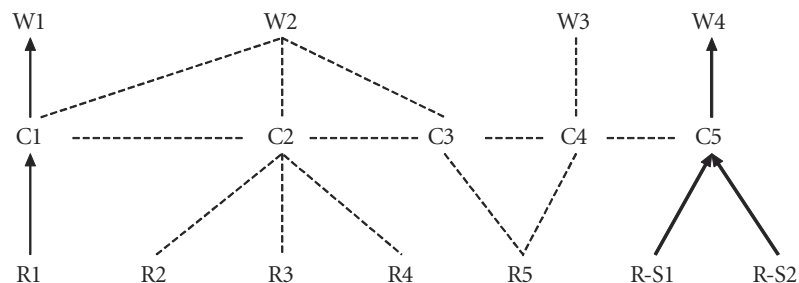


Figure 7. Schematic representation of global categorial onomasiological salience

## 8. Salience and snow

The classification presented in the previous pages is undoubtedly only a first step towards an exhaustive and systematic treatment of lexicological salience. This first step was taken for clarificatory purposes, but it may be interesting to round off by adopting a slightly different perspective: could the classification throw new light on other linguistic phenomena?

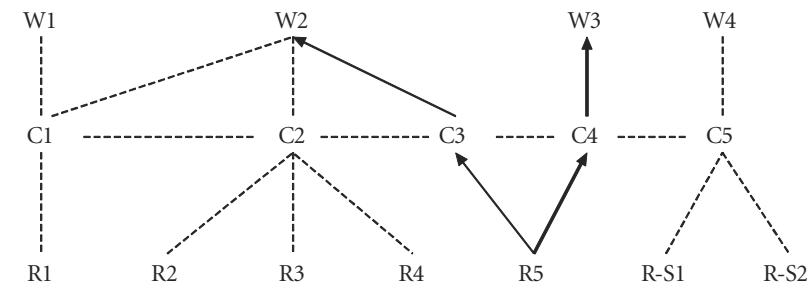


Figure 8. Schematic representation of local categorial onomasiological salience

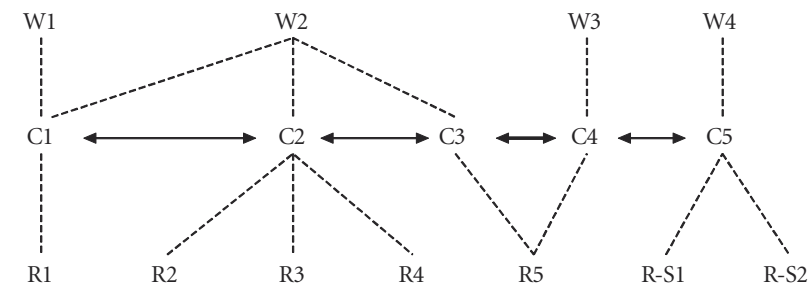


Figure 9. Schematic representation of structural salience

As one example, let us consider the question of conceptual universals. If semantic universals are likely to be statistical universals rather than absolute ones, the notion of semantic salience will be crucial in establishing the statistical universality of a particular phenomenon: semantic phenomena that are cognitively basic are likely to be salient across genetically unrelated languages. Questions of cultural specificity (the logical counterpart of questions of universality) likewise involve salience phenomena. Consider, to address one perennial member of the lexicological stock, the alleged existence of various words for snow in Eskimo. Let us suppose for a moment that there are no empirical problems with Boas's statement (1911) that the Eskimo have four words for snow, whereas English and Aztec have only one (but see Martin 1986). Boas mentions the following four:

*aput* 'snow on the ground'  
*gana* 'falling snow'  
*piqsirpoq* 'scurrying snow'  
*qimuqsuq* 'snowstorm, blizzard'.

It has been repeatedly pointed out that this does not imply that people cannot

notice differences in snow merely because they speak English. Clark and Clark (1977: 555), for instance, draw attention to the fact that English-speaking expert skiers may have specific words for snow such as 'powder', 'corn', and 'ice'. More generally, there is always the possibility of *ad hoc* compounds and word groups: 'snow glue', 'drizzle snow', 'icicle flakes', or the translations of the Eskimo words given above ('falling snow' etc.). The possibilities of expression of a language are not restricted to the vocabulary, and neither are the possibilities of conceptualization of the speakers of the language restricted to what is included in the mental lexicon. This attenuated point of view, however, does not imply that the cultural differences between the Eskimo and the Aztec disappear altogether. The cognitive salience of a concept like 'falling snow' may well be higher for the Eskimo than for the Aztec: it is plausible that they will more easily and more readily conceptualize a particular white substance as 'falling snow' rather than just 'snow'. In the terms of the classification presented in this paper, this expectation can be translated into the hypothesis that the entrenchment (the global categorial onomasiological salience) of 'falling snow' will be higher for the Eskimo than for the Aztec.

The relationship between salience and universals may be specified from yet another point of view. In her work on semantic universals, Wierzbicka (1992) demonstrates that such abstract concepts as emotions and moral notions may be of a culturally specific nature; at the same time, she insists on the possibility of expressing such concepts in any given language by means of a language-independent metalanguage: no matter how culture-specific a term might be, it can be translated in the 'alphabet of human thoughts' that she has been researching for decades. The foregoing pages, then, suggest one way of looking for such an 'alphabet of human thought' that might usefully supplement Wierzbicka's analytic approach: if these concepts really have the universal status attributed to them, they should in one form or another have a high degree of lexicological salience in a large number of natural languages.

The universality question also invokes the problem of pre-linguistic forms of salience, namely the objective correlates of the linguistic phenomena. To what extent is linguistic categorization determined by the structure of the world itself, or at least by the structure of our perceptual apparatus? If naming is often grounded in an act of perception, how do the independent properties of such perceptual acts influence the linguistic phenomena? The typology presented here has steered clear of these perceptual forms of salience, but it certainly does not mean to exclude the possibility of a pre-linguistic level of salience. Rather, a cognitive approach to the study of language will inevitably have to consider

the possible impact of such a pre-linguistic type of salience. Tackling that question, however, is beyond the scope of this article: before one starts looking for explanations of the linguistic phenomena, one has to be clear about those phenomena themselves.

## Prototypicality, typicality, and context

Patrizia Violi

This essay adopts an internalist perspective in order to address a theme central to lexical semantics: the concept of prototype and its associated theories. Assuming a phenomenological point of view enables Violi to explore the crucial topic of the relation between categorization and semantics, or in other words, the difference between categorial prototypicality and semantic typicality. These notions concern, respectively, the prototypicality of something as the most central instance within the superordinate category, and something as the most regular instance within the category. From this point of view, Violi's essay links closely with Geeraerts's contribution, which deals with the problem of prototypicality from a semasiological standpoint. Moreover, since it analyses typicality in terms of morphological and perceptual characteristics, it also connects closely with those by Croft and Wood (different images structuring the same content), Kövecses (typicality in emotions), Wildgen (inherent dynamic of language), and Albertazzi (foundational role of perception). Finally, by exploring aspects to do with context, frame, limited set of features, and the nature of the componential structure of meaning, the essay develops several of the issues discussed by Albertazzi in the Introduction.

### 1. Introduction

In the last fifteen years at least, the concept of prototype, together with that of family resemblance,<sup>1</sup> has become one of the most popular concepts of lexical semantics, often being seen as a definitive solution for most of the difficult problems in lexical semantics.

I believe that behind what is often called prototype theory (although here it would probably be more appropriate to talk of *prototype theories*) lies very important and useful insights into the way in which language structures meaning. This notion is not, however, a universal key magically able to solve all problems, as many people sometimes appear to believe.

This paper discusses some of the more problematic aspects of the use of this concept, suggesting a distinction between two notions often confused in the literature, namely *prototypicality* and *typicality*. This distinction may well prove to be useful, especially in relation to the problem of context and to the so-called problem of the contextual meaning of words, which are discussed in the final part of the chapter.

## 2. Why do we need prototypes?

The notion of ‘prototype’, first developed in cognitive psychology, was introduced as far back as the mid-1970s by a number of linguists as a radical alternative to what is usually called the ‘classical’ model of representation. The classical approach was based on the assumption that linguistic meanings can be completely captured by a limited set of features which represent necessary and sufficient conditions for the definition of these meanings.

Classical models of this kind have their roots in the European tradition of structuralist semantics. Indeed, one of the more foundational models of this kind was developed by Hjelmslev (1943), who constructed a simple model for representing the word-meanings of items such as:

cow, bull, horse, stallion, pig, sow

in terms of a restricted set of ‘primitive’ features, such as:

BOVINE, EQUINE, SWINE + MALE OR + FEMALE,

and so on.

Of course, a model of this kind has little explanatory value, since it is entirely circular in its logic: ‘horse’ is defined as possessing the feature EQUINE, but how can EQUINE be explained without going back to ‘horse’?

Those who have tried to be somewhat less minimalist by adding more explicative features to the model always encounter a number of insoluble problems, the most basic of which is the apparent impossibility of finding any principled way to discriminate between features that are really *necessary* and *sufficient* features and those that are not. Whatever set of features we manage to identify, it always seems possible to cancel at least some of them out, and in some cases all of them.

We could, for example, follow Pottier’s suggestion (1964) and try to define the meaning of ‘chair’ by developing a list of features such as:

- one place sitting object;
- with a back;
- with leg(s);
- not soft;
- without arms.

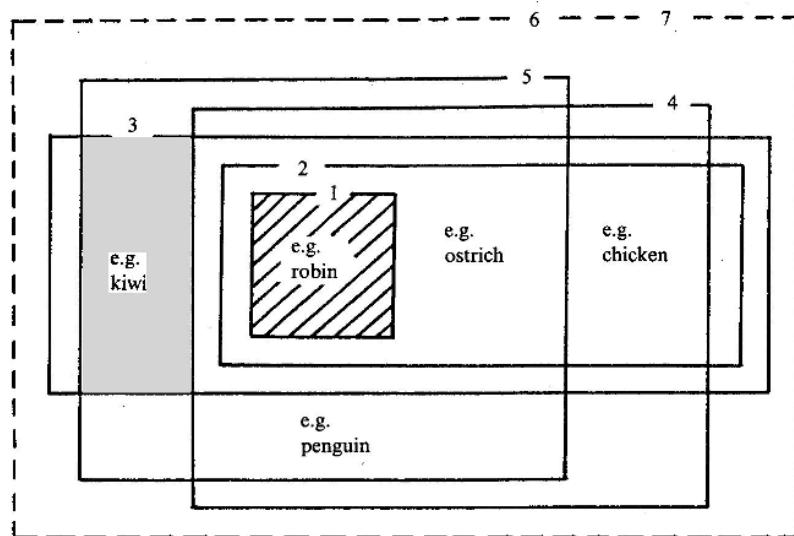
This is a quite acceptable description of the meaning of the word ‘chair’ as long as we take it to be a description of chairs as they *generally* appear to us. This indeed seems to be Pottier’s idea, since he considers these features to be only sufficient conditions for meaning. If, however, they are intended to be both necessary and sufficient, then serious problems arise, for it will be impossible to classify a soft chair or a chair with arms as a chair. Each feature can indeed be cancelled out, but even more dramatically we can in fact cancel out all the properties entirely and still manage to use the word correctly, as we do during a long walk in the woods, when we discover a nice smooth rock and sit down on it thankfully, saying, ‘Ah, this is a very nice chair’.

In the face of these and similar problems that seem intrinsically unsolvable within a classical framework, the notion of ‘prototype’ as the central instance of meaning seemed very promising from the outset.

The notion of the prototype was first introduced in the work by Eleanor Rosch and her associates on human categorization. Here the prototype is defined as the most central instance of any given category. According to Rosch’s early definition (Rosch 1978), prototypes are “the clearest cases of category membership defined operationally by people’s judgments of goodness of membership in the category” (1978:36).

However, it would be misleading in reality to speak of the prototype as only one single entity, as indeed Rosch herself pointed out in the same early paper of 1978; what is being actually referred to here are judgements as to the *degree* of prototypicality.

An example of such judgements as they are applied to word meaning definition is provided by Geeraerts (1989) who analysed the internal structure of the category BIRD:



Different instances of the category share different sets of properties. The prototypical instance (here 'robin') share all the available features 1–7, while less central instances, such as 'kiwi', share only some of these features (and more precisely numbers 3, 5, 6 and 7).

Note that a model of this kind exhibits a componential structure, and this being the case, it is no different in this particular respect from any of the more classical models. In this case too we have a list of features on the basis of which we may try to decide the semantic appropriateness of any given term. The main difference between this and classical models is that the properties are in this case not categorial judgements. Put otherwise, they are not considered necessary and sufficient conditions, and are thus not distributed uniformly among all the members. Members of the category therefore do not necessarily need to share the same set of properties in order to be considered legitimate members.

This solution has some obvious advantages: semantic features may include properties which are perceived as being strongly characteristic, but which are not shared by all members (being able to fly, for example). The representation does not have to be completely minimalistic, and it can be at the same time both richer and less rigid.

### 3. Some problems with prototypes

We should, however, be rather cautious when applying models and concepts derived from cognitive processes of categorization to lexical semantics. There are certain difficulties involved in utilising the concept of prototype in relation to word meanings. Categorization processes and semantic processes are certainly connected, but they are not necessarily entirely coincidental with one another.

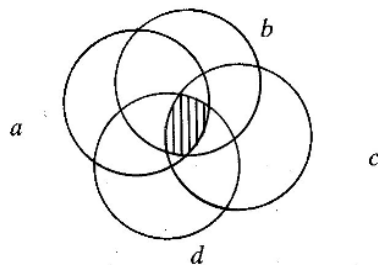
If we consider the example given above, the difference becomes clear: If 'robin' is the prototypical instance of the category BIRD, then it is certainly not the meaning of the word 'bird'. Indeed, we may begin to wonder whether the whole schema suggested by Geeraerts is actually the *semantic representation* of 'bird'.

The fact that we tend to perceive or to think of a robin as a more prototypical bird than an ostrich is an important psychological fact in many ways, and we may want to include such information in the representation of BIRD. But it is certainly not *the meaning* of the word 'bird'.

There are further problems, however: if the most prototypical instance of a category were also the most basic meaning of the semantic category, then all the semantic features of the prototype would be central to the categorial meaning, which is not the case. Robins chirp, but 'to chirp' is not necessarily a central feature of BIRD (which, if anything, is more likely to be 'sing' or 'call').

These and similar problems provoked a shift of perspective on the prototype as applied in linguistic semantics. It became clear that it was not possible, at least for semantic applications, to think of the prototype as the concrete instance of the most prototypical member of any given category, and consequently as a real individual. Instead, it was necessary to turn it into a mental construal: an abstract entity made up of prototypical properties. In this way the prototype, being the result of a mental construction, frees itself from any concrete evidence, and as such may well never be actualized in reality as any real instance.

A similar situation can be represented by means of the schema suggested by Givón (1986:79):



Circles here represent properties, not sets of individuals. The diagonally shaded area, which denotes the intersection of all four properties a, b, c and d, is the prototype, the abstract entity composed of all the available prototypical properties. Since in this approach the prototype is not derived from real instances, but built up on the basis of properties, it may well happen that no real individual actually satisfies all the conditions, but only a limited number of them, as is the case of individuals that fall within the range of the stippled area because they share properties a, b and d.

Considering the prototype as an abstract entity, rather than as a concrete instance, is a necessary step for lexical semantics, since the problems just mentioned disappear if the prototype is taken not to be a specific individual but a set of properties: the prototype of BIRD will not be a robin, but a concept defined by a set of properties which do not necessarily all have to be those embodied in the concrete instance.

Some important questions are still left unanswered, though. First of all it is not clear, in this version of the prototype, how we can define the prototypical properties, for they are no longer derived from a real instance. Since the prototype does not have to correspond to any real instance, we seem to have lost the flavour of psychological realism that was so appealing in the first version of prototype theory.

But there is a second and even more crucial problem. In a model of this kind there are no constraints on which properties need to be shared with the prototypical core meaning. The less prototypical instances of a category can possess any of the properties, or just one of them, and these do not necessarily have to be the same ones.

The basic idea underlying such a model is that linguistic meaning is structured around some area of more salience, where more properties are satisfied; the prototype represents the instance of some better kind of appropriateness. Less prototypical cases are governed by a principle of analogy. Now,

although this may be a quite realistic picture of how linguistically produced meaning works, the principle of analogy cannot be used indiscriminately, because it may be misleading if it is not applied correctly. Not all analogies are equally good: aeroplanes, too, exhibit some analogical relationships with birds.

The model suggested by Givón imposes no constraints on which properties must be shared with the prototype in order to belong to the same semantic category. And yet this lack of constraints gives rise to some undesirable effects. If, for example, we apply the model directly to the meaning of 'bird' with no further constraints, it will predict that any animal able to fly or which has wings is a bird, which would necessitate including also bats in this category. Notice that these problems are largely independent of any distinction that might be made between folk and scientific theories of what a bird is. Indeed, it would be hard to claim in our case that a folk theory of birds would also include bats.<sup>2</sup>

An unconstrained principle of analogy, based on some or other common property, no matter what, is obviously not good enough, at least in some quite specific cases.

Indeed, if we return to Geeraerts' schema, we see that there are two properties common to all kinds of birds, 'being born from eggs' and 'having a beak'.

These properties delimit the boundaries of the semantic category and are therefore essential to the definition of meaning. Which means that, at least in some cases, the existence of a prototype does not imply scalar membership, as predicted by Givón's schema. We may conclude that different degrees of representativity do not coincide with, or imply, different degrees of membership.

This is even more evident in the case of odd numbers studied by Armstrong, Gleitman and Gleitman (1983), who show that people perceive numbers such as 5, 7 or 9 as more prototypical examples of an odd number than something like 1973, although the same subjects knew very well that all are odd numbers. This particular category is a classic example of one based on necessary and sufficient conditions.

This is another case in which the concept of prototype seems to have very little to do with semantics. And indeed one could argue that the fact that 7 is considered a better example of an odd number than 2347 has nothing at all to do with the meaning of the words 'odd number'. Certainly, any semantic definition of 'odd' does not actually need to refer to this psychological phenomenon, no matter how interesting it may be from a psychological point of view.

Linguists using prototype theory applied to semantics have tried to overcome these difficulties by drawing a distinction between categorial structure, which is no longer controlled by prototypes, and prototypical effects, which

may have many different causes but which are not connected in any way with the structure of the category. Lakoff (1987) distinguishes for instance between Idealized Cognitive Models, which are of four different kinds and which represent different categories, and Prototypical Effects, which play almost no role in the representation process.

A solution of this kind is actually more a solution to the problem of categorization, and of squaring a non-classical theory of category with the problematic data discussed above, than it is a semantic theory of representation based on the idea of the prototype. Indeed, from this particular perspective, prototypes virtually disappear from the picture, and prototypical effects are reduced to psychological phenomena which may very well have no semantic relevance at all.

Should we then conclude that the concept of prototype, which at the outset seemed so promising for the solution of many, if not all, of the more difficult puzzles in the field of lexical semantics, has revealed itself to be of absolutely no use at all?

#### 4. Categorical prototypicality and semantic typicality

I believe that, despite the still rather confused nature of the notion of the prototype, there is an important pre-theoretical intuition about linguistic meaning and its functioning to be discovered here. However, in order to capture it we must shift our perspective from the process of categorization to the area of semantic structure. The study of the prototype has so far been linked to categorization, which is obviously related to lexical semantics; yet, as I have already pointed out, these two areas do not completely coincide with one another.

Research on categorization, and its subsequent application to semantics, has focused especially on the analysis of a very particular class of concepts, namely the class of concepts related to what have been called *natural categories* (or almost exclusively *natural kinds* and *artifacts* linguistically expressed as nominal classes). Secondly, and even more importantly, these are always concepts that, in the hierarchical structure of categories, belong to the basic category level.

At the basic level, the prototype has a very specific status: it is a *particular kind of member* of the category. The prototype of a bird, of a fruit, or of a tree is a *kind* of bird, fruit or tree. But this is a very special and peculiar case. If we move from the basic level to the next subordinate level, the status of what may be defined as the prototype changes: if the prototypical bird is a robin, then the

prototypical robin is not a kind of robin but merely represents the average values for that particular subcategory.

In other words, the typical robin, the standard or regular instance of the more general category ROBIN, is defined by sets of average values that can include perceptual and morphological aspects (size, shape, colour, and so on), and other semantic dimensions (habits, and in some cases, also the various cultural values associated with the concept). The average values are what enable us to distinguish between a regular individual and a non-regular one, and to make inferences; these are the meaning components which we generally assume to be shared by competent speakers and are thus part of our semantic competence.

The prototypicality of the ‘average value’ — which is, as I will try to argue, of central concern for any theory of semantic representation — is quite different from the prototypicality of ‘robin’ *qua* BIRD: it is not the most central instance within the superordinate category, but merely the most regular instance within the category (for example because of its shape, size, colour and so on).<sup>3</sup>

It is therefore necessary to distinguish between two different forms of prototypicality: firstly the prototypicality of the robin seen in relation to its being a bird, and secondly the prototypicality of the average individual seen in relation to other similar individuals. I would suggest calling the first one *categorical prototypicality*, and the second one *semantic typicality*.

Semantic typicality is a much more general phenomenon than categorical prototypicality, which is restricted to the more basic levels of only a few semantic categories (i.e. Rosch’s natural categories). Outside of this domain we have many nominal classes that do not exhibit the same kind of hierarchical structure. Think for instance of the lexicon of emotions, where, when we are talking about prototypes, we are really talking about what I would call semantic typicality (i.e. the typical situation of being in love, angry, envious and so on).

But the need to shift to the concept of typicality perceived as regularized meanings becomes even greater when we consider other classes besides those of nominal semantics, such as verbs, adjectives and so on, where there is often no hierarchical categorial structure nor any basic level. In these cases the use of the prototype as categorial structure is of virtually no use for semantic analysis.

Cognitive psychology initially focused on the study of prototypicality mainly because this seemed to be the most important from the point of view of the study of categorization processes, and more generally of conceptual structures and thinking. From a semantic point of view, however, prototypicality is much less relevant, not only because it is restricted to only a few semantic word classes but also and mainly because, although it may be cognitively interesting, it is not,

nor can be, an inherently semantic phenomenon ('robin' may be the prototype of the category BIRD but it is not therefore the whole meaning of 'bird'), and sometimes, as we saw in the case of odd numbers, this particular concept contributes virtually nothing of relevance from a semantic point of view.

On the other hand, the notion of typicality is quite obviously constitutive for semantic representation. Indeed, I would say it is the only really viable alternative to classical models based on the notion of necessary and sufficient conditions.

Typicality may be seen as functioning as the locus for the local stability of lexical meanings. In this sense it represents the habitual or regularity aspect of meaning. The basic hypothesis emphasised by the idea of typicality is that it is possible to find some regularity — some kind of canonical form — in lexical meanings, and that lexical variations and semantic change can only be understood because of the existence of such regular or canonical forms of meaning.

Regularity does not of course exclude variation; both regularity and variation are bipolar terms within the dynamic multi-dimensionality of language and language use. Language possesses an inherent dynamic which constantly moves between stability and instability, regularity and change, because it is neither a completely stable system of representation nor merely a cluster of continuous variations without structure. Meanings do change, not only diachronically but also synchronically, in order to make words fit the needs of new and changing situations. A certain degree of plasticity is inherent in language, and this enables us to cope in an on-going way with contextual changes, while at the same time the regularity aspect of meaning guarantees the possibility of stable sets of meanings which make actual communication possible.

The fact that, in given situations, we might just as well use the word 'chair' for something like a rock or a piece of wood does not mean that the meaning of 'chair' for us has become confused with that of 'rock', or that we do not really know what a chair is, what it looks like, and how it differs from a rock. Language is plastic enough to make it possible for us to call a rock or a piece of wood 'a chair' in given situations, while at the same time allowing us to maintain a relatively well defined meaning for it.

The existence of stable, typical associations of content variables to words highlights the schematic nature of meaning: lexical items may be seen as a synthesis of the complex content schema underlying them. A schematically conceived aspect of meaning of this kind is captured by the related concepts of scene, frame, script, schema, and similar concepts all related to the idea of typicality referred to above.<sup>4</sup>

In particular, Fillmore's Frame Semantics (Fillmore 1982) is closely compatible with the ideas that I have been developing so far. According to Fillmore, lexical items are linked to scenes, which represent the typical, regular, most common situation associated with a given lexical frame. For example the word 'write' activates a typical scene where a human subject draws words and sentences on a surface, usually a piece of paper, using a specific object to do so, such as a pen or a pencil. (At least this was the typical scene before the advent of the computer.) The range of meanings typically associated with words are of course always subject to a certain amount of change and transformation. A scene is a word's standard context of application. This does not rule out the possibility of non-standard situations, such as somebody writing with a pin on a wall, but the non-standard cases must be specified. Without further specification the lexical item activates its typical context of use. Or, if one prefers, the typical context represents the background for the understanding of meaning.

## 5. Typicality and context

I believe that an approach of this kind can yield better understanding of the old problem of context and its relation to word meanings. 'Context' is one of the most controversial terms in linguistic analysis, and the debate on how to define its borders and limits is far from reaching a definitive answer. For some authors it is represented by the very restricted (or delimited) situation of utterance, for others it is the full set of institutional structures within which interactions take place.

From the point of view of the present discussion, however, I believe that the problem of the actual *extent* of the context is not crucial, and that it can to some extent be seen as independent of its definition. The real problem is not how 'large' the context should be, but rather how we should define the relationships that exist between lexical meanings and contextual components, which can be both textual and extra-textual.

The relationship between context and lexical meaning is often approached from the point of view of how context influences some hypothetical and pre-existing non-contextual lexical meaning. This question implies an underlying distinction between context-free meanings and meanings which are context-bound. What I would like to suggest is that meanings are never completely context-free but are instead always indexed to some standard context of reference.

The reason why this is not always recognized depends on the general



acceptance of what I will call an *externalist* perspective on context, where the main question generally asked is: how may context contribute to change in lexical meaning? I will try to develop an alternative position, one which I shall call an *internalist* perspective, and which I assume here to give a more adequate account of the relationship between meaning and context. But let us first take a closer look at the externalist perspective.

### 5.1 The externalist perspective

In the externalist perspective, context — both extralinguistic and linguistic context — is taken to be something that in some way or other modifies word meanings, according to a kind of schematized directionality, such as:

context → word

Accordingly, context can be seen as a selector of lexical features, since it activates some of them while leaving others in the background. Let us consider an example. The semantic representation of a word such as ‘book’ will be something that includes at least the following features:

- perceivable features:
  - physical solid object
  - typical shape
  - standard size
  - made of paper
  - containing a written text
  - ...
- functional features:
  - made to be read
  - ...
- history of the object:
  - artifact
  - written by somebody
  - printing and composition processes
  - production and distribution
  - ...

Depending on the phrasal context in which the word is inserted, only some of these features will be activated. Consider the differences between:

1. John read the book;
2. John burnt the book;
3. John threw the book against the window in order to break it.

Each of these sentences focuses on a different feature of the meaning of ‘book’: the property of containing information that can be read, the property of being made of paper which can be burnt, the property of its solidity as a physical object. The phrasal context of the sentence thus foregrounds some specific components of the semantic representation whilst leaving the others in the background.

Eco (1979) analysed mechanisms of this kind in his textual semiotic approach, describing what he called a ‘narcotizing’ effect. According to Eco, for each sentence or text the topic selects some semantic features and ‘narcotizes’ the others, which continue to remain ‘dormant’ as semantic potential always available for activation.

This is precisely why we can call a smooth rock a ‘chair’ in some appropriate circumstances: all the features that characterize the typical shape of a chair are narcotized, and the only one actually selected is the functional property of ‘something sittable upon’. It was in the light of similar cases that the necessary and sufficient conditions approach was revealed to be inappropriate. The reason why it is often impossible to fix a definite set of necessary and sufficient features is that the context is almost always able to cancel at least some of them out.

To claim that the context can select some features and narcotize others is not simultaneously to deny that every word possesses its own structured semantic potential. Quite the opposite: such selection is only possible because there is some kind of pre-existing standard representation.

There is, however, a strong version of externalist contextualism which claims that meanings are specified entirely by their contexts, and that there is no semantic systematicity underlying them at all. In this case, context does not merely have a modelling function on semantic selection, but becomes the one and only principle that regulates semantic organization. Meanings are, or at least can be, redefined at the moment of realization of each new utterance, and there is no such thing as semantic systematicity.

If this were indeed the case, it would be hard for us to understand each other in even the most trivial situations, since contexts continuously change. However, semantic change is understandable precisely (and only) because meanings are at one and the same time not completely defined and not completely undefined: they exhibit what can be called *regularity*, which is what the notion of semantic typicality basically tries to capture.

## 5.2 The internalist perspective: words as creators of context

The regularity of meaning implied by the notion of semantic typicality may be more properly described as regularity of contexts.

In the pragmatics literature, context is often viewed as the locus of pure irregularities, as something which is continuously changing and almost totally unpredictable. Contextual variations are almost exclusively abnormal and deviant cases.<sup>5</sup>

In reality, however, things are rather different. In our everyday experience what we may call 'context' presents itself to us in highly structured and regular ways. Perhaps it would be more correct to say that our experience itself is developed through a regularity of recurrent and similar situations which we afterwards tend to identify with given contexts. If it is true that context sometimes can be the locus of unpredictable variation, it is also true that this is generally not the case.

I shall define as *standard context* the regular nature of situations that tend to repeat themselves, of which we have repeated experiences and on the basis of which we build our expectations about what will or will not happen, and on which we largely base our abilities to understand and predict how the world around us works. It is precisely to these standard contexts that linguistic meanings allude. Their, at least partial, stability is based indeed on the underlying regularity of their contexts of reference.

From this perspective, the opposition between context-free meaning and meaning in context loses its relevance: there are no meanings that are context-free because each item is always implicitly indexed to a standard context of reference. Semantic typicality is the representation of that regularity which emerges within the standard context.

Context is therefore not only something 'external' that modifies lexical meanings 'from the outside', so to speak. It is also something created and introduced into discourse by every single instance of a lexical item, following a directionality that it is not only from context to words, as indicated before, but also from words to context:

words → context

To say that words activate a standard context of reference is to state that words are always anchored and indexed to a regularity context which represents their structured semantic potential.<sup>6</sup>

Obviously this does not mean that standard contexts cannot be modified.

To claim the existence of some regularity does not imply the denial of all possibility of change. Change is always possible, but with certain constraints. First of all, every deviation from the standard context of reference often requires some specific signalling action, and always some enaction of a process of negotiation and adjustment. Secondly, there are certain limits beyond which our usual judgments of semanticity are suspended and we are no longer sure of 'what exactly is meant'. This is generally the point at which radical transformations of meaning occur.

Before reaching this kind of breaking-point, we have all the various instances of semantic readjustment, where we adapt meanings to irregular and non-standard cases, such as the nice smooth rock which we decided to call a chair.

In cases of this kind we should not ask ourselves whether or not the context is appropriate for the correct use of the word. What actually happens once the word 'chair' has been introduced into the discourse situation is that it forces upon the hearer the construction of a possible context where such a word would be appropriate.

The very use of the word 'chair' imposes upon us the requirement that we must look upon something which is not a chair as if it actually were a chair. Words somehow seem to work as pointers, in such a way that we project what we suppose to be the relevant features (and consequently, functions) of a chair onto any entity that at least partially allows for such a projection. It is not the context that constrains the condition of applicability for lexical insertion; words are inferential devices that create their own conditions of applicability.

Adopting this perspective radically alters the traditional mode of analysis which views context as selecting the relevant features and making the use of any given word appropriate, or inappropriate, in that context. Under the approach suggested here it is not the existence of a given context that makes the use of the word possible, but the use of the word that initiates a mental process in the listener which seeks to construct a context in which its present use would be the most appropriate.

As soon as the word 'chair' is uttered, we try to find something in the situation to which that word can be applied. It is as if words force us to initiate a search process, to begin 'looking around' to see if we can find conditions that might possibly justify the lexical choice made by our interlocutor. In this way words operate as devices that initiate the construal of some possible context for their interpretation.

The power of this device is such that the appropriate conditions for interpretation are created even when they are not initially textually, or even

contextually, present. This explains why we may still have possible interpretations of any given word introduced into a discourse even in those cases where all the semantic features are potentially cancelled out by the perceived context.

An amusing example of a situation of this kind is provided by Almeida (1992), who analyses the meaning of the word ‘dessert’, which can be described as meaning both:

‘the last course in a meal’

and

‘generally sweet’.

However, each of these features can be cancelled out, as in the two following sentences:

1. At our house we always eat the dessert before the soup (here the first feature is cancelled)
2. In some regions of Norway the dessert is always salty (where the second feature is cancelled)

Moreover, both features can be cancelled out, as in:

3. An *entremets* is a kind of dessert that is served in the middle of a meal. It can be sweet or salty.

Here the two former features are cancelled out, but we could still maintain a third, more general feature according to which a dessert is in any case a course which constitutes some sort of transition point in the sequence of a meal.

However, even this kind of general feature may be cancelled out, as shown by the last example given by Almeida:

4. Not far from Avignon there is a restaurant called “La desserthèque”, where every dish is a different kind of dessert.

Faced with cases like these, one possibility is to deny any stable meaning for the word: since all possible features can be cancelled out in various ways, as mentioned above, no regularity at all of semantic structure can be said to exist. Everything is in the context.

The other possibility is quite different, however, and suggests that we begin to view words as indexed to some standard context of reference which represents the normal semantic potential of the word. Because of these standardized links between terms and contexts, words can function as inferential devices, as instructions for possible inferences. Words force interpretations upon us and

compel us to develop hypotheses about what a possible compatible context may be. Words, then, can be said to impose their own context on the situation at hand, rather than saying that their meanings are merely affected by the context in which they are uttered.

Think of the last example: not only can we, even in this rather special case, easily interpret the word ‘dessert’, but nor do we not seem to perceive any semantic weirdness in the process of doing so.

If a word can function as a trigger for possible new interpretations, as in this case, then this is because there already exists some underlying schema, a ‘repertoire’ of available interpretations, which would, in my terms, be the typical context to which every word is indexed.

The relation between these regular contexts and their potential instantial variations is highly flexible and open; otherwise we could never use language creatively in any new situation. But it is also important to remember that the possibility of change and development presupposes some kind of canonical form, rather than denying it.

In this sense the instructional perspective suggested here is entirely consistent with a systemic-functional perspective on language, where the linguistic process — to use Hjelmslev’s terms — always relates back to the system of language which is the necessary basis for all possible textual realizations.

## 6. Conclusions

To sum up my position regarding the vexed question of meaning and context, it seems quite clear that it cannot be answered by separating content (i.e. semantic) information from contextual information. Rather, we should look at meaning as a sort of minimal context. Meaning is the schematic, recurrent, typical context that the word in question evokes. Obviously, a few important questions are still open here: how are we to decide how much information is to be included in such a minimal context? Or, in other words, where does the context end? To some extent this is an empirical question and can only have empirical answers, not principled ones. In this sense semantics is, and cannot not be, part of a general ethnography of culture.

Which kinds of elements define the minimal context of writing, and therefore the meaning of the words ‘to write’ in our culture, as opposed to Japanese culture for example? This is something that cannot be defined in any *a priori* way. Rather, it is a matter for an empirical, ethnographic investigation

within the specific cultures in question, and where judgements of accuracy regarding meanings can only reside in some degree of socially negotiated agreement. After all, even dictionaries can be seen as the repertoires of such a socially negotiated form of agreement.

This is not to say, however, that word meanings themselves do not have any internal structure. Indeed, they do, and understanding these structures can also help us to understand the problem of minimal context delimitation. In any schematic meaning there are some components of the schema that are more central, more stabilized, than others and these central meanings constitute a semantic core which is more resistant to cancellation.

Take the example of the meaning of 'restaurant'. Certainly, the schema, or minimal context, which defines it has to include the serving of food in exchange for money. Such a semantic component is certainly more resistant than all the details about how the event actually happens: having waiters or tablecloths are typical components of restaurants, but we can easily imagine a restaurant without them. A place of this kind would still be called a restaurant, while a place where food is never sold at any time would not.

Elsewhere (Violi 1997) I have developed a more detailed model to distinguish between different levels of cogency of semantic properties, but other work has been carried out along the same lines, for example by Cruse (1986), who draws similar distinctions among different degrees of typicality for semantic features. What is very important in distinguishing degrees of semantic centrality is that each degree of centrality imposes different constraints on textual interpretation, and conversely implies different levels of responsibility on the part of the speaker/writer.

I would like to turn now to some very general and concluding remarks on the highly complex question of semantic delimitation.

First of all I do not believe it is possible, or even desirable, to find some kind of unitary solution to this problem; nor, by the same token, do I think that we will be able to find a unified model for lexical representations.

Different semantic categories tend to exhibit quite different conditions of applicability and different semantic configurations, and one unique solution cannot therefore be proposed for all lexical classes.

At one extreme of the continuum we have terms such as 'square' or 'triangle', which are perfectly represented through a set of necessary and sufficient conditions. In these cases the very idea of typicality disappears: there is no such a thing as a 'non-typical' square as opposed to a typical square. Either a figure is a square or it is not a square.

One could say that in the case of triangles things are somewhat different, because triangles actually do have different forms, and our mental representation of a triangle (i.e. what we might refer to as 'the generic triangle') is still a specific instance of *one* given triangle which in some way or other is considered to be more typical than others. Even if this were true, however, we could still argue as to whether or not this is a truly *semantic* problem, and whether or not the *meaning* of the word 'triangle' is affected by this particular phenomenon. This is a case very similar to the one of odd numbers discussed earlier.

At the opposite extreme of the continuum we will probably find highly abstract words like 'beauty', 'disgust', 'fear', 'happiness', the meanings of which appear to be difficult to grasp via a strict definition, but which are actually closer to being a set of unstable representations. There are at least two reasons for this. First, these meanings often allude to prelinguistic experiences which are not easily translated into words. Second, their codification is heavily dependent on cultural models and social conventions.

In between these two extremes there lies a very wide range and variety of intermediate meaning configurations. For example: natural kinds seem to have some quite essential conditions of applicability which apparently delimit the boundaries of the semantic category, as we have seen in the case of 'bird'. Therefore, membership in these categories cannot be considered fuzzy, although there are some typical values.

Cultural and social artefacts have typical values and do not have well-defined boundaries, as we have seen in the case of 'chair', and so on.

Semantic typicality therefore plays a quite different role within different kinds of lexical category, being of virtually no relevance in some cases, for example with regard to mathematical or geometric definitions, and being extremely crucial in others.

The reason why lexical classes differ in this respect is not linguistic in itself, however; it is our experience of such things as triangles, birds, chairs and emotions that is crucially different — in many important ways and depending on various parameters. First of all, there are entities for which we have perceptual counterparts, and entities that are essentially internal construals (such as emotions for example). In the former case, semantic definitions must be adjusted to perceptual experience; in the latter, there are no perceptual *correlata* to compare our experience against.

Moreover, there are entities, such as mathematical or geometrical constructs, that are the results of our own definitions, and entities that are endowed with "a life history independent of our naming-operations", to use Dwight Bolinger's

words. “A bachelor is a bachelor because he is unmarried, and marriage is an arbitrary defined social ceremony; we impose the conditions. A bird or a fish is something that we take as we find it, and the markers are adjusted like a suit of clothes, often badly” (Bolinger 1965: 568). And so on. The semantic structure of our words depends crucially on the natural and social orders (Halliday 1987) of the world as we experience them; therefore any theory of the semantics of natural language cannot but be a theory of human experience.

## CHAPTER 7

### Directions and perspective points in spatial perception

Liliana Albertazzi

*For Len Talmy*

The paper proposes a philosophical foundation for cognitive linguistics on the basis of an experimental phenomenology. It conducts analysis of the distinguishing primitives and natural categories of cognitive, natural space: distance, position, orientation, change, etc. The author argues the Aristotelian thesis that the contents and structures of the phenomenal world are transposed into language as nuclei bearing semantic and syntactic features. The essay's second main contention is that perception (spatial perception as well) is intrinsically temporal. Its third assertion is that conceptual representation is a continuum of forms comprising a series of positions in a space continuum experienced at rest or in motion according to the various modes of presentation in actual experience. Translated in terms of cognitive linguistics, these assumptions are equivalent to the base principle of construal in imagery, to which the conceptual schemes can be related. From this point of view, the paper has several features in common also with Langacker's (the dynamic character of conceptualization, the subjective point of view in construal and linguistic expressions, conceptual representations as a continuum of forms) and with Croft and Wood's contribute. Like Violi's essay, it investigates the primitive factors in perception and language which behave according to the particular force fields and patterns in which they appear. And like Wildgen's, it contends that the force field is not univocal as to coordination between content and lexicon. Finally, its analysis of Talmy's scheme of force dynamics is complementary to that conducted by Kövecses in his contribution.

#### 1. Background

Recent problems raised by artificial intelligence — such as the perception of forms, the recognition of natural languages, the problems of common sense,

naïve physics — and consequently the need for direct and non-propositional reference to the objects of experience (as cited, for example, by scientists working in robotics) have opened new areas of inquiry for the philosophy of language. Indeed, to quote Brian Cantwell Smith,

the most serious problems standing in the way of developing an adequate theory of computation are as much ontological as they are semantical. It is not that the semantic problems go away; they remain as challenging as ever. It is just that they are joined ... by even more demanding problems of ontology. (Cantwell Smith 1996: 14)

This seemingly brings to a close the decades-long phase in which reflection on language has proceeded along the twofold track of:

1. a logico-formal analysis of natural language based mainly on syntactically-oriented models;
2. a critique of ordinary language based on language use.

In some manner, therefore, scientific research has established the premises for a *second great linguistic shift* whose demands contemporary analytic philosophy seems entirely unable to satisfy. Oddly, this radical shift appears in certain respects to be a return to theories that preceded the paradigm that has characterized the twentieth century (see Albertazzi forthcoming (a) and (b)).

Recent investigations into naïve physics (Hayes), phenophysics (Petitot, Wildgen), and the dynamics of space-time continua (Leyton, Port and Van Gelder), have prompted the question whether it might not be possible to found semantics on *cognitive bases*, and in particular on *perceptive phenomena* (see Hayes 1985; Petitot 1994; Smith and Petitot 1996; Wildgen 1994; Leyton 1992; Port and Van Gelder 1995). The feature shared by these inquiries is their proposal of a *dynamic paradigm* in the stead of the merely *computational* one that has hitherto predominated in artificial intelligence. The dynamic paradigm provides not only (or not immediately) a set of mathematical tools, but also an essentially different *perspective* on the general nature of cognitive systems (see again Port and Van Gelder 1995).

It is space-time continua in particular that require clarification. Computational models based on Turing's machine specify a discrete sequence of static inner states in arbitrary 'steps' or stretches of time (t1, t2, etc.), so that *time* is simply a form of *order* (ibid.:2). By contrast, the proponents of a dynamic model affirm that a system changes from one *total state* to *another total state*. They therefore conceive change as involving *movements in space of all the possible total states of the system*. And since the space phases of their systems are

numerical, they apply natural notions of *distance* and *position* to them (ibid.: 15). It consequently seems that clarification of the nature of *space-time continua* requires, at various levels, *revision of the base primitives* and the use of *natural categories* like *distance*, *position*, *change*. Above all, it requires consideration of the *qualitative modes* of *change* and *unfolding* of the states of the system.

These new implications of scientific research have been matched by developments in linguistic theory. Over the last ten years, a number of linguists have developed a *cognitive semantics*, and they are now beginning to analyse language on the assumption that there are broad similarities among perception, lexicon and grammar. Hence derives the hypothesis that it might be possible to identify meaningful *constitutive features* underlying linguistic expressions, a hypothesis once advanced by Jakobson, but also by psychologists and descriptive psychologists like Stumpf and Marty (see Albertazzi, Introduction, and Albertazzi forthcoming (a)).

The theory of cognitive semantics rests on identification of *Gestalt schemes* from the world of perception, and principally the following:

1. BASE/PROFILE
2. SCANNING
3. POINT OF VIEW
4. ATTENTION DISTRIBUTION
5. FORCE DYNAMICS
6. BARRIER

The most fundamental of these schemes are 1 and 2.

BASE/PROFILE is the primary distinction. We know from classic studies on Gestalt that the figure in the perception possesses the aspect of the 'thing'. It is usually situated in front of the ground and is remembered better than the ground, as well as being more compact and smaller. The ground extends behind the figure and is shapeless and larger. Finally, the outline that separates the figure from the ground belongs to the former, not to the latter.

In cognitive terms, the figure is what moves or is 'conceptually a moveable object', while the ground acts as the context of reference and is static and stationary with respect to the figure (Talmy 1996). The location of the figure, its path or orientation, are the saliences that characterize it with respect to the ground. In any figure it is possible to distinguish between the profile and the base: by 'profile' is meant the entity depicted; by 'base' that part of the scene required to characterize the profile. From a linguistic point of view, as Langacker affirms, "The base for a linguistic predication is its domain, i.e. the

cognitive structures it presupposes, its profile is a substructure of the base that is elevated to a distinct level of prominence as the entity which the expression designates” (Langacker 1990:61). Examples are ‘the water near the island’, ‘the bicycle in front of the house’.

The sequential scheme of SCANNING involves the temporally successive transformation of one scene into another. Scanning concerns the cognitive analysis of a multiplicity of schemes active within movements in the physical world but which may be generalized to every type of conceptual dynamic. Rather than base and profile, this scheme comprises trajectors and points of reference or landmarks. The scanning scheme consists of both a *sequential* reading, which expresses the progressive transformation of one configuration into the next (for example, in ‘falling’), and an *additive* reading, which considers all the schemes to be coexistent and simultaneously present (for example, in ‘fall’).

In scanning, as Langacker observes, “The various phases of an evolving situation are examined serially, in non cumulative fashion; hence the conceptualization is dynamic, in the sense that its content changes from one instant to the next” (see Langacker 1990:78–9). An example in language is ‘the leaves are falling down the tree’ and ‘the fall of the leaves from the tree’.

I shall deal with schemes 5 and 6 in Section 3 and those that follow.

Cognitive semantics has not yet moved into the mainstream of language theory, even though some of its exponents (Talmy, Lakoff, Langacker and Fauconnier, for example) have achieved sophisticated levels of analysis. One possible reason for this — apart from the academic dominance of rival theories like Montague’s semantics or Chomsky’s generative grammar — is that cognitive semantics still *lacks the well-developed technical apparatus* possessed by other semantics, and for the time being this deficiency makes the discipline difficult to ‘implement’.

Cognitive semantics is still passing through the exploratory stage typical of new scientific paradigms. Yet the close attention that it pays to identification of the *basic patterns of conceptualization* and of the *semantic primitives* that operate in language is only to its credit.

Given what we may call its ‘foundational’ aspect, cognitive semantics is of considerable philosophical interest — interest, in fact, which centres on the Aristotelian issue of the *natural origin (physei)* of language. In particular, the question once again raised by cognitive semantics is whether there exist *contents* and *structures* of the phenomenal world which are *transposed* into language as *nuclei bearing semantic and syntactic features*. If this could be demonstrated, then strong evidence would be forthcoming in favour of the non-conventionality —

at least in principle, obviously — of language (see Albertazzi 1998c).

Finding this evidence requires philosophical analysis of the pre-linguistic and pre-categorial structures in the strict sense, as well as explanation of how the successive levels of predication and modalization develop from ante-predicative structures. In other words, inquiry must establish whether and how perception gives rise to the *semantic categories* of substantive, verb and adjective, and to the *linguistic modes* (optative, declarative, hypothetical, etc.). And especially necessary is investigation of whether and how the *expressive modes* of language operate through the *modes of signification* (see Husserl 1900–1 and 1939; Albertazzi 1998c). This latter question, to which the medievals paid close attention, has been entirely neglected by the formal analyses of this century (on the *grammaticae speculativae* and the work of Thomas of Erfurt, see Pinborg 1972).

As mentioned, cognitive inquiry of the type conducted today by cognitive semantics had already been amply developed at the beginning of this century: from a philosophical point of view by Husserl, Marty and Bühler, and from a strictly linguistic one by Trubeckoj, Hjemsløv and Jakobson. There was, moreover, considerable cross-referencing between the two lines of inquiry, both of which hypothesised, in various ways, that there exists a *continuum* and *variation by degree* between lexicon and grammar.

A closely similar hypothesis is advanced by contemporary cognitive semantics, with the specification that grammar comprises morphology and syntax (see Langacker 1991:115). The above-discussed *schemes* employed by cognitive semantics to exemplify this hypothesis, however, suffer from two weaknesses:

1. They are *not always well-defined*. In fact, they are variously described in terms of “diffuse location in a state space” (Langacker), “gestalt patterns” (Lakoff), and so forth, without further specification of the character of this ‘cognitive’ space and of the particular nature of these patterns (on the concept of schema see Peruzzi 1998).
2. They fail to account for the *complexity of the situation* to which they refer.

For example, Langacker’s SCANNING pattern does not take account of the various *expressive forms of falling movement*, although from a psychological and phenomenological point of view there is a large amount of experimental and theoretical literature on the phenomenon (see Minguzzi 1968; Michotte et al. 1962). This, like other examples, intuitively demonstrates the *great expressive capacity* of cognitive semantics, and at the same time the wide implementation of the underlying theory that psychological and philosophical analysis could undertake.

Some cognitive semanticists, Talmy in particular, distinguish *two sub-systems* in language which perform distinct although complementary semantic functions: the lexicon and the grammar.

On this view, lexicon and grammar specify *two different parts of the cognitive representation* evoked by language in the listener — which was a central tenet of descriptive psychology from Brentano to Twardowski to Marty, and thence to Bühler's *Organon Modell der Sprache* (see Brentano 1956; Twardowski 1894; Marty 1908; Bühler 1934). In particular, lexical items convey *content* while grammatical forms convey *structure*.

I shall seek to buttress Talmy's argument that the *coordination between content and lexicon is not univocal* but instead concerns the *modes, conditions and constraints* by means of which certain perceptive saliences prevail over others and *combine* or *merge* to form one particular configuration rather than another, according to the force field in which they are concretized (see Albertazzi 1998c and 1998d).

In other words, I shall try to provide philosophical justifications for the thesis advanced by cognitive semantics that — from the primitive forms of kinaesthetic representation to cognitively most sophisticated ones — there is a *subjective* (but not subjectivist) POINT OF VIEW involved in the construction of linguistically meaningful expressions.

For this purpose, I shall analyse certain aspects of spatial perception, given that the *conceptual organization of space* plays a pre-eminent role at the level of semantic representation (see Jackendoff 1983). The aspects that I shall consider concern some specific qualities of *perceptive patterns*, like *size, shape, position, distance* and *direction*.

I shall analyse two aspects in particular of [Talmy's semantics](#):

1. the *temporal* structure of spatial perception (see Talmy 1983:236);
2. the presence and nature of *tensions* and *forces* in spatial patterns (see Talmy 1988).

This will also give me an opportunity to clear up a misunderstanding that sometimes surrounds Len Talmy's work: namely that his analysis, unlike Lakoff's or Langacker's, is substantially *speculative* (see Serra Borneto 1993: 458). It is not speculative. On the contrary, it is a highly subtle linguistic analysis based on a *complex theory*; and attempting a foundational approach to it is an extremely difficult undertaking.

## 2. The road runs through the trees

A question that spontaneously arises when we set out to analyse language is the following: how is it that we are able to *codify* into a single-dimensional linear structure — a phonetic string — *things* that the language of our experience views as three-dimensional *objects*? The question is extremely interesting from an experimental point of view as well: consider, for example, the problems posed by Marr's theory of vision (see Marr 1982).

Cognitive semantics usually explains the phenomenon by relying on largely undefined *schemes of the imagination* which function as Gestalt patterns and in some cases (in Lakoff and Johnson's theory, for example) are regarded as intrinsic to bodily movements. These schemes are then allegedly *transferred, transposed, projected* into abstract domains, where they give rise, for example, to *linguistic metaphors*.

To quote Johnson:

concrete bodily experience not only constrains the input to the metaphorical projections but also the nature of the projections themselves, that is, the kind of mapping that can occur across domains. (Johnson 1987:15)

The concept of *truth* underlying cognitive semantics therefore does not possess the truth-functional features of formal semantics. On the contrary, as Lakoff states, it is a radical concept based on *kinaesthetic schemes* which are true

by virtue of the directness of the fit between the preconceptual structure of experience and the conceptual structure in terms of which the sentence is understood. (Lakoff 1987:297)

I tend to agree with this view, although the thesis is 'exhibited', 'shown' and exemplified by means of linguistic expressions and is certainly not 'proved', as well as being in danger of begging the question. In this case too, there is a large body of theory on these aspects underlying the structure of kinaesthetic schemes, most notably Husserl's analyses of the topic in *Thing and Space*, and Lewin's theory of the valences (both goal and BARRIER) of force fields in his *Topological Psychology* (see Husserl 1973; Lewin 1936). Moreover, a theory of *direct meaning* based on *proprioception* constitutes the core of Brentano's theory of intentional reference (see Brentano 1874 and 1976; on this point see Albertazzi 1998b).

In other words, both Lakoff and Johnson stress that *orientation* and *movement* are essential for coordination between *perceptive experience* and



*linguistic transposition*, but they do not provide an explanation of the phenomenon; nor, in particular, do they show any insight into the basic *structures* that govern the rules of transposition. Indeed, strictly speaking, as linguists it is not their responsibility to do so.

For my part, I would point out that, at this level, space and time, and with them the direction, orientation, velocity and movement of which they are bearers, are *not yet* 'content' schemes. Rather, they are *structures* of a perceptive space-time with distinctive features and which are in some way the outcome, as I shall seek to show, of the *embedding* of different semantic spaces (see Musatti 1924; Albertazzi forthcoming (c) and (d)). The *content* of the schemes of cognitive semantics, in fact, depends on other 'filling' factors like colour, sound, tactile-kinetic perception and, more in general, tertiary qualities (see Albertazzi 1997b and 1998c).

The argument that I wish to advance is that natural language is rooted in:

1. dynamic temporal structures, in spatial perception as well;
2. not immediately Euclidean spatial structures; and that the latter structures constitute dynamic force fields.

The features of the schemes of perception analysed by cognitive semantics from the linguistic point of view relate essentially to the following aspects of *visual perception*:

- PATH
- VERTICALITY
- HORIZONTALLY

and

- FORCE
- BALANCE
- BARRIER.

I shall accordingly analyse certain *foundational* aspects of these schemes on a perceptive basis. My argument divides into two parts:

1. Spatial perception is woven together by perceptions of forces which inhere partly in the field and partly in the forms of cognitive completion performed by the act of perception (see Albertazzi 1995a and 1998b).
2. Spatial perception is essentially temporal perception, in the sense that time is the source of topological extensity (not of extension) and of the continuity of the spatial perceptive forms. I shall illustrate this argument with examples

of the variation and articulation of the PATH scheme, seeking to show the perceptual *origin* of this scheme in spatial perception as well (see Talmy 1975).

These two statements essentially assert a *psychological mechanics* of perception. I shall give arguments for the first point here and in the next paragraph. Arguments for the second point will be given in paragraph 4.

As to the first point, i.e. that *spatial perception is woven together by perceptions of forces*, examples are provided by *primitive spatial representational elements* like dots, lines and angles, which are the bearers of velocity, intensity and direction. In both the former and the latter case, what we have is substantially a variation on the fundamental PATH scheme. In fact, between the source and the final point of a direction there are *obstacles* of various kinds which act as constant *barriers*, as Talmy points out on several occasions. Here the PATH scheme links with the FORCE scheme, or the scheme that expresses the *intensity* and the *direction* of the vector (see Talmy 1988).

The PATH scheme is both the simplest and the most frequent scheme in language, since, as Johnson rightly observes (see Johnson 1987: 38), it represents the process of reasoning as moving along a path. In its essential version it consists of a *straight line* from A to B, and it intrinsically contains a tension towards development into a curved, broken, zig-zag, sinusoid, etc., line, according to different points of direction. The ornamental designs of Celtic paintings, for example, depict this type of 'natural' progression.

In language, these cognitive and phenomenal schemes of perception underlie expressions like 'the road runs through the trees', 'the queue of cars on the motorway stretches as far as the first curve to the west', 'the conversation took a dangerous turn', 'Veronica's mind went back and forth', 'the cracks in the wall widened overnight', 'the mountain range goes from Canada to Mexico' (the last example is taken from Talmy 1996). The same scheme comprises forms of anaphoric deixis like, 'can you go back to the main point of your argument?' or 'let's start playing again from three bars before'.

How does perceptological and philosophical reflection sustain this point of view?

### 3. A mechanics of rest and motion

The semantic problems addressed by Talmy in the FORCE DYNAMICS scheme are also central to Theodor Lipps's *mechanics of states of rest and motion*, which he

set out in his *Raumaesthetik* (Lipps 1897; on this see Albertazzi 1998d). The similarities between the two theories, although they apparently concern different fields — one semantics, the other the dynamic nature of perceptual space — are striking.

Lipps maintained that the visual *perception* of forms is woven together by *direct presentations* of *natural type* (*mechanische Vorbilder*) of perceived form, and that the *modalities* of perceived objects are rooted in our experience of physical *forces* of movement.<sup>1</sup>

Conceptual representation can therefore be conceived as a *continuum* of forms which may be experienced at rest or in motion, in change or in stasis, in relation to the various *modes of presentation* of objects in actual experience. Thus the *natural space* of Lipps's mechanics is a *homogeneous series of positions* in the natural spatial continuum.

**Lipps's theory of spatial aesthetic mechanics rests on the following basic principles:**

† The *principle of aesthetic mechanical unity*, which states that geometric forms must be *posited* according to *specific directions* which depend on the *determinateness of the form*. For this reason, the principle of mechanical-aesthetic unity covers several types of unity, namely:

- a. *successive* unity;
- b. *simultaneous* unity;
- c. *antagonistic* unity.

a. Mechanical-aesthetic unity is *successive in the case of spatial forms which move in a certain direction or which follow each other in the same direction*, like zig-zag lines or tree patterns formed by roots, trunk, branches, leaves, and so on. The original image of successive unity is *singular*; that is, it is given by a *movement of departure and arrival*, a sort of embryonic *PATH* scheme.

Variations of the *PATH* scheme are all the directions of perceptual continua, like verticality-horizontality, up-down, in front-behind, right-left, etc. I have already pointed out the fundamental role played by the *PATH* scheme in language.

b. Mechanical-aesthetic unity is *simultaneous when form originates simultaneously from the same space*. This is the case, for example, of a *forest* or a *colonnade*, or more simply of lines which *run freely across a surface* and imprint the character of a corresponding movement on it.

The amplifying effect of this type of aesthetic-mechanical unity is plainly visible in the walls of a building traversed by lines, and it closely reflects, for

example, Kandinsky's idea of *free lines* (see Kandinsky 1926).

In this case the original image of the simultaneous unity is one of *unity-in-multiplicity*. In language, this kind of unity is exemplified by the interweaving and dynamic role of schemata *carrying meaning through the entire fields of cross-domain*, as cognitive linguists put it.

c. Mechanical-aesthetic unity is *antagonistic when it acts as the border between the former two types and gives origin to movements in opposite directions which generate antagonistic activities* like *bowing, opening the arms, or grasping objects*.

This is a unity that mediates between differentiation and opposition. It is manifest in dynamic models, in ballet, or in architecture. At the basis of this scheme is the rhythmization intrinsic to the apprehension of perceptual unities (see Sander 1926; Sander and Volkelt 1962).

In language, antagonistic unity is well expressed by the *FORCE* schema, which comprises such notions as vector, contact, impulse, and even the impact produced on the organism by tertiary qualities — as in Lewin's theory of affordances (see Lewin 1936; on tertiary qualities see Albertazzi 1997b).

**A second fundamental principle of mechanical aesthetics is:**

2. The *principle of equilibrium*, which articulates into the two following sub-principles:

- a. the principle of *competitiveness*;
- b. the principle of *confluxion*.

The principle of equilibrium rests on the fact that *every activity has a counter-tendency* (principle of competitiveness), so that a form at rest is in a state of equilibrium between two contrary tendencies. A classic example of a state of equilibrium is provided by the golden section, which is in fact best suited to artistic styles which refer to the organic world, like Art Deco (Zimmer 1998: 54).

Also at work is the *principle of confluxion*, which helps to *shape the spaces of natural forms*. A straightforward example is the Müller-Lyer illusion, where the lines appear to be of different lengths because, according to Lipps, also the *parts of the external space* on both sides are involved in their assessment (Müller-Lyer 1889; Lipps 1897).

According to Lipps, therefore, *form* is the result of an *activity of boundary-making* involving an interplay of *forces* which gives rise to the unitary apprehension of a particular configuration without contradictions. Consequently, starting from the perceptive continuum, the *boundary* which identifies a form

is the only truly *active* thing, and as such it is also the fundamental *fact* of force mechanics — a view shared by Lipps and Brentano.

As I shall seek to show, the principles of Lipps' mechanics of perceptual space provide a good introduction to Talmy's scheme of FORCE DYNAMICS, from both a psychological and a philosophical point of view.

#### 4. Conceptually 'removable' objects

Cognitive semantics constantly refers to *spatial frames* and *conceptual spaces*. The concept of space, indeed, is essential for a semantics with geometrical foundations. But to which space and to which geometry does cognitive semantics refer? Certainly not to some sort of Riemannian space, but rather to the *natural space* of everyday perception, although this is absolutely not a 'simple' space to describe because it comprises, amongst other things, complex *interplays of forces* and *dynamic objects*.

I would stress first of all that *spatial* perception is essentially *temporal*. The examples provided below in support of this contention are extremely common visual materials like the leaning towers of Italian cities and road signs, but the consideration also applies to more sophisticated perceptions like stereokinetic movements (see Albertazzi forthcoming (e)).

The point is the most apparently disputable, since, as it is well known, for example, many temporal terms in language derive from spatial ones but not viceversa (on the expression of spatio-temporal relationship in language see Traugott 1978 and Svorou 1994). It is nevertheless the case that, from a perceptual point of view, every perceptive content, whether visual, auditory or tactile-kinetic, displays a *synthetic internal structure* which is manifest in its *persistence*.

At issue in this case, is the role of the elementary visual phenomena as *schemes* of experience which function as *props* for the development of thought. In favour of the hypothesis of an *essentially temporal scheme* operating in visual perception there are a lot of examples. To present an intuitive one, leaning towers (Albertazzi forthcoming (e)).

Why is the Tower of Pisa, or the Asinelli tower in Bologna, so impressive? Because it seems to be falling on top of us as we walk beneath its leaning side, and also because at first sight it is decidedly *crooked* and — apparently at least — in breach of the laws of physics. However, even though we are reassured that it will not fall (and so far it has not) because there are other physical laws that ensure its stability, a number of problematic features remain.

There is *verticality*, for instance, which is a typical directional index of many objects in the phenomenal world, like towers. In other words, we expect towers to be vertical, possibly solid, and not oblique. For this reason the *overestimation* of verticality is a general phenomenon of experience. In fact, the height of fifteen- or twenty-metre-high buildings is usually overestimated, compared with the same lengths in the horizontal, and rectangles are often perceived as slightly over-tall squares.

Hence there is an asymmetry and a heterogeneity in the estimation of directions which suggests a mix between *visual space* and *kinesthetic functional space*, which also confirms Lakoff's theories from a linguistic point of view. More in general, these findings display interesting features and raise a number of problems, including:

- i. the phenomenal problem of the connection between *verticality*, *solidity* and *incumbency*;
- ii. the problem of the verticality of solids as their *canonical state* but virtually prone to alteration over time;
- iii. the problem of justifying the *sensate connection* — to use Koffka's expression — between the spatial geometry of vision and the dynamic temporality of kinesthesia.

This example also concerns the presence of an *implicit temporal scheme* even in apparently static visual perceptions. The problem of the leaning tower, in fact, can be summed up in the fact that at every single actual moment of visual perception we are dealing with a *single state* of a *process*. In this case, the leaning tower is a 'parallelogram' in a certain state of rotation, in one single static presentation of the whole virtual process. In other words, the leaning tower remands to a straight vertical tower as the *initial state* of the process of rotation and inclination. The actual static visual presentation of the Tower of Pisa obtained whenever we look at it, therefore, virtually contains within itself, as traces, *multiple states prior and subsequent to the actual state*. Hence actual visual *spatial perception is intrinsically temporal* (see Leyton 1992; Albertazzi 1995a, 1998d, and Albertazzi forthcoming (e)).

This fact can be explained from the cognitive point of view as the necessary integration and *completion* of the *structural incompleteness* of every actual perception, and from the *material* point of view as the presence of dynamic elements intrinsic to the texture or phenomenal material of experience.

Put simply: I implicitly judge the Tower of Pisa to be leaning because I recognize it as a *non-independent moment* of a process of rotation, or of deviation

from a canonical state, as in the case of the rotation of a parallelogram, of which the tower is a paradigmatic example. Secondly, I judge the tower to be leaning because the materials of which it is made (stone, brick, etc.) intrinsically convey a sense of staticity and solidity. These are non-volatile materials, ones that are 'heavy' and which therefore tend to assume a position of verticality. From this point of view, the Tower of Pisa, as a whole 'content', is part of a multiple process of intentional states: it is a *state internal to the present* which presupposes a duration.

But there are other very simple examples in favour of my thesis. Public buildings usually contain signs, like *arrows* indicating emergency exits or *notices* stating that it is prohibited to go up or down, and so on. Let us examine the 'emergency exit' sign. This consists of a stick man whose *static* scheme of running is indicated by the *directionality* of his legs, which elicits the perception of rapid movement.

A similar effect is apparent in road signs, like the one which warns drivers of 'rock falls', where the 'fall' is symbolized by the *progressively descending directionality* of the rocks from *left to right* or vice versa. The same applies to the sign 'warning: humpback bridge'. The examples abound.

At the linguistic level, the phenomenological nature of these schemes has been analysed by Langacker, in particular as regards the *SCANNING* scheme, already mentioned, which well exemplifies the 'rock fall' sign in its double *static* and *dynamic* conceptualization.

The simple example of warning signs evidences that woven together in spatial perception are *dynamic structures*, or *parts* of structures, whose traces are deposited in photograms or graphic representations of reality. It is not the photogram, in fact, which tells us that the stick man of the 'emergency exit' sign is running, but a series of *contents* and *successive mental images* of which the photogram is a *non-independent* and implicitly related *part*.<sup>2</sup>

Every perceptive content, whether visual, auditory or tactile-kinetic, therefore displays an *inner synthetic structure* which is made explicit in its duration (see Husserl 1985). The issue therefore concerns the role of elementary visual phenomena as *schemes* of experience which buttress the development of thought.

The hypothesis of an essentially temporal scheme underlying visual perception is supported by other examples.

Some perceptive phenomena, *stereokinetic* movements for example, are important because they provide justification from a foundational point of view of one of Talmy's semantic notions. I refer to the *conceptually removable object* whereby movement can be attributed 'conceptually' to objects which appear to

be intrinsically stable. Numerous examples are to be found in language — as in the sentences cited earlier, or when one says for example that 'the road *runs* along the coast', or 'it *moves* through the trees' or, in examples also taken from Talmy, 'the road runs past the factory', 'the road goes from Burney to Redding' (see Talmy 1991).

In all these cases, although the 'road' is in itself a *static object*, linguists point out that, by occurring with verbs of movement, it conveys the movement itself. But there is a second important aspect to expressions of this kind: the road may be *mentally represented* as a *sequence of points* (see Serra Borneto 1991:454). The same scheme is apparent in examples used by Langacker: 'the hill falls gently to the bank of the river' or 'the hill rises gently from the bank of the river' (Langacker 1987:87).

In all these cases the 'construction' of perceptive reality, and specifically visual reality, involves a complex set of *proprio-centric operations* of completion, and it is thus part of a more general theory of the *acts of intentional reference*. Moreover, the fact that during perception a particular form may vary (obviously to a limited extent) and assume specific features at a certain point of its development (within the time of presentness) provides further evidence of the *temporal scheme* structurally implicit in visual perception (see Albertazzi forthcoming (e)).

This means that the actual perception of an object of some kind, whether it is perceived at rest or in motion, involves both a *succession of temporal modes* and the *perception of this succession*.<sup>3</sup> In other words, both phenomenal objects at rest and phenomenal objects in motion are perceived as such by virtue of the temporal structure of the presentation, which is directly addressed to the phenomenal object given in the *individual moments-now* of the actual presentation and indirectly maintains the individual *phases* of the presentation of the object of the overall duration of the time of presentness (see Brentano 1874). The same occurs in the construction of a significative expression.

All these examples — which are taken from the visual perception of phenomenal events or from their schematic and substantially *spatial* depiction — have a number of characteristics in common. They all, even the most *static* and *schematic* of them, exhibit *kinematic* and sometimes *dynamic* properties tied both to their *virtual capacity for movement* in perceptive space and time and to the implicit change brought about by the more general *field structure* in which they are located, as in the case of apparent movements.

Also the *geometric forms* of visual perception therefore — in so far as they are experienced at the phenomenal level — manifest a processual component

which at first sight is entirely unnoticed. Although a geometric form remains such at rest, it is *nonetheless* a temporal process even if it does not undergo any apparent change of form.

### 5. Signs of place, signs of direction, perspective points

The phenomena discussed above demonstrate from a phenomenal point of view that every particular of the visual field has its own *behaviour* which assumes partly different aspects according to the *force field* and to the *patterns* in which it manifests itself.

This diversity of behaviour among perceptive particulars according to their field is surprisingly apparent even in the simplest of patterns. For example, the perceptive evaluation of the empty *distance* between two points is different from the evaluation of a *straight line* drawn between two points, and so too is evaluation of the size (or better *thickness*) of the points themselves. The same applies in the case of phenomena of *assimilation*: for example, if a small circle and a large circle are placed next to each other, the small one seems larger. There are endless variations on this phenomenon (see Lipps 1897).

The diversity of behaviour among the details of the visual field indicates — as in the case of the temporal perception of spatial figures — that there are *signs of place*, *signs of direction* or perspective points corresponding to the *positions* of various types of details: dots, lines, surfaces, angles, curves, patterns. One of the tasks of the pre-categorical analysis of semantic phenomena is therefore to *single out* the *primitive factors* which convey the *visual forces of direction, relation and expression*.

In cognitive semantics this task is performed by the *FORCE FIELD* scheme analysed by Talmy. This scheme considers the state of two entities which manifest force as direction either towards a movement or towards a state of rest. The more powerful entity is the one that manifests one of these tendencies at the expense of the other. The forces of the two opposed entities give rise to a form of either action or inaction. In language as in perception, therefore, an *Agonist* and an *Antagonist* oppose each other, and the outcome of their contrasting forces is a state tending towards action or towards motion. The balancing of these forces, in other words, comes about through the clash between a weaker and a stronger force.

Examples of sentences which express this situation are ‘the ball kept rolling because of the wind blowing on it’ or ‘the ball kept rolling despite the stiff grass’ (see Talmy 1988). Further examples, again taken from Talmy, are sentences like

‘he sailed along the coast *following the wind*’ and ‘he sailed along the coast *against the wind*’ (ibid.).

Like all the schemes in Talmy’s semantics, that of *FORCE DYNAMICS* is highly refined in its structure, given that it is derived from a powerful intuition and comprises a variety of levels. For example:

- the ball kept rolling because of *the wind blowing* on it  
AGO ANT resultant >
  - the ball kept rolling despite *the stiff grass*  
AGO ANT resultant >
  - the shed kept standing despite *the gale wind blowing against it*  
AGO ANT resultant •
  - the log kept lying on the incline because of *the ridge there*  
AGO ANT resultant •
- Legend: *Agonist/Antagonist*; • = Rest; > = Motion; entity

The *FORCE DYNAMICS* scheme also displays a stratification of levels. For example:

- i. *physical level*:  
the ball was rolling along the green  
the ball kept rolling along the green
- ii. *physical-psychological level*:  
John doesn’t go out of the house  
John can’t go out of the house
- iii. *intra-psychological level*:  
he didn’t close the door  
he refrained from closing the door
- iv. *lexicalized intra-psychological level*:  
she’s polite to him — she’s civil to him
- v. *socio-psychological level*:  
she’s got to the park — she gets to go to the park

However, as in the case of *SCANNING* discussed earlier, the *FORCE DYNAMICS* scheme would benefit greatly from a psychological and philosophical analysis which explicates its inner forms of modalization. In fact, the *FORCE DYNAMICS* scheme *almost always* comprises two forces:<sup>4</sup>

- which oppose each other (non-cooperating)
- at 180° (not in different ways)



- with different (unequal) strengths
- acting in a straight line (not along curves or concentrically)
- in which the antagonist exerts constant (non-variable) force
- which aims at action or rest (i.e. at two values)
- which has two-value final state (action or rest).

In other words, whilst cognitive linguistic semantics expresses the *internalization* of principles from intuitive mechanics, a foundational analysis conducted in both philosophical and psychological terms may enrich it and help to specify its base schemes.

From a *perceptive* point of view, in fact, force dynamics are highly complex. Firstly, operating in the visual field are:

1. a *cohesion* principle according to which a surface lies on an object if and only if they are connected;
2. a *contact* principle according to which surfaces move together if and only if they are connected;
3. a *continuity* principle according to which an object follows exactly the same spatially-temporally connected trajectory (see Eilan, McCarthy and Brewer 1993: 103).

Secondly, internally to the visual field the qualities that saturate it must *extend* themselves to fill the field in uniform manner without leaps or qualitative interruptions. These are still not qualities of spatial extension; instead, as already mentioned, they are qualities of *extensity* — to use an expression from Brentano's metaphysics of continua (see Brentano 1976). The fundamental characteristic of perceptive fields, therefore, is the *topological elasticity* of their particulars.

In other words, the visual perception of forms is woven together by direct presentations of the *natural type* of perceptive form, and the *modalities* of perceived objects are rooted in our experience of physical forces in motion.<sup>5</sup>

A representation may thus be conceived as a continuum of forms experienced at rest or in motion, in change or in stasis, in relation to the diverse modes of presentation of objects in actual experience. In this way, *natural space* is identified with a *homogeneous series of positions*.

Any tendency can only be thought together with a counter-tendency, and both of them act simultaneously and in the same spatial place (see Benussi 1913 and 1925). Moreover, these two tendencies are never simultaneously filled in the perceptual field, so that every form or element of a form brought into being by this opposition is subject to opposing influences. Indeed, when they are not in equilibrium, *perceptive illusions* may arise.

One of the principles governing this force mechanics is the *equilibrium principle*, which in turn comprises two sub-principles:

1. The principle of *concurrence*, according to which every agent activity has a counter-tendency: a form at rest, in fact, is nothing but a state of equilibrium.
2. The principle of *confluence*, according to which the entity endowed with greater force and the one with lesser force balance out their forces, eventually giving rise to a state of rest or a state of motion.

Arguing Talmy's thesis in philosophical and psychological terms therefore requires development of a *psychological mechanics*, that is, analysis of the *states of rest and of motion of spatial patterns* and of the characteristics of perceived movement. It is consequently also necessary to conduct detailed analysis of the *spatial presentational primitives*, of their *indices of direction*, of their *boundaries*, and of their perceptive *regularities* (see Albertazzi forthcoming (d)).

These mechanics also comprise *empathic* elements, in the sense that when perceptive Gestalten are formed, directional possibilities — or more simply directions — of the psychophysical whole arise which function as member-structures within the overall structure of the personality.<sup>6</sup> In fact, *directions rightwards or leftwards, upwards or downwards*, and so on, are *proprio-centric* in origin. Put more simply, we *transfer* the activity, the effort, or the *pathos* experienced within ourselves into perceived external forms.

At the basis of a cognitive theory of *linguistic metaphors* there consequently lies a thoroughgoing theory of *empathy*. Indeed, when developing the principles of a psychological mechanics one must, at least in general, demonstrate some of the claims of cognitive semantics mentioned at the outset: for instance those relating to *imaginative schemes intrinsic to bodily movements* which are then *transferred* by perception to cognition. This seems to be an excellent point of departure for analysis of the *morphogenesis of metaphors* (see Lakoff 1987).

## 6. Conclusions

In the light of the foregoing analysis it seems possible to argue that the *structure of intentional presentation* governs the architecture of both *cognitive* structures and *linguistic* structures. And this means that there is evidence to support the *cognitive hypothesis* in semantics.

Secondly, there is a substantial body of evidence for the existence of a close connection between the *pre-categorical* structures of perception and the *genesis* of

the categories of natural language. In particular, an extremely promising area for further research is a theory of language which starts from a *perceptual presentation*, so to speak, of the linguistic structures — or in other words, a theory which starts from the structures of perceptual continua like time, space, sound, colour, and so on, and their oppositions: continuity and rhythm, openness and closure, phenomena of displacement, *Pregnanz*, transposability of forms. I am firmly convinced, for example, that we shall never be able to handle the problem of metaphor until we have determined the structure of *cognitive transposability*: a line of enquiry which could fruitfully support Lakoff's work and in a sense fulfil Jakobson's programme.

To conclude, I pointed out at the outset that cognitive semantics proposes a paradigm which in certain respects revives theories developed at the beginning of this century and which, broadly speaking, belong to *descriptive psychology* (see Albertazzi 1998a, and forthcoming (a) and (b)). As I have tried to show, a foundational approach of this kind to cognitive semantics would surely provide support for a theory whose complexity of analysis requires an equally sophisticated theory as its philosophical and psychological foundation.

The *scientific apparatus* underpinning this semantic analysis derives from two main fields of research. On the one hand, support is provided by certain *philosophical* theories: Lotze's theory of local signs, the metaphysics of continua developed by Brentano, Ehrenfels and Selz, Stumpf's analysis of the origin of spatial perception, and Husserl's writings on space and the passive synthesis of antepredicative experience (Brentano 1928; Lotze 1856–59; Ehrenfels 1985; Stumpf 1873; Husserl 1900–1 and 1966). On the other hand, scientific support for cognitive semantics is provided by *Gestalt* theory and experimentation. Most cognitive semanticists are aware of this affinity but lack detailed knowledge of aspects of Gestalt theory which they could profitably use: for example, Wertheimer on the temporal structures of forms, Katz on colour, Allesch on non-Euclidean space, Hornbostel on intrasensory integration, and then Brunswik on the perception of objects, Kardos on foundational studies of colour and shade, Benussi on the chromatic continua and a-sensory perceptions of form, Bühler on the aesthetic perception of straight lines, circles, curves and indices of directionality (Wertheimer 1922–33; Katz 1911; von Allesch 1931; Brunswik 1935; Kardos 1934; Benussi 1923–25; Bühler 1913). Also in this case, the examples abound.

Briefly, I maintain that the foundations of a cognitive semantics consist of analyses which could be defined *experimental phenomenology* and are characterized by complementarity between the *objectual description* of *observables* in

perception (to use Koffka's expression), and *psycho-physical experimentation* in the laboratory. Will cognitive semanticists accept this kind of research and enter into dialogue with it?

## CHAPTER 8

# Force and emotion

Zoltán Kövecses

Using the schemas of force dynamics to examine how the emotions are conceptualized in natural language, this essay conducts detailed analysis of the relationship between the metaphors of cause as force, and force (*qua* opponent) as a source domain of emotions. The author's main thesis is that the emotions provide the best representation of force dynamics in the space of conceptualization, for the metaphors relative to them always display a tendency towards inaction, which corresponds to the rational self (Agonist), and an entity exerting force (Antagonist), which is the cause of emotions.

In this respect Kövecses essay links closely with Albertazzi's (and its development of Talmy's theory of force dynamics) and Wildgen's (generic space as the space of force). It also exemplifies the construal structures described by Langacker. It is, in particular, the essay in the book that conducts closest examination of the key role performed by metaphor in the conceptualization expressed by natural language.

### 1. Introduction

In studies of emotion concepts from a cognitive linguistic perspective, one typically finds analyses in which emotion concepts are described as being characterized by a number of distinct and unrelated conceptual metaphors (see e.g. Kövecses 1986, 1988, 1990). This study challenges the validity of this view and offers a new way of looking at emotion concepts and the metaphors that characterize them.

In one common folk theory, emotions are conceptualized as causes that lead to certain behavioural responses. Since in the Event Structure Metaphor CAUSES ARE FORCES (see Lakoff 1990, 1993), it is natural to conceptualize emotions as forces that bring about certain responses, or effects. In fact, this seems to be the predominant way in which emotions are conceived in Western cultures. But as Kövecses (2000) shows, the FORCES metaphor can be found in



several non-Western cultures as well. Furthermore, it is a metaphor that applies to all basic (and many non-basic) emotions. For all these reasons, it plays a very important role in how we think about the emotions in general.

There are two points I would like to argue and stress in this paper. One is that most of the well-known metaphors of emotion (such as FIRE, OPPONENT, NATURAL FORCE) seem to be instantiations of a single underlying ‘master metaphor’: EMOTION IS FORCE. The other is that these metaphors instantiate the generic-level metaphor in very different ways, capturing very different aspects of emotional experience. Both of these points are significant for the study of emotion language because, given the first, we can see a degree of coherence in the conceptual organization of the emotion domain that has not been pointed out to date. This underlying coherence behind the conceptual metaphors makes it possible for us to see the precise ways in which the emotion domain is conceptualized in a systematically different way from other ‘neighbouring’ generic-level domains, such as rational thought or morality. Given the second claim, we can gain an idea of the details and richness of the conceptualization of emotion — without losing sight of its deep underlying coherence.

## 2. The FORCE schema

The EMOTIONS ARE FORCES metaphor has the FORCE schema as its source domain. There is considerable agreement among scholars that this schema is one of the basic image schemas that structure the conceptual system. This is how Leonard Talmy, who has studied it most extensively, characterizes the schema:

The primary distinction that language marks here is a role difference between the two entities exerting the forces. One force-exerting entity is singled out for focal attention — the salient issue in the interaction is whether this entity is able to manifest its force tendency or, on the contrary, is overcome. The second force entity, correlatively, is considered for the effect that it has on the first, effectively overcoming it or not. (Talmy 1988:53)

On the basis of this characterization, Talmy isolates the following factors in the force schema:

- Force entities:
  - Agonist
  - Antagonist

- Intrinsic force tendency:
  - toward action
  - toward rest (inaction)
- Resultant of the force interaction:
  - action
  - rest (inaction)
- Balance of strengths:
  - the stronger entity
  - the weaker entity

If we apply these factors to the concept of emotion, we obtain the following generic-level mappings:

Force Agonist (FAgo)	→	Emotion Agonist (EmAgo)
Force Antagonist (FAnt)	→	Emotion Antagonist (EmAnt)
FAnt’s force tendency	→	EmAnt’s force tendency
FAgo’s force tendency	→	EmAgo’s force tendency
FAgo’s resultant state	→	EmAgo’s resultant state

I will take the entity that manifests a force tendency toward inaction to be the Agonist, and the entity that exerts force on the Agonist and typically overcomes it to be the Antagonist. As a result of the interaction, the Agonist will usually cease to be inactive and produce a response. Typically, though not exclusively, the Agonist is instantiated by the rational self that is or will be emotional, while the Antagonist is instantiated by the cause of emotion or the emotion itself. Correspondingly, the Agonist’s typical force tendency in the emotion domain is to remain unaffected by the Antagonist, while the Antagonist’s force tendency is to cause the Agonist to change this state. However, as we will see shortly in the Table below, there are some significant exceptions to these generalizations.

The question that immediately arises is, of course, precisely how the set of mappings above applies to the emotion domain. As we shall see, there are numerous ways in which this abstract force schema can apply to the concept of emotion. We can get such specific-level instantiations of the generic-level EMOTION IS FORCE metaphor as EMOTION IS INTERNAL PRESSURE, EMOTION IS A NATURAL FORCE, EMOTION IS FIRE, EMOTION IS A BURDEN, and yet others.

To give some structure to the discussion, we may think of these more specific metaphors as focusing on basically two parts of the most general notion of the Western folk theory of emotion:

1. a cause leads to emotion;
2. emotion leads to some response.

Thus some metaphors have primarily to do with the part ‘cause → emotion’ (‘That *kindled* my ire’), while others with the part ‘emotion → response’ (‘He was *overcome* by passion’). That is, not only can emotion itself be conceptualized as a cause (and hence as a force) that produces certain responses, but also the cause of emotion, the event or object that leads to emotion in the first place. In this sense, then, the *cause* of emotion is even more naturally and obviously thought of as a cause, and hence as a force, than emotion itself. Moreover, some metaphors will be shown to play some role in the conceptualization of *both* parts of the skeletal emotion scenario just mentioned.

To give the reader an initial sense of the analyses to follow, the table below shows how two factors of Talmy’s abstract force schema, the Agonist and the Antagonist, are instantiated in the many specific-level metaphors of emotion:

Source domain:	AGONIST:	ANTAGONIST:
<b>I</b>		
INTERNAL PRESSURE	self	emotion
OPPONENT	self	emotion
WILD ANIMAL	self	emotion
SOCIAL SUPERIOR	self	emotion
NATURAL FORCE	self	emotion
TRICKSTER	self	emotion
INSANITY	self	emotion
FIRE	self	emotion
<b>II</b>		
HUNGER1	self	desire for emotion
HUNGER2	emotional self	insatiable desire
PHYSICAL AGITATION1	self	cause of emotion
PHYSICAL AGITATION2	body	emotion
BURDEN	self	emotional stress
<b>III</b>		
PHYSICAL FORCE	self	cause of emotion

Group ‘I’ indicates that the metaphorical source domains focus on the ‘emotion → response’ part of the scenario; group ‘II’ indicates that the source domains

can take either ‘emotion → response’ or ‘cause → emotion’ as their focus; and group ‘III’ indicates that the focus is on the ‘cause → emotion’ part.

I will start the analysis with those specific-level metaphors that are used to conceptualize primarily the second part of the scenario (emotion → response); then I shall look at those that seem to focus on both parts; and finally I will examine those that focus on the first part of the skeletal emotion scenario (cause → emotion). However, it should be kept in mind that this structure is used only to give some order to the discussion of the metaphors.

Many of the conceptual metaphors of emotion that have been identified so far in the literature (see Kövecses 2000: Ch. 2; and also, for instance, Lakoff and Johnson 1980; Kövecses 1986, 1988, 1990) are specific-level instantiations of the generic-level EMOTION IS FORCE metaphor. In other words, the claim is that we can account for a large proportion of the conceptualization of emotion in a coherent way if we assume the existence of the general-level EMOTION IS FORCE metaphor. Just as importantly, however, I also wish to show that all of the specific-level metaphors instantiate the generic-level one in a different way, addressing several distinct aspects of emotion. This is why we have an extremely rich understanding of the concept of emotion in the language-based folk model.

### 3. Specific-level metaphors focusing on ‘emotion-response’

Let us begin the survey and the reanalysis of specific-level emotion metaphors with perhaps the best known and most studied metaphor for emotion: EMOTION IS PRESSURE INSIDE A CONTAINER (see, for example, Kövecses 1990: Ch. 9).

#### EMOTION IS INTERNAL PRESSURE IN A CONTAINER

In the case of the emotions, the generic-level FORCE schema can be found in the more specific version of PRESSURE. The ‘internal pressure’ metaphor assumes two further metaphors: PEOPLE ARE CONTAINERS (FOR EMOTIONS) and EMOTION IS A SUBSTANCE IN A CONTAINER. The specific container for emotion is the human body, and the specific substance is typically a fluid or a gas.

Now let us see how the generic-level EMOTION IS FORCE metaphor is instantiated in this complex special case:

Source: INTERNAL PRESSURE

- 1a. *Agonist*: the container-entity that is affected by the pressure.
- 2a. *Antagonist*: the substance with pressure inside the container.

- 3a. *The intrinsic force tendency* of the Antagonist: substance-pressure on the container.
- 4a. *The intrinsic force tendency* of Agonist: the container-entity resists the pressure.
- 5a. *The resultant action* as a result of a stronger Antagonist's force: the substance goes out of the container.
- 5b. *The resultant inaction* due to a stronger Agonist's resistance: the substance does not go out of the container.

Target: EMOTION

- 1a. *Agonist*: the rational self.
- 2a. *Antagonist*: the emotion.
- 3a. *The intrinsic force tendency* of the Antagonist: the emotion causing the self to respond.
- 4a. *The intrinsic force tendency* of the Agonist: the rational self attempts not to respond.
- 5a. *The resultant action* as a result of the emotion's force: the self responds.
- 5b. *The resultant inaction* due to Agonist's resistance: the self does not respond.

Given these instantiations, we can explain the source-to-target mappings between the FORCE and EMOTION domains in the following way. In this metaphor complex, the level of the emotion substance may rise inside the container; if it does, the substance creates perceivable pressure on the container; the pressure may increase to the point that the substance is forced out of the container. In other words, when there is very little substance in the container, the pressure is low and thus emotion is at a low intensity; when the substance rises, this corresponds to an increase in emotional intensity; the pressure itself corresponds to the emotion causing the self to respond; the pressure's effectively bringing about an effect corresponds to the emotion leading to a response; and the substance forced out of the container corresponds to some external behaviour (response) by the self, or, alternatively, the substance not forced out of the container to the lack of response.

We can make this clearer by laying out the mappings for this specific-level metaphor as follows:

the substance with pressure → the emotion  
 the pressure on the container → the emotion causing the self to respond  
 the intensity of the pressure → the intensity of the emotion  
 the container-entity affected by the pressure → the self affected by the emotion

the substance going out of the container → the response of the self caused by the emotion  
 the substance not going out of the container → lack of response by the self

The particular type of force dynamic pattern that this set of mappings represents is what Talmy calls "shifting force dynamic pattern". In such a pattern, there occurs a shift in the balance of strengths between the Antagonist and Agonist.

Owing to the causal relationship between the emotion and the action-response, emotions are seen as motivations relative to the action-response. That is, in this schema the emotion is seen as an internal motivation for action (i.e., to respond). The motivation is conceptualized as an internal force, while the action produced is viewed as the external effect of this internal force. The greater the intensity of internal pressure, the greater the degree of motivation to respond emotionally. Thus, we can add the following to the above mappings:

internal pressure → motivation for action  
 external effect of the force → action (response) caused by the emotion  
 the intensity of the internal pressure to bring about an effect → the intensity of the motivation to respond emotionally

If the intensity of internal pressure increases beyond a certain point, this brings about an effect on the body-container — that is, an emotional response is carried out. The effect (i.e., the action) may be prevented by not letting the substance leave the body-container. (More will be said about this aspect later.) In other words:

attempting to keep the substance inside → attempting to control the emotional response

If, however, the self is unable to keep the substance inside the container, the external effect on the container takes place: an emotional response is performed. This may happen in two ways: either by the container overflowing or by the container exploding.

These two possibilities call for a refinement of Talmy's system, in that we have to recognize *two kinds of action* on the Agonist's part. When the container overflows, we get uncontrolled but non-violent emotional responses; when it explodes, we get uncontrolled violent responses, such as in the case of anger:

the overflowing of the container → uncontrolled non-violent response  
 the explosion of the container → uncontrolled violent response

The 'milder' or romantic emotions (like affection and sadness) are conceptualized as 'overflowing' the container, while the more 'violent' emotions are viewed as 'exploding' out of the body-container.

To handle a further elaboration of this metaphor, we can continue to use Talmy's system with a further modification: we can talk about the *resultant action of the resultant* action. That is, we obtain a chain of resultant actions, which are in fact the entailments of the metaphorical source domain (as explained by Lakoff and Kövecses 1987). The damage to the container and/or things/people nearby caused by the explosion is the social, psychological damage caused by the uncontrolled violent behaviour to the self and/or other people who are involved in the situation:

the damage caused by the explosion → the social damage caused by the violent response

A crucial aspect of this metaphorical reasoning is the 'point beyond which' emotional control cannot be maintained. This point on the intensity scale of the container-entity's resistance to internal pressure corresponds to the notion of 'emotional tolerance' — that is, the self's emotionality, or disposition to emotional behaviour.

However, it is not claimed that all external emotional responses are internally motivated. When this is the case, we have the conceptualization of emotions not as internal forces (internal pressure) but simply as substances in the body-container. Thus the container may have a little or a lot of substance in it, or it may be empty or full, but the emotional responses of the self will not be seen as 'caused' by an internal force. This is characteristic of the less prototypical, weaker emotions, such as respect or less intense forms of otherwise 'stronger' emotions.

#### EMOTION IS AN OPPONENT

The emotions are also conceptualized as opponents in a struggle. There are a number of linguistic examples that show this:

He was *seized by* emotion.  
 He was *struggling with* his emotions.  
 I was *gripped by* emotion.  
 She was *overcome by* emotion.

The struggle takes place between the self and an emotion as opponents. The self first is in control of the emotion, but then the emotion causes the self to respond, that is, to lose control. The self attempts to maintain control over the emotion. Thus the struggle is an attempt for emotional control. There are two outcomes to the struggle: winning or losing. Here is the instantiation of the

generic EMOTION IS FORCE metaphor through the concept of opponent, represented diagrammatically as follows:

Source: OPPONENT IN A STRUGGLE  
 Target: EMOTION

Agonist	Antagonist	Antagonist's force tendency	Agonist's force tendency	Resultant action
opponent1	opponent2	opponent2's attempt to cause opponent1 to give in to his/her force	opponent1's attempt to resist opponent2	either opponent2 wins or opponent1 wins
rational self	emotion	the emotion causing the self to lose control	self's attempt to try to maintain control	self either loses or maintains control

In this metaphor it is assumed that it is better to maintain rational control than to give in to the emotions. This is why the rational self applies a counterforce in an attempt to control the causal force of the emotion.

#### EMOTION IS A WILD ANIMAL

The WILD ANIMAL metaphor is a special case of the OPPONENT metaphor, and thus inherits most of its mappings. In the WILD ANIMAL metaphor the struggle is between a master and the animal that tries to get away from its master. It is in this sense that the master and the animal are 'opponents,' as shown by the examples:

His emotions *ran away* with him.  
 She *kept* her emotions *in check*.  
 He *couldn't hold back* his feelings.

The shared mappings include:

Source: OPPONENT IN A STRUGGLE  
 Target: EMOTION

Agonist	Antagonist	Antagonist's force tendency	Agonist's force tendency	Resultant action
master	animal	to get away from master	to hold animal back	either animal gets away or master holds it back
rational self	emotion	to exert force on self to lose control	to try to maintain emotional control	self either loses control or maintains it

Obviously, the struggle between the master and the animal corresponds to the struggle for emotional control. The animal is trying to get away but is held back by the master. In attempting to get away, it exerts a force on the master. Corresponding to this force is the emotion's force to cause the self to lose emotional control. The effect of the animal's force can be the performance of an unintended emotional response on the part of the self, which is metaphorically conceptualized as UNINTENDED ACTION IS OTHER-PROPELLED MOTION. This is based on the metaphor EVENTS ARE MOVEMENTS in Event Structure (see Lakoff 1993 for a general view, and Chapter Three in Kövecses 2000 for a special application to the emotions).

#### EMOTION IS A SOCIAL FORCE

Emotions can also be viewed as social forces. Of these, the most commonly used version is EMOTION IS A SOCIAL SUPERIOR metaphor. Let us look at some examples:

He is *ruled by* anger.

She is *driven by* fear.

His whole life is *governed by* passion.

Your actions are *dictated by* emotion.

According to this metaphor, the emotion, that is, the social superior, has control over the rational self. The social force of the superior corresponds to the control that the emotion has over the self. The social effect of the superior on the self is the emotional effect of the emotion on the self.

Source: SOCIAL SUPERIOR

Target: EMOTION

Agonist	Antagonist	Antagonist's force tendency	Agonist's force tendency	Resultant action
social inferior	social superior			inferior does what superior wants him to do
irrational self	emotion			self has no control and acts according to emotion

In this case of the application of force dynamics, there is no longer any struggle between the superior and the inferior forces. This is shown in the table by the

empty boxes corresponding to the Antagonist's and the Agonist's force tendencies. The superior social force (that is, the emotion) controls the inferior one (that is, the irrational self).

The overall result is that this metaphor primarily applies to a person whose behaviour is controlled by emotion, not by reason. Thus, the idea that this particular metaphor adds to the conception of emotion is that it is a way of conceptualizing habitual tendencies, or dispositions, and not so much momentary states or actions. A superior has long-term control over an inferior, whose behaviour is determined by the superior over a long period of time. Thus the metaphor predominantly describes a certain kind of person ('an *emotional* one'), rather than an emotional event, as most of the FORCE metaphors we have seen so far do.

#### EMOTION IS A NATURAL FORCE

Natural forces, like flood, wind, etc., are viewed as extremely forceful and as having great impact on physical objects. Physical things cannot help but undergo their effects. Here are some linguistic examples that reflect this conceptualization for the domain of emotion:

I was *overwhelmed*.

I was *swept off my feet*.

As the second example indicates, one of the effects of a natural force on an entity may be that it moves the entity from one location to another. We can describe this as the CAUSED EVENTS ARE OTHER-PROPELLED MOVEMENTS metaphor (see Kövecses 2000: Ch. 2). The instantiation of the metaphor is as follows:

Source: NATURAL FORCE

Target: EMOTION

Agonist	Antagonist	Antagonist's force tendency	Agonist's force tendency	Resultant action
physical object	natural force	to cause an effect in physical object	to keep being the same	physical object undergoes effect in a passive way
rational self	emotion	to cause the self to respond to emotion	to continue to behave as before the emotion	self responds to the emotion in a passive way

Obviously, only the passions or very intense forms of other emotions are

conceptualized in this way. Through ‘inertia’, the self’s tendency is to continue to behave in the same way — that is, to continue not to come under the influence of the emotion force.

The object affected by the natural force cannot avoid undergoing the impact of the force; in the same way, a person experiences emotion passively and helplessly. This is the single most important property of emotion in the folk theory described here.

#### EMOTION IS A MENTAL FORCE

This metaphor comes in several versions. The mental force may be a force deriving from a human or a drug. If it derives from a human source, it is EMOTION IS A MAGICIAN and EMOTION IS A TRICKSTER. Both of these are capable of deceiving a person. That is to say, they have the intellectual power to change one’s beliefs about the world — either by magic or by a trick. The MAGICIAN metaphor is probably limited to romantic love, and we will not discuss it further here. The TRICKSTER metaphor seems to be much more general, in that its application may extend to any emotion. We can begin the analysis of this metaphor with some examples:

Our emotions often *fool* us.  
His emotions *deceived* him.  
She was *mised* by her emotions.

In addition, a person in an emotional state is commonly seen as incapable of ‘higher’ mental functioning. This can be expressed by sentences such as ‘His emotions *clouded* his judgment’. Language use such as this assumes the following instantiation and mappings:

Source: TRICKSTER  
Target: EMOTION

Agonist	Antagonist	Antagonist’s force tendency	Agonist’s force tendency	Resultant action
normal person	trickster	to attempt to deceive person	to continue to be ‘undeceived’	trickster deceives normal person
rational self	emotion	to make the rational self irrational	to continue to be rational	emotion makes self irrational

As can be seen, the normal person is identified with the rational self that becomes irrational as a result of the trickster-emotion’s tricks. The emotion’s

force tendency is to make the rational self see the world in a distorted way, while the rational self’s tendency is to remain rational. Eventually, however, the trickster deceives its victim, and correspondingly the emotion makes the rational self irrational. In other words, the self which is in an emotional state is depicted by this metaphor as being irrational.

#### EMOTION IS INSANITY

The element of irrationality can also be found in the INSANITY metaphor:

He is *mad* with desire.  
I was *crazy* with emotion.  
She was *beside herself* with emotion.

However, as the examples indicate, this metaphor also suggests more: intense emotion is a state of the ultimate lack of control. While in the case of the TRICKSTER metaphor the rational self becomes irrational in a limited situation (in its judgment of the aspect of the world relative to the emotion), in the case of the INSANITY metaphor the rational self is completely incapacitated cognitively as well as in terms of behaviour; it loses all control.

In the INSANITY metaphor, emotion is an unspecified intense psychological force that can produce insanity. In the source domain of the metaphor, a normal person becomes insane as a result of this intense psychological force. Consequently, it would be more precise to restate the EMOTION IS INSANITY metaphor as THE EFFECT OF AN INTENSE EMOTIONAL STATE IS INSANITY.

The INSANITY metaphor can be described more formally as follows:

Source: INSANITY  
Target: EMOTION

Agonist	Antagonist	Antagonist’s force tendency	Agonist’s force tendency	Resultant action
normal person	intense psychological force	to cause insanity in normal person	to remain normal	normal person becomes insane
rational self	emotion	to cause self to become irrational (i.e. to lose all control)	to remain rational	rational self becomes irrational

Another major difference between the TRICKSTER and the INSANITY metaphors

is that the latter applies to only very intense emotions (the passions, such as anger, fear, love), while the former can apply to any emotion.

The irrationality resulting from intense emotions need not be as intense as suggested by the *INSANITY* metaphor. A milder form of irrationality can be found in the metaphor *EMOTION IS RAPTURE*, as exemplified by expressions like ‘*drunk with emotion*’ or ‘*intoxicated with passion*’. Here emotion is viewed as some kind of alcoholic beverage capable of affecting a person’s intellectual abilities in adverse ways. This metaphor shares the mappings of the *INSANITY* metaphor, but it also adds something to it. Many emotional states are viewed not only as irrational but also as ‘pleasant’ states, a metaphorical projection that comes from conceptualizing emotions as an intoxicating beverage. Thus we have the additional mapping:

the assumed pleasantness of being drunk → the pleasantness of the emotional state

Obviously, this mapping only applies to ‘positive’ emotions, such as love or happiness, and can account for examples like ‘being *high on love*’ or ‘having a *delirious feeling*’.

In general, emotions are viewed as mentally incapacitating phenomena. The specific ‘mental incapacities’ involve in addition to the ones above: *INABILITY TO SPEAK* and *INABILITY TO THINK*. We can take these to be special cases of the very general metonymy according to which *MENTAL INCAPACITIES STAND FOR EMOTION*.

#### EMOTION IS FIRE/HEAT

This specific-level force metaphor can be illustrated by the following examples:

He was *on fire* with emotion.  
 She was *consumed* by passion.  
 The events *kindled* several emotions in him.  
 I am *burning* with emotion.  
 They were *hot* with passion.

It is the prepositions *with* and *by* that indicate that there is *causal* link between certain emotional responses and emotion as fire (Radden 1998); responses are seen as being caused by emotion itself. The *FIRE* metaphor ‘straddles across’ both parts of the emotion schema; that is, both ‘emotion → response’ and ‘cause of emotion → emotion’. The expression *kindle* has to do with latter. However, most of the above examples have to do with the ‘emotion → response’ aspect of the concept of emotion. To account for them, consider how the

source and target domains of this metaphor instantiate the generic-level force metaphor for emotion:

Source: *FIRE*  
 Target: *EMOTION*

Agonist	Antagonist	Antagonist’s force tendency	Agonist’s force tendency	Resultant action
thing burning	fire	to cause thing to undergo effects of fire	to remain unchanged by fire	thing burning is changed by fire
person in emotional state	emotion	to cause person to undergo effects of emotion	to remain unchanged by emotion	person’s behaviour is changed by emotion

The Antagonist’s force tendency is to cause the person in an emotional state to undergo the effects of the emotion, such as becoming energized, dysfunctional, etc. On the other hand, the Agonist’s force tendency is to remain unchanged, that is, not to undergo the effects of the emotion. However, the usual resultant action is that the person in an emotional state does change. That is to say, s/he becomes energized, becomes dysfunctional, and so on.

Intensity in general is commonly conceptualized as heat (see Kövecses 2000: Ch. 3). Thus many states and actions that have an intensity aspect are comprehended via the concept *HEAT*. The ‘hot’ emotions include anger, romantic love, desire, sexual desire. Thus, one can *be hot* with anger, romantic love, and sexual desire. These emotions are seen as very intense and energized states.

A mapping not shown above is that various degrees of heat correspond to various degrees of intensity of emotion, and lack of heat corresponds to lack of emotion. As the latter shows, the mappings also account for the ‘opposites’ of emotions, such as emotional calmness, indifference, lack of desire, etc. In addition, the mappings indicate that the emotions characterized here include both the ‘passions’ and the ‘milder’ kinds of emotion, such as affection, sadness, and the like. These emotions are conceptualized at a lower level of heat (e.g., warmth for affection), and hence are not seen as forces. Correspondingly, it is by virtue of being conceptualized as ‘hot’ that certain forms of anger, romantic love, and sexual desire are conceived of as passions. But there are other reasons as well.

The heat can make the object hot. As previously, the physical force (that is, here the heat-force) corresponds to the emotion. The question is: what specifically



is the intrinsic force tendency of the heat-force in the source domain and what is the force tendency of the emotion in the target? High degrees of heat ('hotness') produce an energized state in the object-person. The 'hot' emotions are all viewed as being very intense states in which the self is highly energized: that is, it is in a state of readiness to act in intense ways. One linguistic example of this is when we say that a person is 'hot to trot', where 'to trot', a motion verb, indicates intense activity, a meaning that derives from, or is motivated by, the Event Structure Metaphor, in which ACTIONS ARE SELF-PROPELLED ACTIONS.

But the particular effect of the heat-force may also be damage to the thing burning, that is, damage to the self. In the same way as the object becomes dysfunctional as a result of exposure to uncontrolled fire (high degrees of heat), so does the self become dysfunctional as a result of uncontrolled intense emotion. This can be seen in expressions like 'be burned up', 'be consumed', etc., where the intense physical response of the thing corresponds to the damage to the self, where the damage results from the self's inability to control the emotion.

Another characteristic of the FIRE metaphor is that the fire may cause damage not only to the object on fire but also to another object. This can happen when the fire is intentionally directed at a target by the self. The fire in this case is inside the object-container. In other words, the FIRE and the PEOPLE AS CONTAINERS metaphors are combined; the fire is inside the person as a container who directs it at another (e.g., 'breathe fire'). The damage to another object is the damage to the other person.

The example of 'breathing fire' is based on a mapping that is inherited from a more general mapping in the FLUID IN A CONTAINER metaphor: externalization of the internal force is the response taking place. This response constitutes deliberate aggressive behaviour.

#### 4. Metaphors focusing on both parts of the emotion schema

The metaphors discussed in this section have a double focus; they may instantiate both the initial and final parts of the emotion scenario.

##### EMOTION IS A PHYSIOLOGICAL FORCE

What can be viewed as 'physiological forces' are also used to conceptualize the emotions. These come in several kinds: hunger, thirst, illness, and agitation.

##### EMOTION IS HUNGER/THIRST

I'm *starved* for affection.  
His anger was *insatiable*.

The hunger for food corresponds to the desire for either the emotion (e.g., affection: 'I'm *starved* for affection') or the action associated with the emotion (e.g., an act of retribution in anger: 'His anger was *insatiable*'). The version in which an emotion is 'insatiable' usually forms a part of the EMOTION IS A WILD ANIMAL metaphor.

What unifies these two seemingly disparate examples is the very general mapping in the conceptual system:

hunger (for food) → desire (for emotion or action)

The DESIRE IS HUNGER metaphor thus instantiates the general FORCE schema in two different ways. Let us look at the details of the difference between 'desire for emotion' and 'desire for emotional action'. The food corresponds to emotion in the former version. When this is the case, the person who is hungry is the person who would like to but does not have the emotion. When the food corresponds to action in the latter, the wild animal that is (insatiably) hungry is the emotion itself which causes the self to perform an action.

In other words, the two versions of the HUNGER metaphor are structured by the following mappings:

*Version One.*

Source: HUNGER  
Target: EMOTION

Agonist	Antagonist	Antagonist's force tendency	Agonist's force tendency	Resultant action
person	hunger (for food)	to cause the person to want food	for the (non-hungry) person not to want food	hunger makes person go get food
self	desire (for emotion)	to cause self to want to have emotion	for the (desireless) self not to want emotion	desire causes self to have emotion

This set of mappings reflects an instantiation of the generic-level force schema that is very different from the instantiations we have seen so far. The major difference seems to be that the emotion instantiates neither the Agonist nor the



Antagonist. What is at issue is the desire for emotion. Naturally, this version only applies to 'positive emotions' like affection and love.

However, in the other application of the schema (in which one's emotion is 'insatiable'), the concept of emotion does instantiate the Agonist. Let us look at the details:

Version Two:

Source: HUNGER  
Target: EMOTION

Agonist	Antagonist	Antagonist's force tendency	Agonist's force tendency	Resultant action
wild animal	insatiable appetite (for food)	insatiable appetite makes animal keep eating food	animal (without insatiable appetite) eats 'just enough'	person with insatiable appetite keeps eating
emotional self	insatiable emotional desire	insatiable emotional desire causing self to keep acting on emotion	emotion (without insatiable desire) does not cause self to keep acting on emotion	self with insatiable emotional desire keeps acting on emotion

The correspondence now new relative to the instantiations given above is

the food → the action response.

This is because 'food' does not instantiate either the Agonist or the Antagonist.

However, it is clearly a part of the elements that get mapped onto the emotion domain, although it is outside the FORCE schema limited to the five elements (such as Agonist, force tendency of Antagonist, etc.) with which we are working here.

Since most emotions, both 'positive' and 'negative', are associated with particular actions, Version 2 of the metaphor can apply to most emotions.

In the general FORCE schema, one of its elements is 'the effect of the force' on the entity affected by it. Now we can ask how this is realized in the HUNGER metaphor. In Version 2, it seems to be the gratification of the animal's hunger, which corresponds to the performance of some action associated with the emotion. In Version 1, it is also the gratification of one's hunger, which corresponds to having the desired emotion.

In sum, the same general FORCE schema is employed differentially in the

case of the HUNGER metaphor, but at the same time the generic structure of the schema is preserved in both versions.

#### EMOTION IS PHYSICAL AGITATION

Like the HUNGER metaphor, this metaphor also comes in two versions. Version 1 has as its scope the 'cause → emotion' part of the emotion scenario, while Version 2 has the part 'emotion → response'. Some linguistic examples for Version 1 include (Kövecses 1990):

The speech *stirred* everybody's feelings.  
I am all *shook up*.  
She was all *worked up*.  
Why are you *upset*?  
Don't get *excited*.  
He was slightly *ruffled* by what he heard.  
The children were *disturbed* by what they saw.

The examples are based on these instantiations:

Version One:

Source: PHYSICAL AGITATION  
Target: EMOTION

Agonist	Antagonist	Antagonist's force tendency	Agonist's force tendency	Resultant action
object in state of calm	external cause that can create agitation in object	to cause physical agitation in object	to remain calm	object is physically agitated
rational self	cause of emotion	to produce emotional disturbance in self	to remain emotionally calm	self is emotionally disturbed

According to this application of the metaphor, emotion is a disturbed state of mind that arises from some cause. What is the conceptual relationship among EMOTIONAL DISTURBANCE, PHYSICAL AGITATION and EMOTION? In this case, EMOTIONAL DISTURBANCE is metaphorically understood as PHYSICAL AGITATION. HOWEVER, EMOTIONAL DISTURBANCE stands metonymically for EMOTION. Put more simply, emotion is viewed as being defined by (emotional) disturbance, and the disturbed state of mind is used to stand for emotion as a whole.

Version 2 presents a different situation both regarding scope and conceptual organization. Let us see some examples first:

I stood there *trembling* with emotion.  
 He *quivered all over* with emotion.  
 As a result of what she felt, *shivers ran up and down her spine*.  
 He was *quaking* in his boots.

These examples suggest bodily agitation that arises from some emotion (as again indicated by the preposition *with*) — not a disturbed state of mind as previously. The instantiations and mappings are:

*Version Two:*

Source: PHYSICAL AGITATION  
 Target: EMOTION

Agonist	Antagonist	Antagonist's force tendency	Agonist's force tendency	Resultant action
physical object	force that can cause physical agitation in object	to cause physical agitation in object	to remain physically calm	object is physically agitated
person's body	emotion	to cause bodily agitation in body	to remain bodily calm	person is bodily agitated

The verbs *tremble*, *quiver*, *shiver*, *quake* above are all examples of this last mapping, which is concerned with the 'resultant action' part of the force schema.

Unlike in version 1, here we have to do with the 'emotion → response' part of the emotion scenario, where the response is agitation arising from an emotion. Moreover, PHYSICAL AGITATION stands metonymically for EMOTION: that is, physical agitation is used to conceptualize emotion in a more direct way.

Agitation is a kind of incapacity: bodily or mental incapacity. When it happens, the self is unable to act normally. This fits the general metonymy in which THE INCAPACITATING EFFECTS OF EMOTION STAND FOR THE EMOTION.

#### EMOTION IS A BURDEN

A metaphor that focuses on the general evaluation of emotions is EMOTION IS A BURDEN:

She is *weighed down* by sadness.  
 He felt good after he *unburdened* himself.  
 When they left the dark forest behind, he felt *relieved*.

The external pressure caused by the burden (Antagonist) on the body-container (Agonist) corresponds to the stress or difficulty caused by the emotion (Antagonist) on the self (Agonist). Let us call this 'emotional stress or difficulty'. In this metaphor, emotional stress or difficulty causes the self to function abnormally (Antagonist's intrinsic force tendency), while the Agonist's force tendency can be identified as the self's tendency to function normally. The mappings thus include:

Source: BURDEN  
 Target: EMOTION

Agonist	Antagonist	Antagonist's force tendency	Agonist's force tendency	Resultant action
person	burden	to cause physical pressure on person	to hold the burden	person experiences physical difficulty
self	emotion	to cause emotional stress in self	to withstand emotional stress	self experiences emotional difficulty

The Antagonist's force tendency in the source domain includes 'pressure *on* person', while in the target it is 'stress *in* self'. The change from *on* to *in* indicates that there is an additional metaphor underlying the mapping; namely, INTERNAL IS EXTERNAL, according to which internal states are comprehended as external events.

Notice also that the BURDEN metaphor may entail physical movement and, consequently, difficulty in action. This implication comes from the Event Structure metaphor. In Event Structure movement corresponds to action (ACTION IS MOTION).

Finally, it can be seen that the BURDEN exerts a steady or constant pressure on the self. This is in contrast to the internal force in the PRESSURIZED CONTAINER metaphor, where the internal pressure is typically momentary or lasts a short time. Correspondingly, the intrinsic force tendency of emotion (i.e., that of the Antagonist) will be momentary in the INTERNAL PRESSURE, while it is steady, or longer-lasting, in the BURDEN metaphor.

## 5. Metaphors mainly focusing on the 'cause of emotion'

EMOTION IS A PHYSICAL FORCE

Let us begin with some examples of the specific-level metaphors that belong to this group:

EMOTION IS A MECHANICAL FORCE:

When I found out, it *hit* me *hard*.  
That was a terrible *blow*.  
She *knocked* me *off my feet*.

EMOTION IS AN ELECTRIC FORCE:

It was an *electrifying* experience.

EMOTION IS A GRAVITATIONAL FORCE:

Her whole life *revolves around* him.  
They *gravitated toward* each other immediately.

EMOTION IS A MAGNETIC FORCE:

I was *magnetically drawn* to her.  
I am *attracted* to her.  
She found him *irresistible*.  
That *repels* me.

As the instantiations of the generic-level FORCE schema and its mappings below indicate, these metaphors have primarily to do with the way emotions arise. I shall not analyse here how each of these different specific-level metaphors contribute to the folk conception of emotion. Instead, I shall only look at what is common to the metaphorical mappings of the metaphors above.

Source: PHYSICAL FORCE

Target: EMOTION

Agonist	Antagonist	Antagonist's force tendency	Agonist's force tendency	Resultant action
physical object	physical force	to produce effect in object	to remain unaffected by force	object undergoes effect
self	cause of emotion	to cause self to become emotional	to remain unemotional	self is emotional

In other words, our concept of emotion is understood as physical effect produced by a cause. This makes sense because our emotions are conceptualized as responses to a situation (the cause of emotion).

Note that these mappings apply to parts of our emotion scenario in the folk theory of emotion that are completely different from the ones dealt with previously. In the cases above, we had the following picture: Emotion as Antagonist has a force tendency; the force tendency manifests itself in the self, which plays the role of Agonist; the result is some emotional effect on the part of the self. Schematically:

emotion — force tendency of emotion on self → resultant emotional effect

With the PHYSICAL FORCE metaphor, however, we have a different pattern: it is the cause of emotion that has the Antagonist's force tendency; the force tendency manifests itself in the self as Agonist; as a result, the self has the emotion. Schematically again:

cause of emotion — force tendency of cause of emotion on self → self has emotion

While the first chain is a description of what happens after an emotion has come into being, the second captures what is required for it to come into being. The two causal chains complement each other, in that one captures what happens before an emotion comes into being and the other captures what happens afterward. They can be put together in the following way to yield a complete picture of the skeletal scenario forming the basis of the most pervasive folk theory of emotion encoded in English:

(1) cause of emotion — force tendency of the cause of emotion → (2) self has emotion — force tendency of emotion → (3) resultant effect

What is missing is the control-related aspects of emotion discussed above, which can be placed between (2) and (3). If we place this information in the schema, we obtain:

(1) cause of emotion — force tendency of the cause of emotion → (2) self has emotion — force tendency of emotion → (3) self's force tendency ↔ emotion's force tendency → (4) resultant effect

This skeletal but now complete schema reveals that our basic understanding of emotion rests upon our understanding of how various forces interact with each other. Most importantly, the schema shows that even our most basic understanding of emotion as 'cause → emotion → response' is metaphorical through and through.

## 6. Conclusions

Emotion metaphors are not isolated and unrelated specific-level metaphors. Rather, they form a large and intricate system organized around the generic concept of force, as analysed by Talmy. The various emotion metaphor source domains are instantiations of the concept of force. This is a conclusion that places prior studies of emotion metaphors in a new light.

At a generic level, emotion and all the source domains share what Fauconnier (1997) and Turner (1996) would call a 'generic space', which is here the space of force. This force space structures not only the particular source domains but also the concept of emotion, yielding the skeletal structure: cause of emotion → emotion → response. This provides an extremely basic structure for emotion that is itself metaphorical.

As has been stressed in this paper, the basic schema of emotion is only a skeletal one. The details of the schema are filled out by the conceptual contribution of the many specific-level metaphors described above.

## CHAPTER 9

### The geometric roots of semantics\*

Alberto Peruzzi

By developing the concept of the geometric space of conceptualization, this paper seeks to establish common ground between the perceptual and logical structures expressed in language. The author's overall thesis is that the logical status of language is a projection of geometric and topological patterns, and that these can be described in terms of category theory. Although somewhat technical, the essay has several points in common with other contributions in the book. Like those by Violi and Geeraerts, for example, it analyses natural kinds and prototypes, and the problem of conceptual universals. The paper also discusses topics addressed by Wildgen's essay (semantic fields and the relation between concepts and their contextual extension) and Albertazzi's (the origin of spatio-temporal patterns). In its treatment of specific issues — the impact of the 'linguistic turn', the critique of unconstrained compositionality, of the classical model-theoretic approach to semantics, and of generative grammar — Peruzzi's analysis supports the theses developed in the Introduction by Albertazzi. It shares with the latter a phenomenological approach to the analysis of schemes which in turn relates to the theories set out in the essays by Langacker, Croft and Wood, and Kövecses.

#### 1. Which semantics?

Semantics is the theory of meaning; and the meaning of a proposition is a thought. The structure of thought is classically described in logical terms. But

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\* The ideas advanced in this paper have been presented in many talks and seminars that I have given in recent years. Sections 1–4 were illustrated in a talk at the Department of Philosophy of the University of Milan, 7 February, 1994; Sections 3–5, 7, and 11 in the 'Philosophy of Language Seminar', November 1991–May 1992, and the 'Open Seminar', November 1993–May 1994, at the Department of Philosophy, University of Florence; Sections 2 and 6, were also part of a talk I gave at Kirchberg am Wechsel during the XVI Wittgenstein Symposium, August 1994; finally, Sections 7, 8 and 11 were the bulk of my talk at the 10th Congress of Logic, Methodology and Philosophy of Science held in Florence, August 1995. This research has been financed by Italian CNR (contract 9501833.CT08) and MURST, Italy (with '40%' funds). I wish to thank the organizers of the Bolzano Conference for their warm hospitality.

the roots of logical structure lie deeper than mere symbolic manipulation, for logic inherits meaning from patterns of bodily interaction that involve essential correlations of space and quantity (hence of geometry and algebra). These correlations must be made explicit through ‘universal’ constructions which can be displayed through category theory.

If this view retains some tenets of analytic philosophy, it repudiates the conventional union of logic and linguistics which divorces meaning from other domains of cognition. As an answer to the question ‘Which semantics?’, the ‘somatic abstraction’ (or somatic ‘Lifting’) view presented here unifies perceptual and logical structures into a single framework, and is intended as a step towards bridging the gulf that divides theories of logic, mind and nature. To achieve this goal, first, abstract notions are traced back to their common source, namely the bodily patterns of interaction with the macrophysical environment; second, these bodily patterns are related to logical analysis; third, the ‘Lifting’ of meaning from the (small) perceptual underlying base to the (large) range of cognitive domains is furnished with a suitable mathematical formulation.<sup>1</sup>

The essential ideas needed to meet this threefold challenge can be summarized as follows. Semantic primitives are identified as schemes for coding spatial interactions. The list of fundamental schemes (*schemata*) is finite and principled.<sup>2</sup> Each scheme moulds a conceptual structure (static or dynamic) of objects-and-actions. The principles for combining and *lifting* such combinations to the whole of language require notions such as parametrizing, indexing and universality, ‘naturally’ expressed and unified in terms of category theory.

Each scheme is discretized into finitely many slots cognized as positional (*thematic*) roles, of a topological-dynamical character, which provide the means by which the structure of any thought manifests itself in language. Motion and invariance of objects under geometric transformations carrying kinematic and group-theoretic information play key roles here, while action is localized in dynamic centres (agents and patients). Through ‘metaphorical projection’, schemes behave as meaning generators throughout language in its full syntactic and cognitive complexity.<sup>3</sup>

The unity of logic and geometry through schemes can be grasped if we have a mathematical framework capable of expressing constructs built from maps among themes. The fundamental tools for this purpose are adjoint functors and fibrations. Once one realizes that concepts cannot be interpreted as sets, and that the constructive constituents of thought are spatially grounded, one is also obliged to renounce the definition of space as a set of points with a suitable family of open subsets. The resulting conception of space is closely linked to the

categorical analysis of logic (as is made clear by topos theory).

This framework does not enable all the obstacles against attaining a satisfactory explanation of semantic phenomena to be cleared away. Yet it allows a finer analysis of logical form, particularly in the case of atomic sentences. Prepositions and verbs are revealing manifestations of the richness of this forgotten structure. Here form meets content, and here also topological and dynamic patterns, concerning bodies-in-space, acquire logical import.

The structure of language involves typing of objects and actions. The resulting hierarchy of types corresponds to the category  $K$  of kinds. There is a selected level  $B$ , formed by *basic* kinds, and it is associated with the existence of *prototypes*. The link between basic kinds and prototypes is expressed by an adjunction between  $B$  (as a subcategory of  $K$ ) and the category  $I$  of individuals, the objects of which are suitable (localized) quotients of particulars.<sup>4</sup> Schematic features at the  $B$ -level are combined and ‘metaphorically’ projected (by somatic abstraction) to any linguistic representation of thought through the lifting process, representable as a family of fibrations.

The salient<sup>5</sup> states of being and becoming are identified as referential attractors, and it is these that are primarily crystallized in language (as basic kinds, schemes, themes). The strategy exploited in grasping the constancy of objects and in schematizing motion is successively applied to information states as propositionally expressed, so that one comes to describe deductive inference as a sequence of discrete *steps*, leading *from* a set of *initial* conditions, or premises, *to* a resulting *conclusion*.

Schematizing and prototyping underpin *imagination*, act as meaning-generators and are the source of logical syntax. Though well-defined, the range of their combinations and liftings varies widely: it is the range of semantic creativity. The possible ‘universes of discourse’,  $U, U', \dots$ , even superposed, result from different organizations of the same stock of primitives. Correspondingly, different logics can also be obtained; but each (cognitively grounded) logic is determined by the structure of objects-and-actions involved in the given  $U$ . And, since every such  $U$  is the result of constructions over  $B$ , the range of possible logics is objectively constrained by the underlying base. Not only logic and topology but also the ‘natural’ correlations between them can be systematically unified in category theory — adjoint functors in connection with nouns and verbs at the  $B$ -level, and fibrations in connection with the metaphorical Lifting.

Working out this framework is best conceived as part of the study of self-organization, which here concerns the emergence of cohesive wholes and

action-schemes, for these are the building blocks with which mind self-organizes in parallel to the self-organization of macrophysical systems. The resulting braid of self-organization grounds *intentional* phenomena in primary *topologico-dynamical* patterns, access to which is provided by perceptual resources. In this way semantics is naturalized without being ‘reduced’ to (macro)physics. Just as the properties of a given base-space  $X$  do not determine every property of a space fibred on  $X$ , the Lifting induces constraints which, in contrast to the appeal to a ‘language of thought’, avoid the so-called symbolic fallacy.

Once again, a foundational approach is employed to achieve an adequate theory of semantic competence. If the crisis of the ‘first phase’ of cognitive science was due to its original sin (i.e. syntacticism in either its logical or computational guises) the moral is not so much rejection of mathematical models altogether as deepening the intuitions that underlie mathematical form.

Similarly, though the generative programme has met with severe obstacles in semantics, the moral is not that universals of intentionality cannot be identified and that one must take refuge in pragmatics. What we seek is not a  $\Pi_n$ -semantics, but rather a  $\Sigma_n$ -semantics. Moreover, to avoid the skeletal formalism by which classical model theory embodies the idea of ‘pure’ metaphysics, the grounding of such  $\Sigma_n$ -semantics has to be pursued by paying due attention to *surface depth*, that is the phenomenology of interactions with bodies, from which all semantic notions are distilled. This suggests that there exist schemes of objects and actions (processes) possessing a *universal* character. Traditionally, emphasis is placed on two unbridgeable gaps: one between the continuum and discrete partitions thereof (associated with language), and the other between subject-centred, local, qualitative space and homogeneous, global, objective space. Algebraic and differential topology have shown how these gaps can be bridged, for the ‘discrete’ in language is as dependent on stable topological (conformal, metric) invariants as morphogenesis is dependent on the local/global dialectic.

To sum up, four sorts of universals are posited: (i) eidological universals, i.e. *schemes* as interaction attractors, (ii) ontological universals, i.e. *themes* as primitive referential dimensions, (iii) objectual universals, i.e. basic kinds (with their prototypes) as shape attractors, and (iv) logical universals, i.e. primitive patterns of structure manipulation.

The resulting view rests on previous research by many authors. Its emergence owes much to Bill Lawvere’s exploration of the logical and foundational meaning of topos theory. Gonzalo Reyes and John Macnamara initiated the application of topos-theoretic models to the semantics of count and mass

nouns. The discovery of objective constraints on conceptualization (‘categorization’ in cognitive science’s lexicon) is mainly due to Eleanor Rosch (and her associates). The idea of somatic-abstraction and the search for geometric roots derives from the pioneering investigations of Jeffrey Gruber and later developments by Ray Jackendoff. Perceptual (kinesthetic) roots of cognition and the role of image schemes was emphasised by Mark Johnson’s and George Lakoff’s extensive research on metaphor. The notion of ‘theme’ has a long history; in recent years, important contributions have been made by Charles Fillmore, Leonard Talmy and Ron Langacker. The theory of ‘Conceptual Dependency’ has been introduced in Artificial Intelligence by Roger Schank as a general framework for knowledge representation in a language-neutral way. As regards the geometrical aspects of themes, the role of singularities in ‘case-morphology’ has been recognized by René Thom and further developed by Jean Petitot. Finally, Dusko Pavlovic’s ‘taxonomical’ analysis of constructive type theories has suggested the use of fibrations (in a categorical setting) as a comprehensive and yet selective framework for semantics.

## 2. Original sins

The ‘linguistic turn’ signalled the success of mathematical logic as the new *Organon* for a theory of meaning. By exploiting the methods of computer science, the ‘cognitive turn’ induced semantics to focus on formal aspects of *representing*. When the use of recursion-theoretic tools shifted from verbal language to other ‘languages’ of the mind, computational architecture became the watchword of cognitive science. But here a polarization arose.

On the one hand, the methodology developed by the founding fathers of analytic philosophy underwent a transmutation: as the mind was likened to a set of programs, the logical structure of language was transformed into the language of thought. On the other hand, neo-connectionist approaches developed models of cognition, according to which the structure of representations emerges from a massively parallel system of sub-logical units: ‘rules’ are epiphenomena and the edge-effects called for in the models are described by means of calculus. A conciliatory moral could be drawn by saying that both logic and calculus are indeed essential tools — and geometry is no less essential. But the fundamental issue remains: what makes *meaning* possible?

The symbolic fallacy derives from the idea of mind as a system of programs for symbol manipulation. A second phase of cognitive science, which coordi-

nated language, vision, motor systems, kinesthesia, and other abilities has been taken as suggesting that no uniform set of principles can cover the full range of language use. As answer to the question ‘Which universals, if any, withstand intentionality?’, a different claim arises: namely that the logical structure of language is a projection of geometric (topological) patterns and that this projection can be described functorially.

It is useful to start by recalling some of the problems unsolved by previous semantic theories, since these problems converge so as to render the reasons for a categorical approach explicit.

Cognitive research has shown the inadequacy of theories centred on ‘meaning postulates’, ‘markers’, or ‘semantic networks’. *Prima facie*, phenomena such as fuzziness, indefiniteness of characteristic features and tolerance to exceptions might be set aside as ‘anomalies’. In fact, however, nouns that admit necessary and sufficient meaning conditions are rare.

Take, for instance, the notion of ‘chair’. Since it is irreducible to a unique list of characteristic features, the search for a definition which expresses necessary and sufficient conditions for membership in the (atemporal?) set of chairs is doomed to failure. Although apparently fixed by baptismal ceremony, the notion of ‘chair’ is flexible. The vagueness of ‘family resemblances’ and the variety of ‘language games’ mark the limits of any direct application of formal semantics to the study of language. However, flexibility differs from arbitrary change — plainly, a table is definitely not a chair. Which principles determine the bounds of such flexibility, and whence do these bounds derive? The use of different degrees of typicality yielding stereotypes seems to be called for: instead of a yes-or-no issue, a wider, *radial*, distribution of possible values is needed — as many tests have confirmed. Hence a reasonable option might be the concept of fuzzy set, which connects linearly ordered degrees of membership with degrees of similarity to typical members. Yet, as argued in Section 7, this approach encounters severe obstacles.

First of all, similarity is a perceptual property of shapes and — even when enriched with aspects of functionality (the use, say, of a hammock *as* a chair or the use of a chair as a weapon) — can be determined only if object-and-action patterns are already presupposed. The function of a chair based on one central leg is grasped by no less a topological ability than that employed in grasping the function of a typical four-legged chair, and this capacity must involve the internal representation of postures objectively possible for the human body to assume — something not at all subject to conventional postulates of culture or context. The same applies to other aspects of reference fixing, thereby preventing

any easy modal variation. If there is no constraint on the field of variation, then equally there is no stable membership in a kind, and hence no objective reason for type-judgments. When shape alone matters, stability concerns not just continuous variation but preservation of singularity points — as in the case of modifying the sides of a triangle from straight to curvilinear — and stability constraints are at work even when parts of the sides are lacking. Further, the informational prominence of junctures confirmed by various empirical tests suggests that shape and motion patterns cannot be separated; thus the way differential topology describes qualitative aspects of dynamic systems is relevant to semantics.

How can we account for specific *centrality* conditions and *limited* tolerance to variations (threshold crossing)? Gestalt constraints have been proposed in the form of a ‘preference rule system’.<sup>6</sup> The range of ‘forms’ (in grasping shapes, melodies, events, etc.) is constrained, so concepts are also subject to selection rules. The issue becomes that of discovering the underlying geometry of form-emergence, and of determining the role of logic in that geometry. Indeed, any semantics based on Gestalt principles should describe not only the way in which they converge, in synergetic reinforcement, or diverge, but also the reason why spatio-temporal patterns spread across cognitive domains.

‘Language games’ are *not* intra-linguistic; they instead involve language-in-action. Before they can be played, a set of primitive resources must be in place: first, the ability to recognize family resemblances and basic action patterns (for ‘search’, ‘capture’, ‘hide’, ...) differently saturated in different contexts and adapted to different kinds of objects (‘Mary goes to the theatre’, ‘2 goes to 4 under the squaring function’, ‘life goes on’, ‘Knight moves and checkmates’, ‘Tom goes crazy’). Context-crossing ‘factors’ of meaning emerge, revealing the connective tissue of language games as trans-local.<sup>7</sup>

In short, the stability of meaning is the result of a *specific* dialectic, one pole of which is the fact that a given concept cannot be isolated from the context of its formation and the particular cognitive strategies thus activated; the other the fact that the same concept can be properly applied, by schematic backtracking, in new contexts of use. Jointly, these two poles avoid the total contextualization of meaning as well as the sort of overkill involved in saying that the meaning of designator  $\delta$  is defined as a function that, for any possible world (or pragmatic context)  $W$ , provides (by *fiat*) the extension of  $\delta$  in  $W$ . If intensions are functions, functions are sets, and sets are extensional (in the sense that they are determined by their ‘global’ elements), then intensions collapse. Previous intensional theories are defective for a variety of reasons, but mainly they prove

to be misleading, since they fail to take into account the fact that each universe of objects and actions possesses its own form of extensionality.<sup>8</sup>

For each kind of action — ‘open’, for instance — there is a field of variation which, although rendered discrete in the dictionary definition, cannot be reduced to the set of specific motions involved in each application: to open a letter you need to cut, to open a pen you need to twist, to open the house door from outside you need to turn down the handle and push, to open a drawer you need to pull. The meaning of ‘open’ is anchored to, but not determined by, specific physical sequences; nor can any global synonymy be likewise justified, since there is a set of local equi-extensionality relations raising the problem of their amalgamation. The ideal case would arise when any two overlapping fields match, prompting a unique, global-support notion, as suggested by Moneglia and Peruzzi (1979) for recovering (in a sheaf-theoretic way) the definition of global truth in a model from the notion of local truth in a ‘context’.

Thus (i) the relation of any concept to its contextual extension is mediated by semantic fields, and (ii) there are cross-field invariants that point to the convergence of modular information in a common format.

Conceptual structure is not preformed; it is accomplished in the course of cognitive development, as a product of innate resources designed to extract information from bodily interactions in space. The Conceptual Structure Hypothesis states that “there is a single level of mental representation, *conceptual structure*, at which linguistic, sensory and motor information are compatible” (Jackendoff 1983: 17). The existence of such a level is supported by identifying the roots of semantics in spatiality. However, the primacy of the spatial domain for the whole of cognition is independent of the actual exercise of a particular input system. Even when an input system is impeded by a deficiency or a contingent poverty of stimulus, the scheme guiding potential performance is still active.<sup>9</sup>

Module-interface processes of stabilization for each constituent of thought — as verbally expressed — are soon ‘forgotten’. This forgetful activity itself makes possible a richer combinatorics, enabling one to employ purely syntactic manipulations. Kant reminds us that if percepts without concepts are blind, concepts without percepts are empty. Yet the amount of autonomous structure he assigned to perception is small — and overdetermined where geometry is concerned.

The view endorsed here is that every concept is percept-laden, in the sense that concept formation rests on Gestalts of objects-and-actions. The process of *forgetting* that we call ‘abstraction’ preserves the track of such built-in spatial

structure. Moreover, syntax enables its objectification and the projection of its richness over any cognitive domain.

### 3. Typing

Model-theoretic semantics of natural language articulates into three steps: (i) a translation  $\phi$  from the given natural language  $L$  into a formal  $L^*$ ; (ii) an interpretation function  $[-]$  from  $L^*$  to set-theoretic entities constituting a model  $M$ ; (iii) the composition  $[-] \cdot \phi$ . In step (ii) either Tarskian or a possible-worlds approach is adopted to deal with problems of meaning in terms of (possible) reference and (possible) truth. In either case the standard of formalization of step (i) is provided by first-order classical logic (and its modal extensions).

After Kripke’s successful application of the idea of relative possibility (also interpretable as knowledge-accessibility to provide a semantics for first-order intuitionistic logic), expressive power was improved by Montague’s intensional logic, which makes use of the abstraction operator relatively to a typed language. The base-types are three, respectively corresponding to three kinds (sets) of entities: the set  $E$  of individuals, the set  $W$  of possible worlds, and the set  $2$  of truth-values,  $\text{True} \neq \text{False}$ , forming the smallest Boolean algebra. Moreover, single indices for ‘possible worlds’ are now replaced by tuples of indices, which function as pragmatic coordinates of contexts of reference and truth (domain, time, place, speaker, etc.), and the range of truth-values can also be modelled by a Boolean algebra larger than  $2$ . The integration of model-theoretic semantics with generative syntax, and the development of related areas of logico-linguistic interest (such as generalized quantifiers) has produced a large and sophisticated body of literature.

These logically-inspired approaches have essentially three shortcomings.

1. In relation to  $\phi: L \rightarrow L^*$ , the formalization takes no account of the procedural features involved in typing, abstraction and quantification, nor of the phenomenological genesis of linguistic competence. Consideration of (syntactic and semantic) stages in the development of language, from early infancy to the ‘steady state’ of the adult, is set aside as irrelevant to description of the structure of thought, as manifested in  $L$ . The criteria for  $\phi$  are either chosen *ad hoc* or imposed on recalcitrant contexts.



2. In relation to  $[-]: L^* \rightarrow M$ , the set-theoretic metatheory prevents representation of the constructive, properly intensional character of predication, and is also at odds with (possibly computational) representation of concepts. Moreover, it fails to specify any (computationally definable) equivalence relation able to distinguish the ‘fine structure’ of synonymy, a structure in which both mode of access and adaptation to context must be taken into account.
3. The formal semantics achieved by composing  $[-]$  with  $\phi$  provides no room for the structures of spatiality, fundamental for the constitution of whatever object of reference: individuals, kinds (of objects and actions), frames of reference (contexts, situations, ...). Truth-values of atomic sentences are supposed to be metaphysically *given* or (once again) chosen *ad hoc*. In either case, the model-theoretic *Organon* is not affected:  $M$  lives in the universe of sets.

Not surprisingly, many linguists have rejected applications of logical theories to natural language as mere formal exercises, descriptively crude and devoid of explanatory power. True, the logical picture can be integrated with information processing models of linguistic abilities. Despite this sophistication, however, the same dead end arises: an abstract semantics in unending search of cognitive flesh.

In part, the shortcomings listed above may be overcome by the use of constructive type theories: not just those devised to express ‘internally’ the logical structure of categories such as toposes (which provide models for higher-order intuitionistic logic), but also other categories related to the development of high-level functional programming languages — for instance, Martin-Löf’s type theories (and the associated ‘contextual’ categories) — and to Girard’s second-order polymorphic lambda-calculus (and ‘\*-autonomous’ categories).<sup>10</sup> However, the problem of assigning meanings to atomic sentences remains for these theories as well.

Macnamara and Reyes have developed a suitable typed language in which predicables are separate from kinds (for each kind there is an appropriate algebra of predicables). The semantics of this kind of typed language is topos-theoretic.

Their first Thesis is that the reference to an individual  $a$  by means of a proper name (PN) requires a kind  $K$ . For instance, the change from child to adult needs the constancy of an underlying kind: given Rommel as a child and Rommel as an adult, it is the kind `PERSON` which traces the identity of Rommel. This Thesis, with its associated rejection of naked particulars, can be profitably

elaborated, provided  $K$  is not taken to be a set (even if with additional structure), for otherwise the shortcomings of model-theoretic semantics re-emerge. In fact, a second Thesis claims that as the kind  $K$  expressed by a common noun (CN) is needed to (re-)identify  $a$ , any individual like  $a$  contributes to tracing the identity of the kind. If  $K$  were a set, the former claim would be circular and any attribution of membership would be analytically true (or false). Also taking membership in a kind as *implicitly* defined by the functional role of the given kind-concept makes membership analytically true (or false) — unless some *ad hoc* trick is introduced. By taking into account the drawbacks (Section 2) of previous theories of predication, one can instead say that the *display* (in extension) of a kind is a variable set.

Accordingly, identity statements are well-formed only for terms of the same type. Thus, ‘Sam is the father of Tom’ is formalized with  $s:\tau = u(t):\tau$ , where  $\tau$  is the intended (though implicit) type underlying the reference to  $s$ ,  $t$  and  $u(t)$ .<sup>11</sup>

Since proper names, descriptions *and* demonstratives require kinds to fix their references, the first Thesis above can be generalized: any reference to an individual requires a kind of suitable ‘level’ (neither `BUNCH OF MOLECULES` nor `FIELD-MARSHAL` would serve to trace the identity of Rommel from childhood to adulthood).

A problem for this view arises with the use of PN’s and definite descriptions in fairy tales. Suppose we are presented with a situation in which the prince becomes a frog. What is the underlying kind needed to give sense to ‘the prince = the frog’, if frogs are not persons? One can resort to `ANIMAL`, but one could vary the situation by considering the case of a stone prince, so that `ANIMAL` would not work either. Hence, our control of this kind-shift remains unexplained. Also the adoption of strict typing as contextual necessitates sophisticated changes in the usual type theories.

Only if kinds are not sets will the maintenance of the distinction of predicables and kinds make sense. But then some other constraint has to be introduced, for if in order to refer to *something* reference to a mediating kind  $K$  is necessary, an infinite regress begins, and the simplest way to stop it consists of postulating the `KIND` of all kinds and the self-referential axiom `KIND:KIND` (linguistically `TYPE:TYPE`). But such a postulate lacks cognitive grounding.

Drawing attention to the underlying maps shows that set-theoretic semantics is inadequate for representing conceptualization. For instance, an individual — Ann, say — can count as two passengers for an air company, but Ann counts as one person, so the underlying map  $u: \text{PASSENGER} \rightarrow \text{PERSON}$  is *not* inclusion. And yet, besides typing and underlying maps, what standard logical

analysis obscures is the difference between state and change-of-state (the former being usually associated with adjectives and the latter with verbs).

Getting at the *real* roots of semantics means retrieving the trace of spatio-temporal patterns of objects-and-actions, and this, in turn, means assigning the functorial relations between topological and group-theoretic invariants a *direct* logical import. Moreover, if space is presented in terms of figures and the notion of group is  $\in$ -free, issues in semantics of natural language link with issues in the foundations of mathematics. This link may be brought into focus by highlighting the logical import of the constitution of reference in terms of bounding surfaces, paths, singularities, local/global properties, monoid-actions and lifting of maps. Far from being the result of a formalistic drive towards generality ('abstract nonsense'), the categorical imperative arises from the fact that the systematic relations among topology, algebra and logic have a functorial nature. What matters is the structure of a universe of entities varying over a (generalized) space, and the semantics of *natural* language is no exception.

#### 4. Individuals and kinds

Reference presupposes recognition of individuals and kinds through localization and conceptualization. All forms of recognition involve some form of classification. Classifying the entities of a given domain  $U$  means partitioning of  $U$  into disjoint cells, namely 'classes'. The partition may be refined (or expanded) into smaller (or larger) classes. Since any indexing map  $U \rightarrow I$  produces a partition of  $U$ , the set-like idea of classification is recovered from a view centred on maps.

There are several different types of classification: *oppositive* classification of features (states) of a given system; *taxonomical* classification of systems into a partial order of kinds (genus, species, etc.); *quantitative* classification of static and dynamic qualities in terms of measurement; *structural* classification by means of algebraic structures — as in assigning non-isomorphic homotopy groups to non-homeomorphic manifolds. What is usually not mentioned is the existence of well-defined maps between the constituents of such different types of classification.

In order to be effective, every classification must properly reduce the complexity of information to be processed. Natural language embodies effective classifications of the four sorts above. In fact, much philosophical discussion has been devoted to the reasons why language succeeds to any degree in discretizing information, and also to the principles that govern such discretization.<sup>12</sup>

Any concrete token is identified by means of spatio-temporal localizers. That is, in order to identify any particular, access to some localization procedure is required. From the early stages of cognitive development onwards, we refer to equivalence classes (orbits) of particulars as *individuals*, and this fact is mirrored in basic object-typing. 'The cup' that I see there is the same if I move around and look at it from different perspectives, and it remains one and the same body independently of certain actions I can perform on it. However, while the possibility of perceptual localization relies on sensory systems, it also relies on external constraints. If a breeze could make the molecules of the cup move independently of one another, I would not be able to recognize the cup as a stable object of *reference*, with its characteristic shape. Even if a bunch of molecules were to emerge miraculously from the physical background and assume the shape of a cup for a time, this could still not be *used* as a cup in a stable way. 'Individuals' are by-products of physical regularities, equally as fine-tuned as our inherent capacity to select a well-determined 'window' of invariance in conceptualizing the world.

Since any concrete individual is cognized as an equivalence class of particulars, proper names are not symbols for particulars, so that kinds corresponding to count nouns (CN) are 'atomic' in a far from nominalistic sense. Taking a proper name as an *individual constant* finds its justification in the invariance of a class of particulars under the pertinent transformations. Correspondingly, concrete individuals (bodies) can be treated as connected  $G$ -spaces embedded in  $\mathbb{R}^3$ , where  $G$  is a (continuous) group (see Peruzzi 1996). Given such a cohesive object  $X$ , a continuous map from  $X$  to  $X$  is, intuitively, a transformation that does not affect the integrity of  $X$ .

A concrete individual is associated with such (minimal) topological invariance, but it can also tolerate local discontinuous transformations (pressing/glueing, stretching/tearing). Consider an algebra  $A$  of actions performable on a physical body  $B$ .  $A$  may contain actions that do not preserve the cohesion of  $B$ , while others preserve cohesion but violate order of connectivity (think of the difference between 'push', 'stretch', 'press', 'crush', 'split', 'disperse', 'patch', 'cut'). Viewing macro-bodies as invariants relative to a subalgebra of  $A$  which is a group reveals that classical logic is selected because actions are supposed to be invertible. Actions inducing discontinuities are marked with cognitive emphasis: they violate the cohesive stability of the given 'whole', causing the transition of a body from one state to another sharply distinct one ('to break the glass', 'to tear the sheet', 'to kill someone', 'to stain the clothes'). Yet this mark lives on an underlying layer of continuous transformations.

Similarly, the notion itself of set results from ‘abstracting’ separable entities within a bounded region of space, as forming a Figure on the given Ground, while it forgets everything but the discreteness of individual members and the sharpness of boundaries ‘around’ them.<sup>13</sup> The existence of canonical elements (prototypes) means that the classifying map has a canonical factorization. Moreover, if the quotient structure obtained by partition is assigned a topology, this induces a topology on the domain of entities to be classified via the inverse-image of the classification map.

Dual to the formation of kinds through figures, a recognition function is a map from a domain  $U$  of variously structured kinds of individuals to a classifying object. A remarkable discovery of contemporary mathematics is that this object can be treated within the same domain  $U$  of entities to be classified. Whereas truth-values — as the standard for classifying judgments — are traditionally disentangled from *any* specific domain, the classifier can vary depending on what is classified and on what sorts of *changes* affecting  $U$ -individuals are considered.

The objects, qualities and actions referred to in natural language are the result of a complex ‘constitution’ process. However, set-theoretical semantics takes no account of the fact that the very nature of this constitution depends on functorial relationships between the category of spaces (manifolds) and the category of (Abelian) groups. Topos theory makes it clear that the topological properties of a given base space affect not only the properties of entities varying over it but also determine the logic suitable for describing those properties. This gives rise to a semantics which explicitly deals with shape identification, (relative) location patterns and forms of motion.

Though finitely generated by schemes, the category  $\mathbf{K}$  of kinds is not necessarily finite. It arises as the product of aspects pertaining to all of the above types of classification. Primarily, however, the actual classification of objects and actions (in any given spatio-temporal domain  $U$ ) with values in  $\mathbf{K}$  corresponds to a quotient of ‘stable’ entities (say, invariant under a category of actions, such as a transformation group).

Confusion of  $\mathbf{K}$  with the category  $\mathbf{Set}$  of sets and functions can be motivated by the existence of a faithful ‘extension’ functor  $Ext: \mathbf{K} \rightarrow \mathbf{Set}$  that assigns each kind its set of ‘members’. Yet,  $Ext$  is not an equivalence. The relation between a kind and a super-ordinate one is not captured by  $\subset$  but rather by a parametrized *forgetful* map.

The way that such a map acts depends on the features it preserves. For instance, ‘dogs are quadrupeds’ and ‘dogs are mammals’ express two different

forgetful maps. If any mammal were a quadruped and vice versa — i.e.  $Ext(\mathbf{MAMMAL}) = Ext(\mathbf{QUADRUPED})$  — the maps would remain different. Also, if the only quadrupeds were dogs or cats, so that  $Ext(\mathbf{QUADRUPED}) = Ext(\mathbf{DOG}) \cup Ext(\mathbf{CAT})$ , the kind  $\mathbf{QUADRUPED}$  would be different from the (disjoint) union of  $\mathbf{DOG}$  and  $\mathbf{CAT}$ ; in  $\mathbf{K}$ ,  $\mathbf{DOG}$  and  $\mathbf{CAT}$  would be coequalized, say, by sharing the four-legged feature. The same applies in the case of the relation of a kind  $B$  to any two kinds  $K, K'$  subordinate to  $B$ , provided both depend on the constitution of  $B$  — which is the case for basic  $B$  (see Section 5). Consider, for instance, the relationship of  $\mathbf{DOG}$  with  $\mathbf{SETTER}$  and  $\mathbf{COCKER SPANIEL}$ . Given that dependence, however, it would be preferable to speak of ‘specialization’ from  $B$  to  $K$  and  $K'$ . Mutual separation of basic kinds states that there is no common specialization for any two different  $B$  and  $B'$ -set — theoretically,  $Ext(B) \cap Ext(B') = \emptyset$ . Exemplars of a kind  $B$ , corresponding to a CN, are cohesive wholes, as functions of a finite set of Gestalt parameters, i.e.  $b = f_B(g_1, \dots, g_n)$ . A subordinate kind  $K$  is obtained by expanding the space of parameters.

## 5. Basic kinds

Thus far I have emphasised the fact that the roots of meaning lie in spatial modalities of perception and action, and more specifically in proprioceptive and sensory-motor abilities involved in early language learning. Traces of these concrete roots can be found in the most abstract lexical items and syntactic constructions. Although, at bottom, CNs type objects and verbs type actions, the logical resources involved in the abstraction process permit the objectification of actions. Objects and actions have to be taken together: as J.L. Bell has remarked, category theory puts nouns and verbs on the same footing. Now, the point is that there is a *basic* level at which cognitive stabilization in classifying objects and actions is achieved.

Since basic kinds of objects are defined in terms of a finite set of Gestalt parameters  $g_1, \dots, g_n$ , individuals that ‘belong’<sup>14</sup> to a basic kind  $B$  are cohesive wholes  $w_B(g_1, \dots, g_n)$  of definite shape, surface texture, material, motion-affordance. Thus the meaning of an atomic sentence such as ‘Fido is a dog’ is semantically rendered by a map that (for simplicity’s sake) can be taken as a constant figure of kind  $\mathbf{DOG}$ . Within this *anschauliche Topologie*, the figures selected as cohesive act as generators of thresholds, ending with the punctuated equilibrium that shows up in lexical discretization.

Basic kinds are accessible through perceptual presentation, and the exis-

tence of prototypes for such kinds, as recognized by Rosch et al. (1976), *normalizes* the presentation. Since prototyping relies on perceptual similarity  $\approx$  between individuals of the same kind, the basic level in the hierarchy of kinds can be identified as the supremum of the levels at which (i) perceptual similarity between an individual  $x$  of kind  $K$  and another individual  $y$  is sufficient for deciding whether  $y$  ‘belongs’ to  $K$ ; (ii) for any two members  $x, y$  of  $K$ , the class of action schemes  $\alpha$ ’s applicable to  $x$  is the same as the class of  $\alpha$ ’s applicable to  $y$ —that is, motor responses are the same for any two members of a basic-level kind.<sup>15</sup>

Different kinds of actions are relevant to different kinds of objects. (Compare a dog, a balloon and a chain, with respect to running, rolling, puncturing.) Plans of action contribute to functional identity and thus to kind-assignment. In fact, as far as actual typing is concerned, any set of sensory data would be indeterminate in the absence of cues provided by motions (of wholes and their parts). The first steps in language learning hinge on kinesthetic competence: a cohesive whole in motion comes with a family of ‘figural moments’ organized into a symmetry group. *Reference* implies invariants. So an object is (re)identified as one and the same in different positions, from different angles, while its parts can also modify their mutual relationships. (Compare the coherent motion of the wings of a bird in flight, a fishing net, a football team.)

The salience of basic kinds concerns not only shapes but also motor responses organized into plans of action of different levels of specialization. Plans for (interacting with) quadrupeds or with setters lack the salience of plans for dogs, by under- and over-specification respectively; plans for plants or a particular variety of olive-tree lack the salience of plans for trees: think of turning around, climbing, cutting a branch, searching for shadow under the leaves. In defining the category **B** of basic kinds, we focus on maps which represent basic kinds of action, in the sense of being directly related to schemes. As for **B**-objects, **B**-maps are not ‘elementary’ (the action of cutting a branch is a combination of different motions). Yet there is an informational peak associated with them, and it corresponds to patterns of scheme-saturation needed for *imagining*. This fact allows them to differ from both more specific and more general kinds of actions.<sup>16</sup>

## 6. Fuzziness and prototypes

Experimental evidence suggests the need for a formal framework dealing with both kind-representativeness of certain individuals<sup>17</sup> and the graded (ideally continuous) character of membership in most kinds. Linguists and psychologists have paid almost exclusive attention to fuzzy set theory, and since this meets with serious obstacles, the use of fuzzy sets varies in an *ad hoc* way from case to case.

Convergence between categorical analysis of language and experimental research by cognitive scientists yields a different result. First of all, prototypes are distinct from stereotypes (in Putnam’s sense) and from their various renderings in Artificial Intelligence. Second, the notion of prototype as used here does not appeal to a *homunculus* controlling the matching (or non-matching) of a percept with the standard: prototyping is an in-built perceptual resource. Third, the drawbacks to the adequacy of ‘prototype theories’ framed in terms of fuzzy sets can be avoided if we approach prototypes in categorical terms.

The idea underlying the use of fuzzy sets was that, given an (ambient) domain  $U$ , any predicate (concept) defined over  $U$  is interpreted as a fuzzy subset  $A$  of  $U$ , so that there is a characteristic function  $\chi_A: U \rightarrow [0,1]$  measuring the degree of membership in  $A$ . If  $\chi_A(x) = 1$ ,  $x$  is definitely an instance of the concept, while if  $\chi_A(x) = 0$ ,  $x$  is definitely not an instance of  $A$ . Moreover, associated with  $A$  there is a (real-valued) distance function  $d$  measuring the similarity between any two elements of  $A$ . Finally, for arbitrary  $A$ , we are given a distinguished member  $p$ , the prototype of  $A$ . The functions  $d$  and  $\chi$  are related through  $p: (*) d(x, p_A) \leq d(y, p_A) \rightarrow \chi_A(y) \leq \chi_A(x)$ . For  $B = \text{BIRD}$ ,  $d(\text{a robin}, p_B) < d(\text{a penguin}, p_B)$  holds.<sup>18</sup>

The psychological reality of  $\langle A, d, p, \chi \rangle$  would be supported by (i) the increasing accuracy and speed in categorization performances when subjects are presented tokens more and more similar to  $p_A$ ; (ii) the precocity of learning such instances; (iii) the fact that the prototype induces a ‘radial’ distribution of elements around it.

The fuzzy treatment of logical operations prescribes that  $(**) \chi_{A \cap B}(x) = \min(\chi_A(x), \chi_B(x))$ ,  $\chi_{A \cup B}(x) = \max(\chi_A(x), \chi_B(x))$  and  $\chi_{\neg A}(x) = 1 - \chi_A(x)$ .<sup>19</sup> If  $\chi_A(x) \neq 0, 1$ , also  $\chi_{\neg A}(x)$  is such, thus  $\chi_{A \cap \neg A}(x) \neq 0$  and, dually, the law of excluded middle is no longer valid. The conjunction fuzziness+prototypes is problematic not for these reason, but rather because it is incapable of dealing with subkind inclusion, as argued by Osherson and Smyth (1981) from the experimental standpoint, and Barr (1986) from the mathematical one.

If extensionality is assumed,  $=$  is definable in terms of  $\subseteq$ . Taking membership, but not identity, as fuzzy leads to incoherence in forming the powerset of  $A$ , that is, the set of all (fuzzy) subsets of  $A$ . For suppose  $X$  and  $Y$  are subsets of  $A$  and for any  $x$  in  $A$  the map  $\chi: A \rightarrow [0,1]$  is such that  $X$  and  $Y$  consist of elements that belong to  $A$  at most at degree  $r$ , with  $0 < r < 1$ . Then  $X=Y$  should be true at degree  $r$ . A related difficulty affects the maps: given two fuzzy sets  $\alpha: A \rightarrow [0,1]$  and  $\beta: B \rightarrow [0,1]$ , a fuzzy function  $\phi: \alpha \rightarrow \beta$  is defined as a (non-fuzzy!) function  $\phi: A \rightarrow B$  s. t. for every  $x$ ,  $\alpha(x) \leq \beta(\phi(x))$ . But the assignment to any  $A$  of an equivalence relation  $E$  on  $A$  with a corresponding  $\varepsilon: E \rightarrow [0,1]$  makes the definition of morphisms  $(A,E) \rightarrow (B,E')$  extremely awkward, and it is impossible to form quotients modulo such equivalence relations.<sup>20</sup> A way out based on a different definition of fuzzy morphism has been shown not to be satisfactory, for at best what is achieved is merely the category of Boolean-valued sets (see Pitts 1982).

These problems find elegant resolution in topos theory, passing from  $[0,1]$  to a *locale* structure  $\mathbf{H}$ , considering the topos of sheaves over  $\mathbf{H}$ ,  $\mathbf{Sh}(\mathbf{H})$ , and then interpreting the language in the category of  $\mathbf{H}$ -valued sets, so that, for any predicate  $A$  defined over the type  $U$ ,  $\chi_A$  becomes a map  $U \rightarrow \mathbf{\Omega}$ , where  $\mathbf{\Omega}$  is a Heyting-algebra object: this category allows quotients of equivalence relations (actually, this condition is necessary in order for a category to be a topos).

The semantics of natural language, which allows expression for exponentiation and truth-values, needs suitable mathematical tools. By renouncing the assumption that all properties are on the same footing, as in first-order logic, type-dependence of predicables on kinds is made explicit in the topos-theoretic approach. Moreover, any topos is a *particular* kind of fibration, and the generality of fibrations can be exploited in order to deal with semantic phenomena — among them prototyping — in a functorial setting. Taking into account the fact that not every kind comes equipped with a prototype, the construction sketched below is formulated in terms of adjoint functors.

## 7. The golden adjunction

Kinds are supposed to form a category  $\mathbf{K}$ , with kinds of actions as maps, while individuals (perceptually localizable, cohesive wholes) are collected into a category  $\mathbf{I}$  that contains single instances of actions as maps. Given the category  $\mathbf{I}$  of individuals and the category  $\mathbf{K}$  of kinds, it is possible to define functors between them.<sup>21</sup>

Two maps relating  $\mathbf{I}$  and  $\mathbf{K}$  have already been considered: namely, the typing map  $\sigma$ , which assigns each individual a kind, and the prototyping map  $\pi$ , which assigns each kind a specific individual. Since  $\sigma$  and  $\pi$  preserve identities and composition of maps, they are functors. Both maps, however, are in need of a suitable restriction in order to be well-defined, because there are many kinds, hierarchically ordered, by which one and the same individual may be classified, as well as kinds with no prototype. By restricting  $\sigma$  and  $\pi$  to a subcategory of  $\mathbf{K}$ , viz., to the category  $\mathbf{B}$  of basic kinds of objects-and-actions, consistency with the foregoing sections is preserved, since, for any object (kind)  $K$  which belongs to  $\mathbf{B}$ , there is a map  $\pi: \mathbf{B} \rightarrow \mathbf{I}$ , such that  $\pi(K)$  is the prototype of  $K$ .

The connection between prototypes and basic kinds can be expressed by means of three principles. While they involve some element of idealization in respect of psychological and linguistic data, these principles allow precise formulation of a theoretical model, avoiding the drawbacks of previous semantic theories.

The first principle is an existential axiom about individuals; the second is a uniqueness axiom about kinds; the third is a condition relating the category of individuals and the category of kinds, with direct consequences for the internal organization of either category:

*P-Principle.* Every basic kind has a prototype.

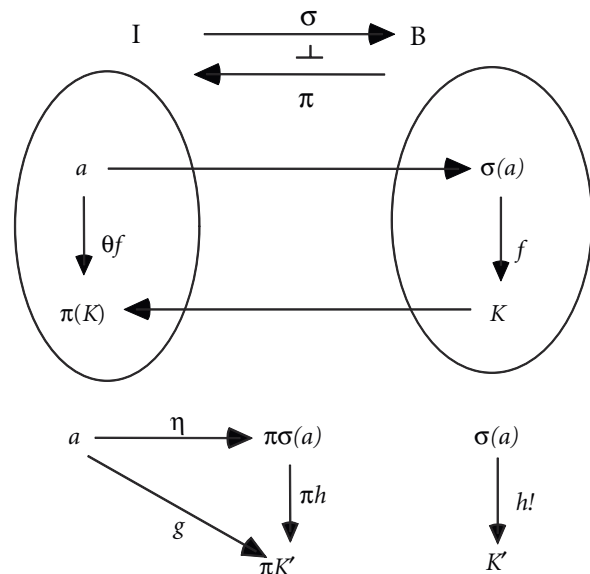
*B-Principle.* For every individual, there is a unique basic kind by which it is classified.

*A-Principle.* The functor  $\sigma$  is left adjoint to the functor  $\pi$ :

The first two principles express the idea that basic kinds and prototypes have privileged status not only for perception but also for cognition, and they jointly imply the connection of any individual  $x$  to the prototype of the basic kind to which  $x$  belongs. To determine this connection, the third principle is added, which says that, for any individual  $a$  and any basic kind  $K$ , there is a natural bijection  $\theta$  between maps from  $a$  to  $K$ 's prototype and maps from  $a$ 's basic kind to  $K$ , as illustrated below.

The universality of  $K$ 's prototype is expressed by the unit  $\eta$  of the adjunction, since in the case  $K = \sigma(a)$  and  $f = id_K$  there is a canonical map  $(\eta_a)$  from  $a$  to  $\pi \cdot \sigma(a)$  such that, for any  $K'$  and any  $g: a \rightarrow \pi(K')$ , there is exactly one  $h: \sigma(a) \rightarrow K'$ , for which the following triangle commutes, i.e.  $\pi \cdot h \cdot \eta = g$ .

In other words, any relation between an individual  $a$  and the prototype of a basic kind can be recovered through the prototype of  $a$ 's kind. A further step



is the hypothesis that any relation between two individuals is definable in terms of prototypes. Support for this hypothesis comes from the fact that any  $f: a \rightarrow b$  in  $I$  gives rise, by composition with  $\eta_b$ , to  $f' = \eta_b \cdot f$ , a map that can be recovered as  $\pi(h) \cdot \eta_a$  for a unique  $h: \sigma(a) \rightarrow \sigma(b)$ .

However, extending the adjunction to one between  $I$  and  $K$  would be inappropriate: (i) for any individual there is a whole family of kinds to which it ‘belongs’; (ii) the choice of an individual canonically instantiating a kind of level superordinate to the basic one has no basis in cognition; (iii) there is no principled way of relating the exemplars assigned to different kinds, such as **DOG** and **CAT** to the exemplar possibly assigned to a common superordinate kind (**ANIMAL**, say).<sup>22</sup>

Treating  $B$  as a subcategory of  $K$  captures the fact that prototypes exist not only for kinds of objects but also for kinds of actions;<sup>23</sup> and, through the unit of the adjunction, any relation between basic kinds is reducible to prototypical relations between prototypes. Moreover, if the combination of prototypes and fuzziness gave rise to the difficulties of Section 6, now a prototype works as a universal element in category-theoretic terms.

In fact, once predication is formally interpreted as membership, the only systematic way of dealing with something similar to the prototype for a property  $\phi$  is by means of the Hilbertian  $\varepsilon$ -operator, so that  $\exists x\phi \rightarrow \phi(\varepsilon x\phi)$  and  $\phi(\varepsilon x-\phi)$

$\rightarrow \forall x\phi$ , to which  $\varepsilon x\phi = \varepsilon x\psi \rightarrow (\phi \leftrightarrow \psi)$  may be added to grant a strong form of extensionality — even though one would need to further assume the existence of a function  $h$  s. t.  $\forall y (\phi(y) \rightarrow y = h(\varepsilon x\phi))$  with  $h$  suitable for  $\phi$ , in order for such a strategy to be effectively applied. But, first, this boils down to postulating the axiom of choice (in some form), which means discretizing variation in an arbitrary way, and second, it neglects the perceptual constraints on prototyping that led us to admit prototypes *only* for basic kinds.

One might resort, as an alternative, to platonic intuition. In that case, instantiating a property  $\phi$  does not mean membership; it means, rather, participation  $\mu$  (for *metexis*) in a universal  $u\phi$ , which embodies the essence expressed by  $\phi$ . This provides an intensional version of the comprehension axiom, namely  $\forall x(\phi(x) \leftrightarrow x\mu u_\phi)$ . This alternative is also cognitively inadequate: for *any*  $\phi$  there would be an individual ( $u\phi$ ) of prototypical character, while not every kind turns out to have a prototype. The conjunction of the P- and B-axioms restricts the above form of comprehension to basic kinds, with one difference:  $\mu$  is replaced by the universal  $\eta$ -map induced by the adjunction  $\sigma \dashv \pi$  (which makes the assumption of  $u\phi$ -uniqueness superfluous). In contrast with the  $\varepsilon$ -operator,  $\exists x\phi \rightarrow \phi(u_\phi)$  holds only for  $\phi$ 's naming basic kinds, and even in such cases,  $\neg\phi$  does not refer, in general, to a basic kind. Finally, the interpretation of  $\mu$  as membership ( $\in$ ) would produce  $u\phi \in u\phi$ , violating the grammar of the deliberately typed language.<sup>24</sup>

### 8. Themes

In the past, research on ‘positional’ primitives was pursued by linguists, philosophers and logicians, although with somewhat divergent methods and goals. With the standardization of first- and higher-order languages, together with their use in analytic philosophy, such research has almost disappeared.

The recent development of many-sorted and typed languages for programming and the kindling of a new interest in the *case*-systems has profoundly modified the state of the art by emphasising the logical import of different ‘thematic roles’ as coordinate axes along which the meaning of any text can be analysed and so be properly simulated. In fact, in Artificial Intelligence, the taxonomy of elementary thematic-roles has become a principal issue.

In order to understand a text, it is presumed that one possesses the ability to answer such questions as: What is the **ACTION**? Who (what) is the **AGENT**?

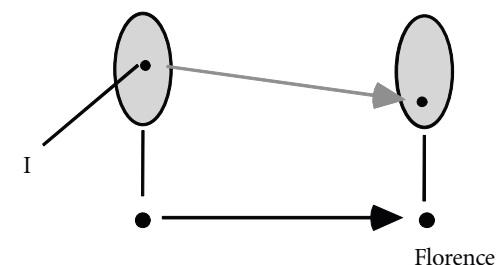
Who (what) is SUBJECT to the action? What is the GOAL? Which TOOLS are exploited to achieve the goal? *Scripts*, as elaborated by Roger Schank, simulate the ability displayed in text understanding. The difficulties met by such computational models (and similar ones like Minsky's *frames*) have been taken as indicating that these models fail to avoid the symbolic fallacy. But what emerges in the above models is the relation of 'primitives' to fundamental *patterns of action*; a relation which plays an essential role in the geometric semantics based on somatic abstraction.

Between the abstract logical form of a sentence and the representation of its full meaning in terms of (the meaning of) the lexical items occurring in the sentence, there is more than compositionality versus context principles: there is a layer of patterns of action. Schank posited eleven such patterns: *physical, mental and abstract transfer, propel, move, grasp, ingest, expel, construct mentally, speak, attend*. It is useful to see how their number can be reduced.

The notion of *transfer*, as change of location/state (from — to —) of an object (of *any* kind) as a result of action, is variously expressed by verbs like 'give', 'bring', 'buy', etc. Given the notions of *space, path and time*,<sup>25</sup> physical transfer is described as the motion of a body resulting from an action on it. Of the three types of transfer, only this one is needed, the others being obtained by lifting: any action resulting in a path is lifted from change of position to change of state. The specific modality and the causal source of transfer can be 'forgotten', so that what is left is a monoidal structure  $M_2$ , whose only two elements are the identity  $S$  (for STAY) and  $T$  (for TRANSFER), and  $S \cdot T = T = T \cdot T = T \cdot S$ . Since positions  $p, q, r, \dots$  in space and composable paths  $f, g, h, \dots$  form a category, the associated actions on objects located at  $p$  ( $q, r, \dots$ ), i.e., in the fibres  $E_p, E_q, E_r, \dots$  also form a category under composition:  $(T_h \cdot T_g) \cdot T_f = T_h \cdot (T_g \cdot T_f)$ , with  $T_e = S$ ,  $e$  being the null path (continuity of action being induced by continuity of paths).

Here, the category of paths is not taken to be a groupoid, in view of  $T = T \cdot T$ , otherwise one would have the group  $Z_2$ . (When a particular category  $A$  of actions is made explicit, any two actions having the same effect on some element, coincide, if  $A$  is a group.) Difficulties arising from lexical superposition of an object with the place it occupies — as if in 'I am going to Florence' there were a path from me to Florence — are thus avoided:  $M_2$  acts not so much on positions as on the associated fibres (see the following picture). Likewise, confusion between source of path and source of action is also avoided.

Moreover, 'grasp' and 'ingest' are instantiations of an archetypal pattern of *capture*, as 'expel' is of its inverse: either is covered by the IN/OUT scheme



composed with  $T$ . *Construct mentally* (as manifested in verbs as 'decide', 'infer', etc.) is recovered as a lifted action (operating on information states). Finally, *attend* calls for the emergence of a FIGURE ON a GROUND, thus reaching back to Gestaltic resources of localization.

The underlying idea can be fruitfully related to the project formulated by Fillmore (1968) for a new 'case grammar', leading to a list of primitive *thematic roles* in the constitution of sentential meaning. The bottom list consists of SOURCE, DESTINATION (TARGET OR GOAL), PATH, LOCATIVE, AGENT, PATIENT (RECEIVER), INSTRUMENT, to which STATE and EVENT can be added;<sup>26</sup> moreover, AGENT, PATIENT, SOURCE and DESTINATION are united in the categorical analysis of actions  $C \times D \rightarrow D$  (with category  $C$  acting on category  $D$ ) with suitable action-preserving maps, bringing us back to a functor between a category of locations in a given base space and a (variable) category fibred over such a base (the fibres of which category contain agents and patients and the maps are constructed from action-schemes). What thus emerges is the figural core of a proposition.

The notion of 'event-frame' was used by Fillmore to refer to a typical set of inter-related thematic elements, possibly varying with socio-cultural context. Talmy modified this notion, identifying a set of core elements as cross-language universals through which the cognitive process of 'windowing of attention' takes place. Is the *salience* of such event-frames principled? In the light of Talmy's research, a positive answer is at hand: event-frames are organized according to a set of general principles that prime FIGURE/GROUND (F/G) effects. In parallel with object-and-action Gestalts, there are also event Gestalts. For instance, asymmetry of the F/G effect is apparent in pairs of sentences like 'The bike is near the house'/'The house is near the bike' or 'The cat is on the mat'/'The mat is under the cat'. Moreover, F/G asymmetry is lifted from the original spatial context to time, e.g. by mapping *along* (space) to *during* (time).<sup>27</sup> The FIGURE is generally likened to something *variable*, the GROUND to

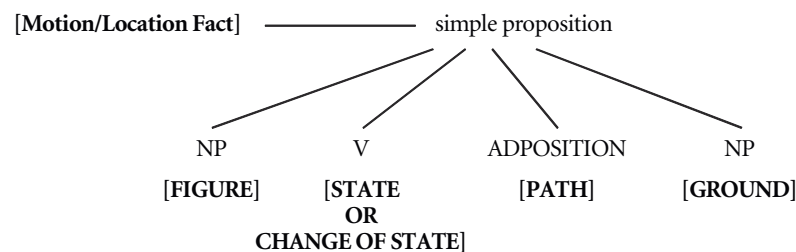


something *constant* — to be intended not much as an absolute as a relative state: cf. ‘While A stayed at r, B moved from p to q’/ ‘While B moved from p to q, A stayed at r’.

The standard use of variables, constants and function terms in logic has misled many linguists, and for good reasons. To clarify contextual inversion in the role of variables and constants, more is needed: what is left unanalysed are the cognitively relevant constraints.<sup>28</sup>

The way that identification spaces enter linguistic representation is a case in point. For instance, given a ground space  $X$ , linguistic representation of paths having an extended region  $U$  as source and another  $U'$  as target ( $U, U' \subseteq X$ ) induces the quotient:  $X \rightarrow X/\{U, U'\}$  under which  $U$  and  $U'$  are collapsed to points. So the schematic meaning of sentences like ‘I am going from Milan to Florence’ involves a similar map, where the collapsed regions are, respectively, the SOURCE and the DESTINATION.

To summarize,<sup>29</sup> the hypothesis is that any thought as expressed in a ‘simple’ proposition of any natural language is of the core-form



with the following qualifications: (i) FIGURE and GROUND can be either singular or collective entities; (ii) STATE can be distributive or otherwise; (iii) the opposition of STATE to CHANGE is not absolute; (iv) when CHANGE of state is null, PATH is constant; (v) the PATH modalities can be definite or not, with one or both extremes (SOURCE, TARGET) possibly unspecified; (vi) cause-effect structure related to action result from nested clauses; (vii) the core-form (and its meaningfulness) is directly grounded in somatic abstraction.

This approach to themes cross-fertilizes with other ingredients of semantic structure (dealt with in previous sections), converging on the claim that there exists a finite list of primitives, not so much as undefined predicates but as patterns of location and interaction articulated into four groups of universals: individual/kind dialectics, schemes, themes (as pointers to ontological dimensions), and the ‘Lifting’ (by means of somatic abstraction).

Thus logic is again intended to make the formal principles of proof and definition explicit, but Form inhabits the roots of Content. That logic is manifested in language does not mean that logical primitives are of a linguistic nature. The internal language of a topos has a great advantage over first-order logic and previous type theories, since it allows us to reduce the structure of any sentence to equational form. This was also the key to description of the world in terms of mathematical physics; and once phenomenological qualities and covariance relations among them are defined by equations relatively to suitable state spaces, the present approach connects with the physics of macroworld structure, encompassing the constitution of individuals and kinds as well as the integration of typing with schemes.

## 9. Singularities

Case grammar was criticized for its lack of generativity. But the main import of themes is their function as axes of reference which keep the generative power of ‘basics’ under control.

According to generative grammar, there are four lexical ‘categories’, i.e. nouns, adjectives, verbs and adpositions. Recent type theories applied to natural language provide types, predicables, terms and operators (which include connectives and quantifiers) to form compound expressions, while verbs are still assimilated to predicables. Somatic-abstraction semantics assigns a more strategic function to verbs as action-markers. The logical form of predication is analysed as an expression of either STATE or CHANGE essentially grounded in *being* (located at a given place) and *becoming* (in motion from a place to another), so that change of state of a body already involves a lifted space — a ‘quality-space’ or a category of attributes.

What is at stake here is the identification of universals as patterns of maps active in every field of concepts, so that universality is no longer taken to be static as in any sort of *characteristica* aimed at definition. If definition were the goal, then the analysis of, say, ‘x kills y’ might well stop at CAUSE [(x, die: STATE(y))], just as it is sufficient to state that ‘Tom is a cat’ is true iff the object assigned by the (implicit or intended) interpretation to ‘Tom’ belongs to the set assigned, by the same interpretation, to ‘cat’. Similar clauses may be refined, but the perspective essentially lacks explanatory power. Understanding of atomic sentences is crucial, for their apparent simplicity with respect to compound sentences embodies the trace of complex meaning generators. *These* are the real



building blocks of semantics, usually manifested by position markers (prepositions, firstly). Hence, analysis of ‘atomic’ sentences should focus on the import of spatial patterns.

One major step in identifying the geometric roots of semantics was made by Thom (1980), whose topology-inspired analysis of ‘ground cases’ is based on the classification of ‘elementary catastrophes’ and their phenomenological relevance. The issue consists of the *stability* of singularities and the classification of their types.<sup>30</sup> Thom’s idea of looking at cases as the transposition of a finite number of dynamic patterns provided the first possibility of unifying conceptualization, schemes and thematic roles in a mathematically rich framework in which attractors came to play an important role.<sup>31</sup>

If one examines the regularity by which different perceptual features support Gestalt effects such as the constancy of size, one sees that non-linear perturbations of stimuli are compatible with law-like emergent perceptual organization. Since object invariance is amenable to description in terms of morphodynamical attractors, one can put forward the hypothesis that semantic universals in cognitive development can be described in a similar way.

This line of research pivoting on morphogenetic self-organization signals a break in the dualism of Physical and Symbolic underlying the variety of approaches to semantics by ‘cognitivists’.<sup>32</sup> What replaces dualism is not reduction: structure emerging in one of the layers (Symbolic or Physical) of reality is not collapsed to the other. Yet, a single theory, of a geometro-dynamic character, is intended to cover the flow of information manifested through the emergence of *qualitative* phenomena in phase transitions. There cannot be a wider gap between this and the view centred on the form/content dichotomy and the division of labour between logico-linguistic and physico-geometrical methods.

Singularities in the external world are not created by language. They tend toward symbolic discretization by *amplifying* the boundaries that separate basins (in the state space of any given macrosystem): differences between entities (states) in the same basin are flattened in a kind-concept formation that leads to the stability of nouns, while thresholds are manifested through basic action-verbs (typically, nouns that refer to barrier-crossing are verbal abstracts). The way standard logical form codes the ‘deep structure’ of a proposition is superficial, since it misses the generating morphodynamics of a system of thresholds which is the precondition for conceptual structure. However, two shortcomings of this ‘morphogenetic’ approach must be mentioned: (i) justification for assuming that semantics is governed by a potential function was lacking; and (ii) the problem of achieving a geometric treatment of logic remained unsolved.

Ad (i), the lifting-process is not committed to such an assumption. Yet it keeps conceptualization as a system of thresholds over continuous variation in the control space. Semantic fields are not given in parallel: they are localizations hierarchically fibred over the base formed by *SPACE* and *ACTION*. In consequence, what is obtained is more than a family of domains independent of one another and freely related in contingent ways (ethnolinguistic relativism and combinatory explosion are two sides of the same coin).<sup>33</sup>

Ad (ii), exclusive attention to emergence of ‘qualities’, in terms of differential topology, is unable to account for the place of logic. The decisive step was made by Lawvere and Tierney in introducing elementary toposes, since it was through these that the precise way in which logic and geometry are related to each other came to the fore.<sup>34</sup> Thus the categorical approach provides the topology of cases with a more general and at the same time more articulated setting for semantics. In this way we obtain a precise *generative* mechanism for projecting the role of themes in simple propositions to higher-order language in its full logical complexity. And so the gulf between logic and space, persisting in both analytic philosophy and Thom’s objections to set-theoretic foundations, can be bridged without adding logic as an extrinsic tool or charging it with direct metaphysical significance.

The ‘*hypothèse localiste*’ (so named by Petitot 1979) states that positional roles in localized regions of space-time also act as archetypes for syntactic structure. This hypothesis has received support from linguistics mainly through the pioneering work of Gruber (1965), and solid empirical grounds for it have been provided by Jackendoff, Lakoff, Langacker and Talmy, though with noticeable differences among them. What consequences follow for logical analysis from a theory based on the primacy of space intuition, and how can they be formulated in categorical terms? An answer to both questions is presented in Section 10, starting from the zero-level of atomic propositions. But before we turn to this topic, it is advisable to dwell briefly on a controversial issue.

Any model for meaning stability (balance of compositionality and context) should provide room for instability as well, which calls for finer analysis of local and global aspects of meaning. As it is, the compositionality principle makes no reference to the local/global distinction: it refers to hierarchically organized parts and generally involves a correspondence between semantic and syntactic functional dependence. The argument of a function cannot depend on the function itself, otherwise circularity or regress prevents any interpretation from getting started. The context principle supports such dependence, but the presumed counter-examples to compositionality exploit the fact that the

opening to context is bounded, and in a principled way (schematic patterns, themes and the F/G effect).

Accordingly, the context-sensitivity of adjectives and verbs in compounds can be recovered as consistent with compositionality once the mediating kinds (types) and information on the background are made explicit. This is an issue of parameter-saturation filling (implicit) slots in the root of adjectives and verbs. The GROUND is as relevant as the FIGURE, and ellipsis in the analysandum remains different from non-compositionality in the analysans. Compositionality must be seen in relation to schematic molecules of meaning and the constraints on their composition: localization resources, typing, schemes and themes are presupposed.<sup>35</sup>

At bottom, each molecule of meaning has a definite number of slots, the specific (and exact) value of which is *not needed* to activate molecular meaning. Precisely for this reason, schemes are semantically generative, and at the same time they trace the boundaries within which the frame problem can be raised (before being solved). Basic schemes, as instantiated in ‘*a* is in *b*’ or ‘*a* goes from *x* to *y*’, represent minimal units of interaction, and they alone provide the basis from which compositionality derives its sense. Instead of searching for a global semantics, what matters are the meaning generators, independently of the hypothesis that they produce a unique, consistent system. In other words, the context principle is constrained from below by a set of constructive elements, just as the compositionality principle is constrained from above by conditions of Gestalt stability.

## 10. The Lifting

The patterns of representing and intervening that are activated in the early stages of cognition crystallize in the common-sense world, where they are moulded to carry cultural constructs until they become hidden behind more and more abstract units of meaning. But the original organization of space and coherent motion is always at work.

The semantics of a concretely-grounded typed language is organized into two layers, one fixed and the other variable. The first layer is centred on a base category **B** of basic kinds of objects and action-morphisms. So nouns, verbs and prepositions are basically organized into schemes of spatial character. The second layer varies freely among the range of cognitive contexts brought into focus by our understanding of nature and culture. The two layers are related by

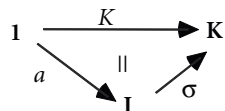
thematic structure: invariance, from Concrete to Abstract, of schematic patterns of interaction in space is mediated by ‘themes’, providing the many-dimensional reference system for any linguistic manifestation of thought. There is a family of liftings from **B** to any (abstract) universe of discourse, conceived as a category **C**, functorially fibred over **B**. Since the features of specific liftings must be properly investigated in each particular case, semantic theory can but establish the minimal conditions on the lifting-process that still make the whole construction *contentful*. These conditions concern the first layer, which is crucial to the ‘enchaining’ of individuals and kinds (Sections 5–7), as well as to thematic structure (Section 8).

Still to be dealt with is Lifting. This will be done by paying attention to its very basis, namely, the meaning of ‘simple’ propositions. Three ground forms of these are now considered, plus a fourth that is often taken as atomic; for each of them the lifting-process is illustrated by examples.

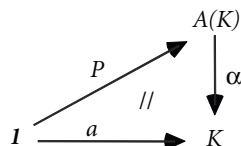
- (1) *a* is at *p*.
- (2) *a* goes from *p* to *q*.
- (3) *a* stays at *p*.
- (4) *b* causes *a* to go from *p* to *q*.

With **X** as the intended space, the map  $\text{LOC}: \mathbf{I} \rightarrow \mathbf{X}$  assigns to an individual *a* the location of *a* in **X**; for any location  $p \in X$ ,<sup>36</sup> the fiber  $F_p$  is  $\text{LOC}^{-1}(p)$ , thus (1) is analysed as  $a \in F_p$ , which in turn can be expressed by a map  $\mathbf{1} \rightarrow F_p$ . (2) involves a path  $f: [0,1] \rightarrow \mathbf{X}$  such that  $p=f(0)$ ,  $q=f(1)$ , and the flow of time parallels the motion along the path, so that  $t_0$  is associated with  $F_p$  and  $t_1$  with  $F_q$ , thus *a* corresponds to a section of LOC along the path. (3) adds to the former the condition that  $\forall x \in [0,1] (p=f(x))$ . In case (4), a category **A** of operators acting on fibres along the path *f* is implicitly presupposed, *b* is in **A** and is such that  $a \in F_p \times \{t_0\} \Rightarrow b \cdot a \in F_q \times \{t_1\}$ . (Note that in natural language *a*, *b*, etc., are ambiguously treated as both objects and operators.)

The first step in the Lifting consists of substitution of states for positions in space, and basic type-assigning judgments are the elementary instances of form (1). ‘Fido is a dog’ is likewise analysed as ‘Fido is *at* the kind DOG’, with  $\sigma$  having the role of LOC. Hence, a closed-term type judgment like  $t:\tau$  has a different meaning from  $[t] \in [\tau]$ , even though by means of *Ext*:  $\mathbf{K} \rightarrow \mathbf{Set}$  the usual reading is recovered. Attribution of a predicable, as in ‘Ann is pretty’ is analysed as being of the form  $P(a:K)$ . Given the factorization

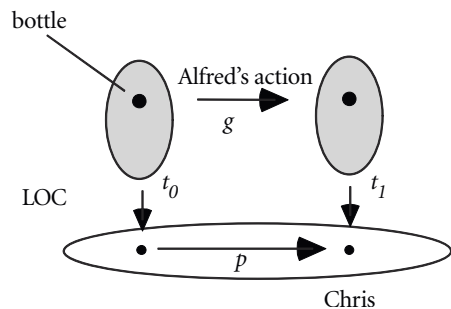


one can summarize it as  $I \xrightarrow{a} K$ . For any  $K$ , there is an algebra of attributes  $A(K)$  so that  $a$  has attribute  $P$  if  $a$  factorizes through  $P$ :

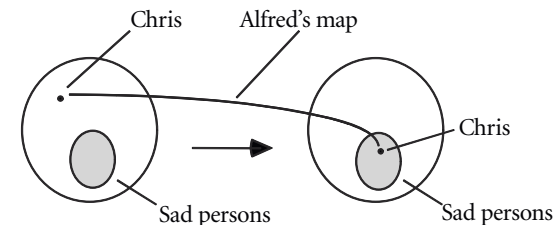


The concrete implementation of this corresponds to: Ann, as located at  $K$  (WOMAN), is in the state of prettiness.<sup>37</sup>

A sentence like ‘Alfred gives the bottle to Chris’, which in standard logical form reduces to  $G(a,b,c)$ , is analysed as Alfred’s action  $g$  causes the bottle to go from — to Chris, with the initial ‘location’ of  $b$  left as implicit. This is made possible by another ground form of the Lifting (individuals as places), as illustrated in the picture.



(The AGENT can also be left implicit: ‘Chris receives the bottle’). Since language tends to collapse agents with their actions, so that the previous sentence is represented as  $a \cdot b(0)$  is at  $c(1)$ . When elements of the base space are lifted to states, one obtains by the same pattern the meanings of sentences as ‘Alfred makes Chris sad’ (Chris is now thought as being in the fibres, not in the base), ‘He smashed the glass’, etc., where the relevant states in the base are, respectively, not-sad/sad, integral/smashed, etc. The considerations in Section 8 about TRANSFER and other primitive schematic interactions apply here. But one could simplify the analysis in a more set-theoretic way, as illustrated by the following picture, where states (of mind) are *lifted* positions.



In the cognitive order, the abstract notion of ‘applying a function to an argument’ (by which Frege interpreted predication) is a fundamental lifting of a primitive resource, concretely exercised in action on bodies. Since every action is originally typed as a mapping from a localized domain to a localized codomain, it is clear why diagrams are commonly used to introduce the function-concept: they take us back to where cognition is *primarily* organized.

### 11. The philosophical corner

The idea put forward above is that concept formation, which underlies all forms of reference, is constrained to universals (of object-and-action), and that the same bodily patterns pervade any content of thought. Proprioceptive and sensory-motor abilities (of a philosophical system coupled with the physical environment) impose natural constraints on intentionality.

The supposition according to which the phenomenological sources of information leave no trace on the formal architecture of cognition is the first step towards the symbolic fallacy, unless one resorts to the miracle of a pre-established harmony of causal and intentional. ‘Entwined naturalism’, as advocated in Peruzzi (1994a), suggests that both the fallacy and the miracle can be dismissed by focusing on the bodily propensities/affordances that drive the formation of concepts.

Both structuralism and idealism oppose this natural dialectic with the view that the four sorts of universals are by-products of a segmentation of reality (as an undifferentiated continuum) determined either by language or by autonomous patterns of mind. Their common and crucial shortcoming is that they keep silent on the origin of constraints on the provision of information. Structuralism flourished in semantics under the seal of a holistic view of meaning, the problems of which have already been analysed in Peruzzi (1993).

Semantic idealism avoids the miracle by claiming that the world is filled with order projected by the mind, description is assimilated to creation, the only sense of *seeing* is *seeing-as*, and basic kinds and schemes are susceptible of being presented likewise. The problem with any such view is that an amorphous nature cannot make the *existence* of such a discretizing system possible and the structure of cognition *explicable*.

Often, the idealistic story continues by saying that, since the world is inaccessible in itself and the world as experienced is all that one can speak of, there is no room for truth and reference. Hence model-theoretic semantics is merely a formal game. The foregoing criticisms of the inadequacy of set theory, as the proper *Organon* for semantics, might be taken as paving the way for this kind of intensional argument (against the reduction of meaning to reference and truth). But although the semantics of Lifting focuses on ‘experiential’ constituents, it preserves, in its full majesty, the primacy of reference and truth.

However the idealistic story is continued, the miracle recurs. Any virtual construct calls for real support, and if this is virtual too, an ineradicable regress begins. By shifting commitment from the external world to its representational construal, the gain is illusory, and not just because it is less economical (through unnecessary multiplication of internal entities), for the shift leaves reality and stability of that very construal unexplained by *fiat*.<sup>38</sup>

In this connection, it is illuminating to examine an argument which purports to show that any appeal to reference and truth will clash with the turn toward the bodily roots of meaning.

The argument starts from the possibility of an absolute separation of symbols from their meaning, this separation making it possible to view thought as merely the recursive manipulation of symbols. Now, if the linguistic expression of thought possesses meaning, meaning must enter through a correspondence with things out-there; and set-theoretic semantics specifies how this correspondence projects from atomic to compound sentences. But the entities involved in such semantics are abstract and no less formal than the symbols that they should serve to fill with content. Hence we are back in the ‘symbolic fallacy’ loop. Since natural language is semantically closed, the predicate ‘... refers to —’ has to be defined in terms of itself, and the completability of this task clashes with the liar paradox (Tarski’s Theorem). Moreover, other results of logic (such as the Löwenheim-Skolem Theorem) state that unique characterization of reference is impossible. Finally, if meaning has to do with actual reference, the principle of compositionality states that the reference of a (non-tautological) sentence can change if the reference of one of its constituent parts

changes. However, predicates can be suitably re-interpreted (the *cat* is on the *mat*/the *apple* is on the *tree*) to leave the truth-value unchanged. The conjunction of recursive manipulation of symbols and set-theoretic semantics is bankrupt and, as a consequence, the use of mathematical methods is out of place in semantics.

This argument is defective in many respects. In principle, nothing prevents schemes from being algorithmic in character; meaning and reference can be related without reducing the former to the latter; reference and truth are not necessarily framed in the Tarskian manner; ‘limitative theorems’, like those mentioned above, apply to natural language only if this is faithfully translated into *one* formal language which obeys the laws of *one* logic. Yet the argument contains a grain of truth: model-theoretic semantics neglects the richness of spatial intuition in fixing reference. Once this richness is recovered, ‘limitative’ results start to play a *positive* role, while others become no less fundamental.<sup>39</sup> In fact, essential information about macroscopic bodies is provided by the number of connected components and the number of ‘holes’ in each component. Constancy of these two numbers provides basic cues for devising plans of action and forecasting their adequacy to the goal. The world can be understood in more than one way only if it can be understood in at least one.

The traditional thesis that metaphors are deviant expressions whose meaning, if any, is reducible to some set of literal propositions, is wrong not so much in view of the unachievable reduction as in view of the presupposition that Tarski-style conditions describe the facts of the matter. The literal is space-laden, and metaphors project literal concreteness. What was taken to be literal in model-theoretic semantics is only a parasitical reconstruction of a deeper and authentically primary level of meaning. Metaphors are able to transpose schemes across domains, only because they, literally indeed, appeal to the sole source at hand: the bodily structures of understanding. The formal is metaphorical, but patterns of metaphor manifest mathematical form.

## CHAPTER 10

# The history and future of field semantics

## From Giordano Bruno to dynamic semantics

Wolfgang Wildgen

Various features of the space of semantic conceptualization, and specifically position, neighborhood, path and motion, are discussed in the essay. These characteristics of conceptual space are applied to the dynamics of field semantics on the basis of concepts from Gestalt theory. Wildgen's main contentions are that there exist different geometries of lexical fields, and that there is a linear array of ideas, concepts and words, the extremes of which may be glued together. He argues these theses by drawing on such authors as Lullus (linear field), Bruno (regular surface, as a sort of generative mechanism of infinite spaces filling the system), Peirce and Lewin. Some aspects of Wildgen's treatment — those concerning antonymy, hyponymy, synonymy and metonymy — are also covered by Violi's essay in this book. Others — in particular the schemes of path and barrier, the concept of routes — are discussed in the essays by Albertazzi (force dynamics), Croft and Wood (phenomenological and Gestalt approach) and Peruzzi (semantic fields).

This paper has a twofold purpose. It takes a step back from modern linguistics by considering the contribution of a Renaissance philosopher, Giordano Bruno (1548–1600), and it looks at the future of field semantics. The current interest in Renaissance philosophy and semiotics also has current motivation. In the year 2000, when Christianity begins its third millennium, Rome commemorates the day when Giordano Bruno was burnt at the stake for heresy at the Campo di Fiori. This essay shows that the 'Art of Memory' elaborated by Giordano Bruno is already a highly developed semantic theory, and it uses his insights to evaluate contemporary models of semantic fields. In general I have adopted two different perspectives:

1. Four centuries are a rather short period in our historical consciousness of basic problems of semiosis and meaning. I shall prove this by showing the advanced technique of Giordano Bruno's 'Art of Memory'. Since this Art has a

geometrical basis (mainly in two dimensions), and since memory organizes “pictures, ideas and signs” (cf. the title of Bruno’s last book *De imaginum, signorum et idearum compositione*), his artificial memory is a very early theory of semantic fields and sets out basic processes of semantic composition. Moreover, it is multimedial, since it is not restricted to linguistic items but refers by means of *imagines* to external and internal pictures, and by means of *ideae* to abstract theoretical principles. Contrary to the structuralist models of semantic fields, it possesses dynamics (by metaphors, metonymies and semantic metamorphosis) and links the basic concepts, the *ideae*, to a cosmological construction. Thus the theoretical range of Bruno’s ‘theory of semantic fields’ is much broader than that of the classical paradigm established in the 1920s by mainly German and French scholars.

2. The slow evolution of semantic field theory prompts me to guess as to its possible future. Cognitive semantics, as proposed by Talmy, Langacker, and Lakoff, has been a first step towards elaboration of the classical (structuralist) paradigm. These authors have re-introduced space and motion; but I take their models to be only first steps which we can go far beyond. Dynamic semantics makes the decisive step, and by virtue of the fact that it refers to very fundamental topological and dynamic principles, it brings the theory of semantic fields back into the neighbourhood of Bruno’s proposals. In his and Cusanus’s terms, the extremes are in contact with one another.

## 1. Semantic fields in Giordano Bruno’s theory of artificial memory

### 1.1 Lull’s circular fields as a starting point for Giordano Bruno

The first systematic spatial organization of lexical items (their concepts) was put forward by Raymundus Lullus (Ramón Lull: 1232–1314). All conceptual systems of his *Ars Magna* are arranged in a linear order with (normally) nine segments. Since the extremes of this ‘belt’ are joined, we have a circular field. Every concept has two neighbours, and by adding specific figures (triangles, squares, etc.) one can join three, four, etc. concepts to create a sub-network. The concepts of an area of knowledge may be organized into a set of such nine-tuple ‘fields’. On top of all the more specific conceptual fields (arrays of nine concepts), stands a universal field, which contains those qualities of God that are at the origin of all further entities and their concepts. The semantic system has an ontological and metaphysical foundation in the tradition of Aristotelian

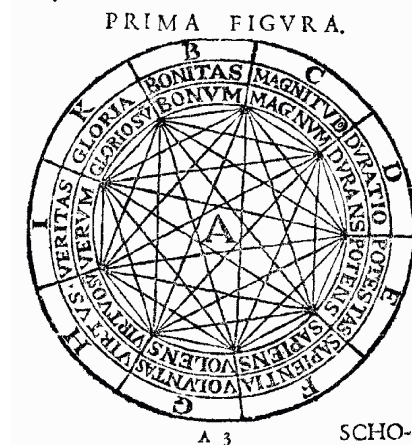


Figure 1. The Lullian circles (Lullus’s first figure)

and medieval logic. Table 1 shows a set of such conceptual arrays, and the circular organization is shown in Figure 1.

Such lists of primary qualities which are aspects/emanations of God-hood have very deep historical roots. Thus, in Egyptian mythology the primary God Ptah displays an emanation into nine (sometimes eight) deities responsible for different aspects of the universe. Corresponding figures of a subdivision of God are known in the Jewish and Islamic religions. In Egypt, another figure recurring to triads was introduced and is reflected in the Christian Trinity of God (Father, Son, and Holy Ghost). If we analyse the list in Figure 1 from a purely semantic point of view, we can discern three subfields which have a parallel substructure.

Table 1. The dignities of God as the first layer in the hierarchy of ontological-semantic fields

bonitas/bonum	=	good	B
magnitudo/magnum	=	big	C
aeternitas (duratio)/aeternus	=	eternal	D
potestas/potens	=	mighty	E
sapientia/sapiens	=	wise	F
voluntas/volens	=	will	G
virtus/virtuosum	=	virtuous	H
veritas/verum	=	true	I
gloria/gloriosum	=	glorious	K

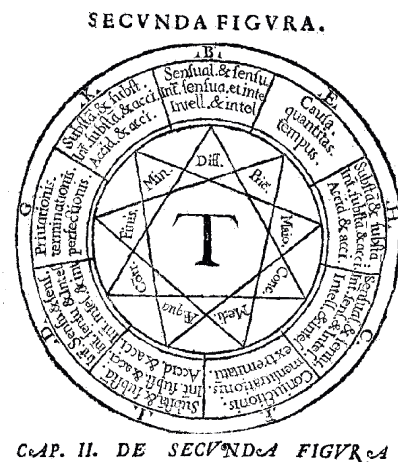


Figure 2. Lullus's second figure

The first group: 'good', 'big', 'eternal', may be called metaphysical; the second comprising 'mighty', 'wise', 'will', is related to the human mind and body; and the last group of 'virtuous', 'true', 'glorious', may be called ethical. Moreover, the different positions in the group fit together (across levels): good-mighty-virtuous. A deeper understanding of this lexical field presupposes knowledge about the mythical and theological contexts and their historical evolution.

The idea that ideas/concepts/words form linear arrays, that the extremes may be glued together, and that a hierarchy of such arrays exists, is a first realization of 'field-semantics'. But Lullus did not stop at the static idea of a (circular) field of concepts: he proposed a combinatory mechanism which may have been motivated by the 'machinery' of medieval syllogistics, but which contained a new mathematical impulse which allowed the later development of computing machines by Leibniz, Pascal, and others (cf. Wildgen 1998). The 'semantic field' is endowed with a dynamic (which is discrete).

In a system — for example, with the circles  $C_1$ ,  $C_2$ ,  $C_3$  — every segment on the intermediate circle has four neighbours:

- the two neighbours at the left and right of an element on the circle;
- the two neighbours in the circles above and below.

The elements in the circles in the extreme position have only three neighbours. In general, the first pair of neighbours is invariant, the other two neighbours may be changed by the rotation of the circles. Thus every move of a circle (in the

inner area) changes two neighbours. In a general sense this may be called discrete dynamics on a semantic field. These dynamics have two main interpretations:

1. The morphological or syntactic interpretation. If two circles contain simple morphemes, their combination generates complex morphemes; if the circles contain words, the combination generates phrases and sentences.
2. The time of the process could be the time of actual production or historical time in language change. In principle one could start from a specific (and rigid) type of combination, then language change would move the circles and produce new constellations.

This system of semantic fields is at first sight very primitive, and its dynamics are extremely crude, for they lack the necessary restriction of a free algebra, which is characteristic of generative systems in Chomsky's (1957) sense.

In the second 'figure' of the *Ars Magna*, Lullus introduces relational concepts which are basically organized into triads:

- minor, major, equal (minoritas, maioritas, aequalitas);
- beginning, middle, end (principium, medium, finis);
- concordance, difference, contrary (concordantia, differentia, contrarietas).

If in a constellation of three circles one of them is relational, then the system can produce:

- a. Words with a relational core and absolute concepts as the arguments of the relation. This is the case if we have a preposition and the noun-phrase governed by it, or a verb and the noun phrases filling its valence pattern.
- b. In a diachronic context specific types of changes (e.g., in the correlation of semantic content and phonetic form) remain constant, shrink or diffuse, etc. The relational term is the operator of change or constancy.

I will not go further with analysis of the Lullian system. It should by now be clear that a hierarchy of linear (and circular) fields, and a combinatorial dynamics on it, already constitute a powerful theoretical instrument for organizing the universe of concepts and for producing utterances (and for a model of change).

## 1.2 The houses (atria) of memory introduced by Giordano Bruno

In the late sixteenth century, Giordano Bruno (1548–1600) began to elaborate the Lullian system, devising a new system of conceptual organization based on the analogy between the macrocosm (the universe) and the microcosm (man,

his mind). He replaced Lullus's closed linear field with a regular, bidimensional pattern extending to infinity. I shall comment only on the consequences of this new geometry of 'fields'.

Mathematically, Lullus's field is a circular segment divided into nine sub-segments. If instead of linear segments the basic unit is a regular surface, we may consider either the filling of an (infinite) area by circular surfaces (spheres), or its filling by regular surfaces (polygons) or bodies (polyhedra). The corresponding mathematical problem is that of an (optimal) package of circles/spheres or polygons/polyhedra. The 'practical geometry' of the sixteenth century (as elaborated by Bovillus) had already considered this problem. The corresponding practical problem of the regular filling of a surface by a geometrical pattern was a technical problem for craftsman who had to complete a surface using one, two or several specific forms. There are two basic ways to package circles, as Figure 3 shows.

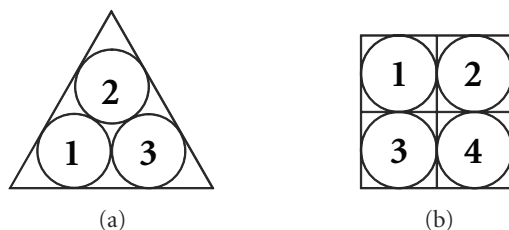


Figure 3. Two types of circle-packaging

Type (a) corresponds to the filling of an equilateral triangle, the second to the filling of a square. Figure 4 shows the regular filling of space with regular polygons; note that the pentagons do not completely fill the surface.

The surface can be filled without lacunas by equilateral triangles, squares and polygons decomposable into these simple surfaces (it *cannot* be filled with, e.g., pentagons).

Similar observations can be made in the case of three dimensions, with the important difference that we have only three basic types of regular polyhedra (if we consider the duals as variants).

But what does this imply for the organization of a conceptual system, of a lexicon?

If we decide, as Bruno did, that the filling of a surface by squares (i.e., type (d) in Figure 4 below) is most adequate, the semantic universe is constructed on the basis of a square grid. Bruno went further. Referring to the tradition of artificial memory dating back to antiquity, he defined different areas of complex fields.

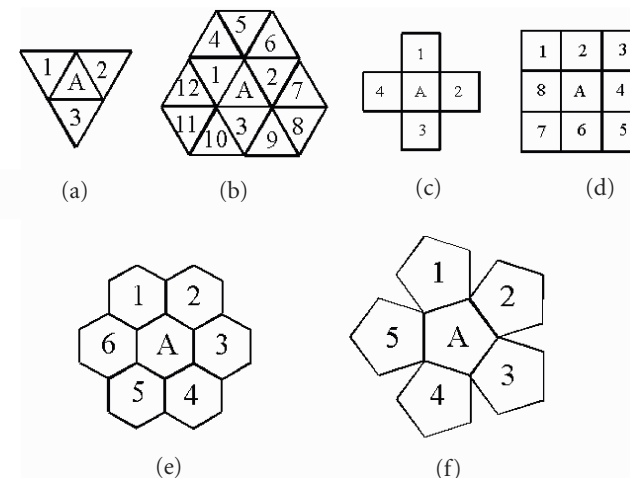


Figure 4. The optimal filling of space with regular polygons

### 1.2.1 The atrium-house

This consists basically of  $3 \times 3 = 9$  square rooms; if the central room is open (the atrium), we have *one* centre and eight rooms in its periphery. Figure 5 shows this arrangement. Note that the central atrium has eight neighbours, four of which have a line as their borders, and four have only a point of contact.

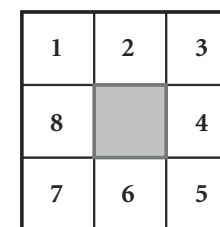


Figure 5. The atrium

In my book on Giordano Bruno's artificial memory (Wildgen 1998) I described the further subdimensions of his atrium, and the construction of villages and fields around the atrium, again using the same geometrical pattern. The basic principle is:

- an optimal package of space;
- a generative mechanism of (infinite) space filling;
- a hierarchy of fields (cell, atrium, village, field).



As a consequence of the regular pattern, all fields show self-similarity; on every scale we find the same type of pattern; the universe is homogeneous (isotropic); and there is no global centre. I will give an example for the filling of such a geometrical structure with concepts in Table 2.

Table 2. The *atrium altaris* in Bruno 1591

aqua/water	lavacrum/bath	palma/palm
aratrum/plough	thorax/breastplate	anchora/anchor
catena/chain	amphora/amphora	currus/chariot
scrinium/desk		stabulum/stable
scapha/skiff	altare/altar	fruges/fruit
solium/throne		fumus/smoke
carcer/prison	fornax/oven	arbos/tree
cadus/jar	ensis/sword	globus/globe
sella/stool	ignis/fire	epulae/banquet (food)

If we consider the eight subfields as lexical fields, we can try to establish the types of semantic relations which link the items in these sub-fields. Modern treatises distinguish among antonymy, hyperonymy, hyponymy, synonymy, metonymy, and so on. Since Bruno's system is space- and image-oriented it is plausible that spatial, part- whole or focus-periphery relations are prominent. With a small elaboration of the given terms into contextualised entities, we may assemble the following coherent substructures and their corresponding lexical relations.

Table 3. Semantic relations (in context) discernible in Table 2

Chain-plough (part of)	Bath-amphora (large and small containers of water)	Palm-anchor (beach-ship anchoring)
Desk-throne (both are pieces of furniture)		Stable-smoke (the animals in the stable produce dung, which creates fumes)
Prison-jar-stool (the stool and the jar are typical objects present in prison)	Oven-sword-fire (the fire in the oven may be used to heat the sword, which is forged)	Tree-globe (parts of the globe are covered with trees)

But this is only the static aspect of the system; there are two types of dynamic elaborated by Bruno:

a. The generation of phrases and sentences. The atrium is embedded in a square. The four corners of the square may be assigned different syntactic functions, e.g., subject, absolute predicate, relational predicate, and circumstances. As an example, a concept in the right upper corner is taken as subject; if one moves to the upper left corner, the concept there can be taken as absolute (i.e., an attribute/adjective of the concept first chosen). The lower left corner is the place where a relational predicate may be chosen. And so on. The precondition for a generative mechanism of this kind is that every concept may have four variants corresponding to the four functions. This means that the field only contains the rough concept, which may take different cases or be changed into an adjective, a verb or into an adverb (adverbial phrase) corresponding to the syntactic function with which it is associated (Tesnière would call this operation "translation"). As in Lullus' system, the specific morphological realizations are not considered to be important features; rather, the system works with ideas, images, and lexical concepts (cf. the title of Bruno's 1591 treatise).

b. A second dynamic directly concerns the fillers of the memory pattern. Every word in this pattern may be replaced by its metaphor or its metonym. Thus, a text which was first generated along the lines of basic meanings associated with the terms filled into the system can now produce a totally different text or text interpretation by using a set of metaphorical and metonymical processes.

Giordano Bruno's system is extremely rich, and it contains a complex of new intuitions about a conceptual system. Seen from a modern perspective it is, however, very general, and one cannot imagine how it could work in practice.<sup>1</sup>

Historically, we may say that the consequence of Bruno's parallel work on artificial memory (first publication 1582: *De umbris idearum*) and cosmology (first publication 1584: *Cena delle ceneri*) is a new model of semantic fields which was so radical in its time that the first modern followers (although ignorant of this tradition) are the von Neumann automata and the neural net systems of the 1980s (cf. Wildgen 1998: Ch. 5).

### 1.3 Applications of Bruno's houses of memory

The true sense of Bruno's organization of memory is revealed by the applications he proposes. In all cases he treats the "memory of words" — that is, the codification of the letters or syllables of a word by images/lexical items distributed

throughout the houses of memory. This presupposes that every position in the house (with 24 places) is linked to one letter. The sequence of letters is then mapped onto a path in the house. Thus, in order to code the Latin word *ARTEM* ('art'), the path produces the following sequence of images: water (A)-prison (R)-bath (T)-breastplate (E)-fire (M). These five images/lexical items are the centres of a scenario/story, in which water flowing from the prison washes down the breastplate which is consumed by fire. The fact that this scenario is rather bizarre is not inconvenient for memory experts, because the bizarre character of a scene is helpful for memory retrieval. In the context of a theory of lexical fields we can say that the lexical organization in the house of memory is partially static and supported by lexical relations, as well as partially dynamic and supported by (bizarre) episodes, which may be constructed on a linear path through the house of memory.

Giordano Bruno adds numerous complicated mechanisms for memory coding and retrieval, decomposing words into syllables and using astrological and mythological systems for their mnemonic organization (cf. Wildgen 1998: Ch. 4). In order to show the scope of his theory, I will add that he develops a far-reaching method of textual metamorphosis. Thus he takes the first verses of Virgil's *Aeneas* and reduces the sentences to their central concepts. These concepts undergo a series of semantic transformations (e.g., global and partial metonymies and metaphors). The results of the transformed concepts are finally used to build a new text which is radically different from the initial one. With the same technique Bruno is able to transform an epic text into a dramatic one or into a series of logical arguments. This extreme form of transformationalism goes beyond the theoretical imaginings of Noam Chomsky and even of George Lakoff. Any text can be produced by skilful transformation of some given textual basis.

In what follows, I shall skip the Cartesianism of the seventeenth century, the empiricism of the eighteenth, and Kantian idealism, and continue my journey through the history of mind with Peirce (almost three centuries after Bruno's death on the Campo di Fiori in Rome).

## 2. Summary of modern contributions to a theory of semantic fields

### 2.1 Peirce's existential graph

Charles Sanders Peirce (1839–1914) developed his 'existential graph' as an intermediate formalism between mathematical logic, which was about to

assume the form that it has today, and topology, which was a new mathematical discipline which went beyond geometry (cf. the works of Felix Klein, Möbius, and others in the nineteenth century).

The basic ideas of Peirce's system is that every utterance may be inscribed on an abstract utterance sheet. The absolute terms are represented by dots on the sheet. If two dots are referentially identical they are joined by a line. The negation of a dot is represented by a closure which contains the dot. Insofar as no general geometrical pattern is presupposed, a dot can be placed anywhere. Relations between concepts (schemata) are represented by relational graphs with different valences. Figure 6 shows the representation of valences from 0 to 3.

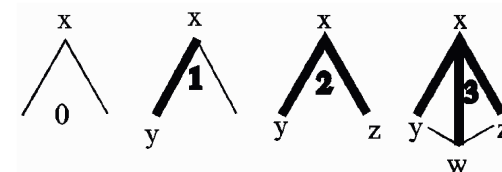


Figure 6. The graphical representation of valences

What is new in Peirce's existential graphs?

- Lullus's relational concept is elaborated by the concept of valence. Fillmore would later call these schemata for the organization of concepts into a unitary macro-concept: *frames* (cf. Fillmore 1977).
- Negation, and in a similar manner modality (described by a permeable closure), is included.
- The whole system can be translated into the sequential language of modern predicate calculus (it is formally equivalent to it).

The first two innovations are of immediate relevance to our purposes. The relevance of a formal logical model of meaning for field-semantics is open to discussion (many field-semantics may be translated into logical models). The first innovation is perhaps the most important one: it has to do with the consolidation of chemistry in the nineteenth century (the term 'valence' is a clear indicator of this origin). It would be crucial for any later field-semantics to cope with the phenomenon of 'valence'.

Fillmore and Atkins, 1992, contrast lexical fields (based on semantic relations) with cognitive frames. The latter relate words "by way of their links to common background frame" (ibid.: 76f.). The concept of valence points to a

basic type of holistic frame found in chemistry, i.e., the structure of a molecule may be predicted by the possibilities of completion in a central atom (and shells of electrons). The difference between binary semantic relations and valences is a very fundamental one, as Peirce shows. Higher range relations follow specific laws of stability, have specific “gestalts”. This fact is exploited systematically in catastrophe theoretic semantics (cf. Wildgen 1982, 1985, 1999a). As Fillmore showed in his scenes-and-frames semantics linguistic valence is more than a syntactic phenomenon, it has roots in cognition, i.e., in the perception, enacting and categorization of basic and stable scenes. Before René Thom, Peirce was the first to understand the mathematical structure underlying the phenomenon of valence. Both go beyond cognitive semantics as they consider fundamental laws valid for all types of valence-patterns.

**Table 4.** Types of rhematic units in Peirce’s system of diagrammatic logics

Rheme with 0 places:	medad rheme:	a proposition
Rheme with 1 place:	monad rheme:	a quality
Rheme with 2 places:	dyad rheme:	a dyadic relation
Rheme with 3 places:	triad rheme:	a triadic relation

Many elements in Peirce’s thought (for instance the ‘marriage’ between natural science and semiotics) and the importance of modern physics and modern (experimental) psychology for theoretical work in linguistics and semiotics, are also characteristic of Gestalt theory, the next stage in our journey to field-semantics.

## 2.2 Gestalt theory and semantic fields

At the origin of Gestalt theory stands philosophy and psychology, which were not yet institutionally separated in Germany. Thus Christian von Ehrenfels’ 1890 article ‘Über Gestaltqualitäten’ follows the tradition of Goethe and Humboldt and considers mainly perceptual ‘Gestalts’. In the various schools of Gestalt psychology (Berlin, Graz, Leipzig) different aspects were foregrounded: psychophysiological aspects in Berlin (e.g., Wertheimer, Koffka, Köhler, Lewin), intellectual forces as Gestalt-foundation in Graz (e.g., Meinong, Benussi), emotional and symbolic aspects in Leipzig (e.g., Cornelius, Bühler).

In general, the new window opened by Gestalt theory for semantics was the insight that such fields have some ‘over-summative’ force which defines their unity, and that they are dependent on a kind of resource for Gestalt-binding. Moreover, the field is mostly non-homogeneous: it has areas of dominance, of

centrality. The sub-dominant parts are attached to the dominant one. This feature acquired much importance, and the theory of prototypes applied to colour terms (as realizations of a colour concept) and botanical and zoological classifications in natural languages (Berlin’s “basic level terms”) are examples of its relevance. This Gestalt principle can also be applied to syntactic phenomena, for example to the role of a grammatical subject as a dominant part of the simple sentence and the attachment of sub-dominant constituents of the sentence to it.

Another basic insight, already constitutive of von Ehrenfels’ analysis, is the ‘transportability of a Gestalt’ as shown by musical patterns. If we generalize this idea, we arrive at schemata, frames which require only some general conditions for their application, although they may be filled with very different materials which fit the schema or the frame. The concept of the case-frame developed by Fillmore and others in the 1970s (under the influence of vision research), takes up this idea of a Gestalt-quality. Although von Ehrenfels mentioned possible applications in semiotics and Bühler elaborated a semiotic framework inspired by Gestalt theory, the rise of the concept of ‘semantic field’ was not explicitly linked to Gestalt theory. However, the concept of ‘field’ has two specific applications in Bühler’s *Sprachtheorie* (1965; first published 1934) which are independent of the ‘field linguistics’ that evolved in the same period, for example in the work of Jost Trier:

1. The semiotic activity makes use of two fields: the *Zeigefeld* (deictic field) and the *Symbolfeld* (field of symbols). A third candidate, the *Malfeld* (field of pictorial representation) is not considered to be fundamentally relevant to natural languages (Bühler 1965: 153–4).<sup>2</sup>
2. The symbolic field may be considered in isolation, and one can define *Feldmomente* (field moments), which allow, for example, the reconstruction of a whole (a sentence) from the set of its constituents. Bühler distinguishes two major types: *Stoffhilfen* (material field moments), and *Wortklassen* (word classes). The former open a material domain and a system of interrelations with other elements of the same domain. Thus the term ‘salad’ opens a field either of garden plants and garden activities or one of kitchens and eating. (ibid.: 171)

Bühler mentions two Gestalt principles at work in the area of *Stoffhilfen*:

...if either a single point of cristallization has been gained, around which everything gathers (‘law of centralization’) or either a richer schema of relations (pair of contrasts, series of intensification, schema with four relations as

in an analogy  $a:b = c:d$  is materially suggested and appears to the one in quest for it, then the reconstruction is normally going strong.<sup>3</sup> (ibid.: 171)

Gestalt psychology and the philosophical and epistemological discussion that it engendered in the 1920s and '30s influenced the structuralism of the Prague School (namely Jakobson). The terms 'system', 'structure', 'field' almost became synonymous, but the theoretical level already achieved by Gestalt theorists (e.g., Bühler) was lost as soon as practically-oriented philologists began to use the term 'field' in a highly extensive manner.

### 2.3 Lewin's topological fields and their application to communication

As early as 1912 Kurt Lewin foresaw that a scientific psychology would have to make use of 'topology' and of the dynamics which could be conceived in a topological structure (cf. Lewin 1969:9). Lewin's central idea was that of a 'psychological life-space' (*psychologischer Lebensraum*). Life-space is constituted by the individual and a situation relevant for the individual at a given moment. The life-space of an individual has two aspects:

1. Every partial domain of an individual's life-space corresponds to a 'psycho-domain', containing the person, structures of the life-space specifically relevant for the person (individual situations) and structures of the life-space which are constituted independently from the person (standard situations).
2. Psychic 'locomotion', i.e., paths in the life-space with preferred routes, barriers and obstacles.

The development of a child or an adult may be described as a change in life-space. The life-space of a child alters as soon as it learns to grasp, to control, to walk, to speak, and so on. A prisoner has a dramatically reduced life-space and some situations may contain attractors (cf. emotional attractors, sympathy, love, etc.) or repellers (situations of frustration, anger), which provoke reactions of escape.

Thus far we have considered the person to be an integral component of a life-space. But persons may themselves be regarded as a topological field with an inner area (intrapersonal domain), a periphery of this domain, and a sensor-motorical domain, which lies between the person and his/her context (the situation). In Lewin (1969:185) the following diagram is used to depict this structure.

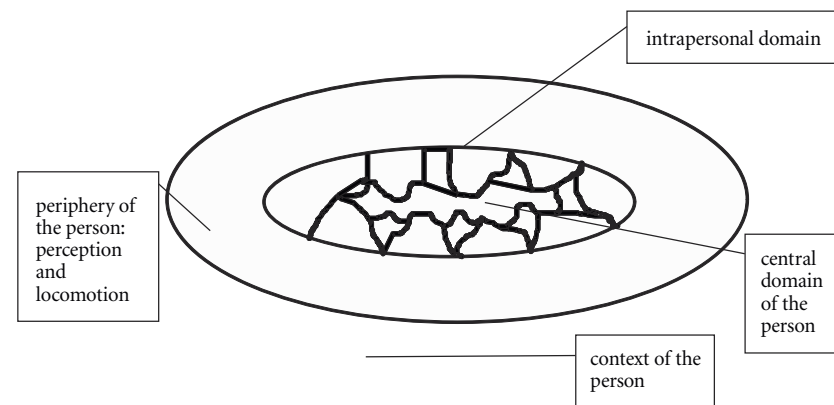


Figure 7. Lewin's structure of the person

Language has two major functions in this framework:

1. It transfers internal states of the person to his/her environment. This corresponds roughly to Bühler's expressive function (*Ausdrucksfunktion*).
2. Language enables a type of indirect locomotion in psychic space: for example, surrogate locomotion as in the speech act of ordering or in social coordination via language, change of social and personal relations and cognitive influence, which creates new possibilities of psychic locomotion via learning. The topological psychology of Lewin was later elaborated by Fritz Heider and his 'attributional psychology'. Heider strengthened the relation between 'life span' categories and semantic categories, for example, perceptual, experimental, affecting, causing, evaluation, part-whole relations (possessive), can, trying, wanting, etc. (cf. Heider 1958).

Thus, the psychic and the symbolic world have the structure of a field, and topological and dynamic (vectorial) notions from contemporary mathematics are used to specify these fields. Nevertheless, the concept of a field in philology and linguistics prior to 1970 did not follow this 'scientific strategy'. I will, therefore, comment briefly on the internal evolution of the concept of field in European and mainly German linguistics between 1925 and 1970.

### 3. Current views: a short critique

#### 3.1 An overview of 'field linguistics' in Europe (1925–1970)

In pre- and post-war German linguistics the term 'field' was associated with the very vague and ideological ("weltanschaulich") theories of Leo Weisgerber and his pupils. I shall not comment on this rather obscure part of German linguistics, but on the three different types of field that emerged:

- a. The field as a quasi-spatial organization of lexical items; the space can be linear as in evaluative predicates or scores, two-dimensional or three-dimensional as in colour-terms and gender-terms, or multi-dimensional as in a feature-matrix (these fields are *static lexical* fields).
- b. The field may have a preferred axis which corresponds to utterance time (the basic one-dimensionality of language stressed by de Saussure).
- c. In a diachronic analysis the fields described under (a) may undergo a change, i.e., the corresponding areas expand/shrink, the interrelations in the field change. These fields are called *diachronic*.

The dominant image schemata of (a) are the 'mosaic'; for (b) causal/temporal chains could serve as an image schema; in the case of (c), Jost Trier (in 1931) proposed the image of the horse-race. The relative positions of the horses in the 'field' change between the start and the winning-post.

These image schemata make up the stable core of field semantics. In practice, many inadequacies of the theory of semantic fields derive from the appreciation of these image-schemata. I shall mention only a few:

1. Polysemy and vagueness are not reflected in the classical concept of a semantic field. If we take the image schema of the mosaic, this means that the individual 'stones' overlap and have variable surfaces; gaps may appear and disappear. Some areas are filled better than others. Some stones belong to different mosaics at the same time. As these considerations show, the image schema of a mosaic breaks down under these assumptions.
2. In a one- or two-dimensional field, the boundary between two items is a point or a line. Neighbourhood is the only permitted relation. In a semantic field many different relations may exist (hyponymy, antonymy, contrast; central, peripheral organization, etc.). The image schema of a low-dimensional space of representation breaks down under this premise.
3. Many connotative and pragmatic nuances of meaning may co-exist. Whole structures become dissipative and chaotic, and one must ask what the specific conditions of stability and order are (cf. Wildgen 1994: Ch. 4).

I shall try to remedy the informal and inadequate image schemata of traditional field theory by introducing more powerful mathematical tools which yield a theoretical account beyond image-schematic analogies.

#### 3.2 Some remarks on the link between Gestalt psychology and cognitive semantics

In 1968 Charles Fillmore published his famous article "A Case for Case". Later he generalised the notion of (abstract) case to frames (Fillmore 1977), and to constructions (Fillmore 1988). In the context of my historical introduction I shall only mention the fact that the concept of 'frame' introduced in 1977 by Fillmore was anticipated by use of the term in Minsky (1975). It cannot be historically proved, but my impression is that Gestalt psychology was finally accepted by major trends in computational vision research, and via vision research it reached the centres of cognition research, one of which was founded in Berkeley in around 1968, and of which Fillmore and his colleagues in Berkeley were members. Thus, after an odyssey comprising persecution (after 1933) in Germany, emigration, and then difficult integration in the USA where it conflicted with the dominant behaviourist trends in psychology, and after the rather mechanistic first stages of computational psychology, this strand of ideas entered mainstream theorizing in 1975, contributing to the development of cognitive linguistics. In 1977 Lakoff gave a paper on linguistic Gestalts at the Summer School on Mathematical and Computational Linguistics in Pisa. In the same period Leonard Talmy wrote his articles "Rubber Sheet Cognition in Language" and "Figure and Ground in Complex Sentences", and in 1979 Langacker published the first article — entitled "Grammar as Image" — on what would become 'space grammar' and later 'cognitive grammar'. Thus, between 1976 and 1979 the new 'wave' of topological and dynamic semantics finally reached California and soon thereafter began to spread through Italy, Germany, and France — cultural areas in which, half a century earlier, the major trends in Gestalt theory and corresponding applications to linguistics had been created. But this 'comeback' was something more: it had inherited the rigour (and also the missionary attitude) of American linguistics after Bloomfield, Harris, and Chomsky. It would be a mistake, therefore, to belittle or even reject this revival. European scholars should rather ask themselves why they were not able to make more of the Gestalt heritage.

#### 4. Dynamic semantics and the future of field theories in semantics

Morphodynamics is a type of general modelling strategy which can be linked to Greek philosophy: Aristotle's categories, Plato's construction of the world and the mind from primitive geometrical forms. In the later tradition, Goethe's *Morphologie überhaupt* (cf. Wildgen 1983) and Schelling's natural philosophy are specific phases in the naturalization of semiotics. Thom has coined the term 'semiophysics' for a modern assessment.

The techniques of modelling used by Thom (and Haken) are new, however. They apply basic results of physics and mathematical theorizing related to physical dynamics, for instance catastrophe theory, synergetics, chaos theory, and so on.

##### 4.1 The dynamic field of action and interaction as the proper basis of syntactic (valence-governed) fields

In Wildgen (1994: Ch. 3) physical dynamics (e.g., those of a pendulum) are used as a type of dynamic field which may be applied to lexico-syntactic fields. I shall describe only one, rather complex case: the dynamic semantics of the verb 'give'.

An initial clue to the basis of interactional patterns can be found in animal behaviour. Fentress (1982) and Golani (1982) show that very specific paths exist for the contact behaviour of mammals. The paths and their attractors can be lines of contact (between the tip of the mouth and the body of the partner) or lines followed in the bodily orientation of one animal (the direction of its head and its eyes). These lines follow stable paths and stabilize in very specific regions. Thus a very small sub-field of the body surface is selected for allowing contact. Furthermore, in the course of repeated contact very specific symmetries and asymmetries in the relative behaviour appear in the interaction, so that a highly ritualized pattern is created (cf. the analysis of the behaviour of wolves by Fentress 1982). The attraction in the relative movement of two agents plays a similar role to body joints in locomotion. Different types of social contact make use of different 'joints':

- the eyes of the mother are an attractor for the baby, and they are essential for the first contact with the mother (humans attract humans specifically by the white parts of the eyeball and the movements of the eyes);
- the bodily contact zone (at a short distance) using the lips (compare the suckling activity of the baby); in the same way the breast of the mother is an attractor for the baby;

- contact at a certain distance using the hands (grasping, petting);
- contact of exchange (using the hands controlled by the limbs and the eyes);
- communicative contact (using the mouth and the ears as instruments).

The co-ordination of the interactive processes exploits these kinematic and energetic sources and elaborates them. Linguistic activity itself is simultaneously such an interactive process and the product of it (it is therefore self-referential). One specific process in this field will be analysed more closely: the process of giving (receiving/exchanging).

The basic schema or prototype of 'giving' can be configurationally described by a sequence of snapshots: t1 to t5. Each snapshot represents an instantaneous three-dimensional configuration in which the specific positions of sender, receiver and object define a plane. The third dimension is a density (or relevance) function. This density is a correlate of the subjective focus in the perception or the motoric control of a specific region of the scene. At the beginning and at the end of the series, density has two attractors (maxima of attention, relevance), in the middle of the series (t2 to t4) a third attractor appears, grows and finally disappears (the participants focus on the entity exchanged).<sup>4</sup>

The intermediate, symmetric scene is the most unstable one. Both agents concentrate their control on one target, and their control must be coordinated in order to secure a smooth exchange. Thus, if A releases his control before B takes the object, or if A holds the object tight, although B seizes it, the character of the process is dramatically changed and degenerates into 'A loses, drops the object' or 'A and B compete for the object C'. Hence the unstable state of exchange is the 'junction' of the process, the point of maximum coordination of the controls. It can be a meta-stable state if the object gains some autonomy: for example, if it lies on a table between A and B such that it is within the reach of both but is not strictly controlled by either of them. This configuration corresponds to the topological schema of transfer (see Wildgen 1985: 185). The process of exchange, transfer, or change of possession is highly differentiated in the lexicon of verbs.

The five major phases are separated by the catastrophes called EMISSION, CAPTURE and TRANSFER (transition) between HAVE<sub>1</sub> and HAVE<sub>2</sub>, which are the start- and stop-positions. The line of TRANSFER separates HAVE and HAVE NOT; M<sub>1</sub> or M<sub>2</sub> are the permanently existing and dominant agents of transfer.

The concepts of control and intentionality allow the construction of a scale with four steps:

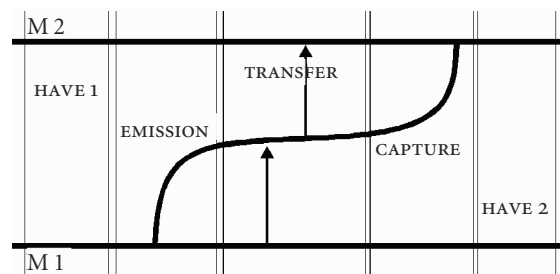


Figure 8. The phases of the TRANSFER schema

1. a simple control is a function inside the agent and its immediate parts (limbs),
2. a second type of control is created if the agent takes into consideration an entity which is not part of himself and has its own dynamics (own forces),
3. the control necessitates a recognition of the “intention”, the goal of another agent,
4. a complex scenario with objects and other agents is integrated into a higher “Gestalt”. It creates a social schema which is the presupposition for the evolution of communicative routines and of language.

In relation to the basic intentions of the participants in the transfer scenario, the schema of giving is in disequilibrium because agent A finishes ‘poorer’ and agent B ‘richer’. A symmetric configuration is found in the schema of mutual exchange, which corresponds to a closed loop in the underlying control-space of the catastrophe called ‘butterfly’. Figure 9 shows this structure.

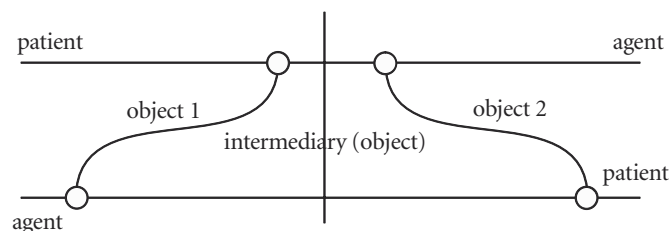


Figure 9. The energetic cycle of transfer

In the first phase the patient gets object 1 and ‘wins’, thus creating an asymmetry of possession; in the second phase the former agent gets object 2 and ‘wins’. The general figure represents two basic movements of a simple game

(compare the theory of game-theoretic equilibria and the application of game theory in Wildgen 1994: Ch. 7, §2.2).

In Figure 8 the line of TRANSFER is defined by a shift of dominance (from  $M_1$  to  $M_2$ ). The concept of dominance of a force<sup>5</sup> allows the definition of a perspective; the different dynamic perspectives are the basis for a semantic subclassification of verbs. We find the following subclasses of

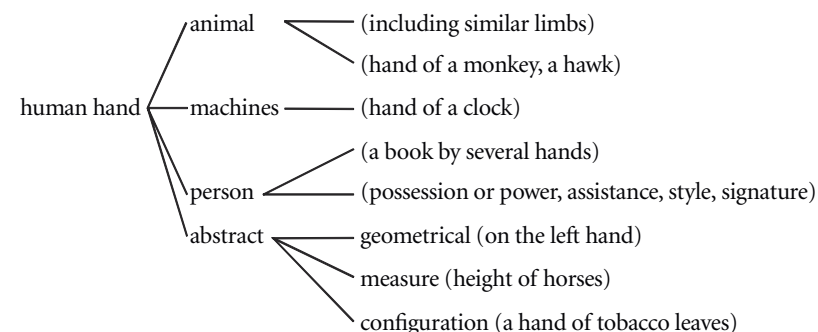
- a. GIVE: give, donate
- b. CAPTURE: receive, take, take off, rob, steal
- c. TRANSFER: exchange
- d. TRANSFER + CAPTURE: buy, buy from, purchase, shop
- e. TRANSFER + EMISSION: sell, lend/borrow, return.

The concept of dominance in a dynamic system can also be used to model topicalization and passive transformation (cf. Wildgen 1988).

#### 4.2 The synergetics of words and (internal) images

If we consider the lexical fields linked to body-parts, e.g., ‘hand’ or ‘eye’, we find that these simple lexemes and the very concrete and well-known objects (real body-parts, as experienced by ourselves) are the kernels of a very complex network of readings, derivations/compounds, and locutions.<sup>6</sup> I shall give solely an overview of the information on ‘hand’ contained in *Webster’s Encyclopedic Unabridged Dictionary of the English Language*. If we consider the mental image linked to the word ‘hand’, the following network appears:

Table 5. A sub-network of ‘hand’



The basic problem with this kind of field is that the real object ‘hand’, its shape, its function, its kinematics, and so on, are mapped into the structure of a

semantic field. We observe a synergetic (i.e. highly stable and selective) cooperation of two systems: motor control and proprio-perception on the one side, and linguistic categorization on the other. The geometrical transformations of a human hand (e.g., into the 'hand' of a monkey or a hawk or to the pointer of a clock) and the functional abstraction (to possession, assistance, measure, and configuration) could be simulated by a synergetic computer in the same fashion as face recognition was simulated in Haken (1991). The concrete object 'hand' can be perceived partially and distortedly, some of its typical motions can be enlarged, augmented or simplified, bleached. Embedded into different contexts these transformations of the original object and its functional dynamics acquire new meanings. The invariable kernel of all these transformations conserves the original label 'hand' but changes its specific content. Different languages perform these operation in different ways, sometimes they shift to labels for sub-parts like 'palm', 'finger' or 'thumb'. Thus in German one may read from 'hand', in English from the 'palm', etc. Empirical and experimental research along these lines is currently being prepared.<sup>7</sup>

The organization of lexical fields selects the stable and prominent subfields of such a pattern recognition in the domain of limb and motor perception and maps them into the categorical system exploited and manifested by our lexicon. Research in this area could shape the future of lexical field semantics.

Whereas Section 4.1 dealt with archetypal fields found in almost any language, and Section 4.2 pointed to the possibility of an analysis of a highly cooperative (i.e. synergetic) process which links pattern recognition and linguistic categorisation, the final section will consider the possibility of chaos and fractality in semantic fields.

### 4.3 Metaphors on their journey into chaos

"Love is a journey" is one of Lakoff's favourite metaphors, and metaphors have been his love since 1980. But where does the journey of metaphor-semantics end — in chaos?

Metaphors, in the sense of Lakoff and Johnson (1980), are basically mappings from one semantic domain to the other, from a source to a target, and the basic formula A is B clearly shows the nature of this process. Since Lakoff does not subscribe to Chomsky's axiom of autonomy of a syntactic (linear) component, he has to acknowledge that this mapping is one between spatial (multidimensional) entities: moreover, the metaphorical mapping is by definition partial, and it is not even clear what the partial basis of the mapping is.

In terms of a copying machine this means that there are strong factors of deformation involved in every mapping. One can, therefore, foresee that the metaphorical process reaches chaos after a few steps (two or three).<sup>8</sup>

Now, if the chaotic outcome which should be the case given the explanation of metaphors as mappings does not occur, this shows that the fundamental explication of metaphors is perhaps mistaken. In Wildgen (1994: Ch. 4) another theoretical account in terms of diffusion and synergetic self-organization was proposed. Instead of a mapping I assumed a process of diffusion by similarity (metaphor) or contiguity (metonymy). For this purpose, I presupposed that meaning in the adult behaves similarly to meaning in children learning their first words: it has a natural tendency to infect all neighbouring percepts and experiences (neighbours in terms of the mind = metaphorical neighbours, neighbours in terms of perceived/experienced world = metonymical neighbours). This 'natural' non-caused process is then channelled by specific conditions on the growth of metaphorical and metonymical meanings and by conditions of their stability (repeatability, learnability). An elaboration of this point of view is part of the future of a theory of semantic fields. Chapter 4 in Wildgen (1994) is only a first sketch of such a theory.

Some of Lakoff and Johnson's results have been basic knowledge in Gestalt psychology, especially in 'attribution theory', since the 1950s.<sup>9</sup> The body-periphery topology, which was already a constitutive part of Lewin's topological psychology in the 1930s could be elaborated by further subdivisions such as: grasp-distance, shout-distance, and locomotion-distance, which stratify the body-centred space. What is new in Lakoff and Johnson (1980) is the role played by locutions and proverbs like 'time is money', 'argument is war'. Since only a small number of the examples for metaphors in Lakoff and Johnson refer to such frequent and very convincing locutions, I presume that the phenomenon of metaphorical interpretation has different sources:

1. Orientational metaphors are rooted in non-linguistic cognition (complex perception and action programmes).
2. Metonymical processes apply general inductive procedures in perception, action and reasoning.
3. Further metaphorical relations exploit differences in semantic density in the sense of Thom (1978). The general rule says that expressions which are more concrete (have more semantic density) may replace less concrete ones if some basic similarities are given.



Finally, there remains a subclass of metaphorical processes which have a symbolic character and have a regulative power in a specific society. The locutions ‘time is money’, ‘argument is war’ describe, in a quasi-symbolic manner, specific Western societies in which the economy plays a prominent role (individual performance, professional achievement, and social status based on wealth are valued), which have democratic institutions, and where the force of the body and violence are (partially) substituted by argument and communicative skills. The metaphorical power of these locutions therefore arises from the fact that they stand for basic structures of a specific society and stem from a general cognitive capacity.<sup>10</sup>

Another domain of chaos and fractality concerns the basic linguistic categories themselves. Typological research shows that as the number of well-analysed languages increases, the traditionally accepted grammatical labels tend to disappear and a huge variety of different, although in a general sense similar, categories appear. If we assume for simplicity’s sake a scale, e.g., of nouns, then the further comparison of languages tends to show many different intervals on this scale (as centres of a prototypical category). In Cantor’s sense, the line is cut in many different ways so that intermediate holes appear. The fractal Cantor-set is a new field-concept which may be applied to semantics and which completes the classical notions.

## Notes

### CHAPTER 3

1.  $\iota$  is the uniqueness operator: the last term should be read ‘the (unique)  $x_2$  which is T’.
2. It does not make any difference for the argument whether I assigns intensions (rather than denotations) to the descriptive constants of the language.
3. “The use of a language would ideally involve not only the determination of the collection of *all* models of the language (a determination sufficient for the *logical* notions...), but also the specification of a particular, *actual* model” (R. Montague, “English as a formal language” (1970), in Montague 1974: 209).
4. So the matter is not simply that ‘pure’ truth-conditions (without MPs) do not suffice for genuine semantic interpretation, as Bonomi (1983) seems to put it (pp. 62–62). Even truth-conditions *with* meaning postulates do not suffice.
5. Such consequences of the Löwenheim-Skolem theorems were originally pointed out by Quine (1969) and Putnam (1980). Lakoff (1987: 235) remarked that Putnam’s argument does not depend on a restriction to first-order languages; for Putnam’s point is that truth (e.g. of meaning postulates) underdetermines reference (of their constituent expressions). Thus the argument in this form is not a corollary of Löwenheim-Skolem; it only depends on the general features of semantic interpretation in the model-theoretic sense (including compositionality).
6. “With symbols defined only in terms of more symbols, their meanings are ungrounded. The problem is rather like trying to learn Chinese from a Chinese-Chinese dictionary alone, without any prior knowledge of Chinese” (Harnad 1989: 15; see also Harnad 1990: 5).
7. This interpretation is correct, I believe; however, it is slightly misleading in that it can be taken as stating that meaning postulates have no semantic import. This is not so: the point is that meaning postulates are insufficient to represent lexical meaning, not that they are vacuous. An example of an overstatement of this point is the following quotation from Haiman (1980): “Given the three Ooga Booga words ‘nooze’, ‘thung’, and ‘slimp’, and the information that ‘nooze’ is the converse of ‘thung’, which, in its turn, is a hyponym of ‘slimp’, we clearly know nothing about any of them. One of them (it does not matter which) must be named by ostension”(p. 333). I would say that we know, about the three words, exactly what we have been told and what follows from it. This is clearly not enough to recognize a slimp or to obey an order involving a thung (if there be any such); on the other hand, it is enough to assert that all thung are slimp. Perhaps the following analogy may be

enlightening: it is correct to say that an electric typewriter cannot write — it cannot write at all — until it is plugged in. However, it would be wrong to conclude that the machine, or its wiring, plays no role in its writing, or in its writing ability.

8. B. Partee (1981:61) has expressed what I take to be essentially the same view by identifying Montague semantics with “the structural part of semantics”.
9. Of course, these are not the statements one actually finds in a Montague grammar; nor would one find there a category such as “singular noun phrase”. These oversimplified examples are only introduced (with no significant loss, I believe) in order to make the point about truth conditions in a simple way.
10. ‘Contributing’ in the following sense: semantic statements that are not statements of truth conditions are used as intermediate steps in the derivation of statements of truth conditions.
11. “To understand a proposition means to know what is the case if it is true” (*Tractatus*, 4.024).
12. Not meant to contradict presuppositional analysis, etc.
13. An example is Chierchia 1992:293.
14. Again, this is not the truth condition for ‘John runs’ in standard Montague semantics; however, the real truth condition derives its plausibility from the fact that it can be reduced to a formulation like (3).
15. As in Chomsky (1992, 1995).

#### CHAPTER 4

1. Our thanks to Louise Coward and David Denison for providing these and other examples of British English ‘point’ compounds.
2. This same point is made by Slobin 1991, where he describes ‘thinking for speaking’ as the appropriate domain for the influence of language on thought. It is worth adding that we are not arguing that outside of language we have a direct access to a ‘universal conceptual structure’. Instead, the world is always given to us under some construal for our purposes; it just may not be the conventionalized construal provided by the language we are speaking.
3. We should point out that we may not be doing justice to Talmy’s model of conceptualization processes (which he calls ‘imaging systems’ — note the similar use of the term ‘image’ by Langacker) because most of the ones discussed here, particularly those of attention and perspective or situatedness, have not yet been elaborated in detail by Talmy in published work. Most of our remarks here regarding Talmy’s organization of his imaging systems are based largely on his brief comments in Talmy 1988a: 194–5.
4. Attention provides a cognitive interpretation for the difference between vagueness and ambiguity. Ambiguity of a word between two senses implies that the level of attention defined by the conventional image of the word’s meaning(s) is fine-grained enough to distinguish the two meanings; vagueness implies that the level of attention built into the word meaning is too coarse-grained to distinguish the two meanings. Our assumption that English ‘river’ is vague, not ambiguous, makes the claim that the level of attention that is part of the meaning

of ‘river’ is too coarse-grained to differentiate what type of body of water a river empties into. It should be noted that it is not always easy to distinguish vagueness from ambiguity, and this fact too has a cognitive interpretation: attention is gradient and so there is not a sharp line between attending to and not attending to some feature of the entity in question.

5. These remarks refer to only one sort of use of *in front of/behind*. In a sentence such as ‘The cat is in front of/behind the tree’, the choice of preposition is determined purely situationally, by the relative positions of speaker, cat and tree. In a sentence such as ‘The cat is in front of the house’, there is another interpretation available in which the house has an inherent orientation such that the side with the main entrance is the front side, regardless of the speaker’s relative position. The remarks in this paragraph refer only to the purely deictic interpretation.
6. A number of linguists have argued that clausal subordination represents a foreground/background distinction, but it appears to be better analysed as a figure/ground distinction (Talmy 1978; Reinhart 1984).

#### CHAPTER 6

1. Here I shall discuss only the concept of prototype and will not consider the concept of family resemblance. It should suffice to point out that the two notions are by no means equivalent, as they sometimes appear to be considered in the literature, and should thus be kept distinct. For further development of this particular point see Violi 1997.
2. This is not the place for extensive discussion of folk versus scientific theories of meaning. I would claim, however, that the relevance of such a distinction will vary considerably among the different areas of any given semantic system, and in relation to different situations. It should therefore be precisely defined on each occasion. In general, a certain amount of scientific knowledge is included in any folk theory.
3. Of course, this does not mean that we do not have different ‘kinds of’ loving relationships (friendly or platonic, erotic, and so on) which are all specializations of love and thus subordinate to it. However, this form of subordination is not the same as the hierarchical structure exhibited by natural categories. The most important difference is that, generally speaking, subordination does not necessarily imply a basic categorial level. There is, for example, no general sense in which we could say that one kind of love is more basic than any other.
4. This of course would also include Lakoff’s ICM. Once we have made explicit and clarified the distinction between categorial prototypicality and semantic typicality, ICMs are just other models for representing typicality, i.e., regular aspects of meaning.
5. A good example of this way of defining the context is provided by Searle 1978, where the claim that there is no literal meaning is supported solely with examples of highly deviant cases, such as hamburgers two metres long or encased in plastic blocks.
6. Note that this internalist position is not incompatible with any form of moderate externalism that assigns context a function of modelling onto a pre-existing standard representation. In fact, it actually combines with it, while it would be incompatible with any strong version of externalism.

## CHAPTER 7

1. Bühler criticised Lipps for failing to *prove* that our corporeal mechanics are involved in optical illusions. Cf. Bühler 1913:37.
2. I use the concept of non-independent part in the sense of Husserl's Third Logical Investigation (1900–1).
3. This was first pointed out by the Brentano school. See in particular Meinong (1899).
4. This does not mean, however, that Talmy thinks that all cases of rest result from an opposition between an Antagonist and an Agonist which 'cancels each of them out', and that all cases of motion result from an Antagonist and an Agonist in which the former overcomes the latter's tendency towards rest. In fact he distinguishes between situations that involve force dynamics — as in the cases analysed here — and ones which are dynamically neutral.
5. This is the difference between 'type' and 'prototypicality' (see also Violi, in the volume).
6. This feature was subsequently analysed by Leipzig *Ganzheitspsychologie* (see Sander and Volkelt 1962).

## CHAPTER 9

1. The reader is referred to Lawvere, Schanuel (1991) as a first introduction to category theory. Peruzzi (1991) offers a survey of the manifold relationships between categories and logic. Chaps. 5, 6 and 8 of Macnamara, Reyes (1994) show how category theory can be applied to the study of cognition and, more specifically, to type-theoretical analysis of natural language.
2. What Piaget called 'schemes' (for sucking, moving, handling *etc.*) are ground patterns of the child's interaction with the environment. They concern modalities of actual implementation for schemes in the present sense. The emergence of schemes during cognitive development will not be examined here.
3. In what follows, reference to schemes as meaning-generators will appeal to Peruzzi (1998).
4. This structure involves both the constitution of objects of *reference* in the first stages of cognitive development and the basic patterns of action for interacting with them. Such phenomenology generates central concepts of mathematics, see Mac Lane (1986) Ch. 12.
5. 'Saliency' translates the German term *Prägnanz* used by Gestalt psychologists.
6. Jackendoff (1983) provides an extensive critical review of previous semantic theories, as they do not take such a 'preference rule system' into account.
7. As confirmed by research on causative verbs in Italian, see Moneglia (1993).
8. For the difference among forms of extensionality in category theory and their relevance for specific problems of semantics, see Peruzzi (1988), (1994b). Rejection of the classical principle of extensionality does not impede the preservation of compositionality (see § 9).
9. Like migratory birds, whose orientation capacity is present before they are able to fly and persists if their wings are damaged, humans can exploit spatial schemes even if they are blind or possess motor impediments.
10. For a comparative review, see Pavlovic (1990).

11. This is no commitment to relativized identity, expressed by  $s=_t t$ . The arguments put forth by Macnamara and Reyes deal with this issue at length.
12. If there are rules of formation for concepts, as well as rules of recognition (as to whether or not a token instantiates a given type), they need not wait for the growth of language to start operating. Conceptual formation feeds syntax, which is as 'formal' as possible: the trace of content, left by gestalt parameters in types of objects and actions, appears in pre-positions as much as in connectives and quantifiers.
13. In such a case the group-action is trivial; a finer analysis of definite descriptions requires non-trivial actions, see Peruzzi (1987).
14. The use of 'belong' is in inverted commas for two reasons: (a) the typing procedure by which an individual is assigned a kind does not coincide with membership of a set; (b) individuals may be conceived of as localizations of atomic kinds — that is, as the result of applying localizers to kinds (here the situation splits according to whether the kind in question corresponds to a count or a mass noun). The way localized entities are initially referred to is essentially expressed by deictics; the polymorphic nature of 'this' makes it possible to reduce the range of deictics to just one.
15. The *quantitative* economy (optimal balance) of information associated with prototyping is bound up with *qualitative* features of a gestaltic nature; 'economy' is related to image-schematization, and the latter is confined to (or accumulates around) a privileged level in the hierarchy of kinds. Maximization of cognitive efficiency is indeed a constraint which must be taken into account when evaluating the adequacy of logical analysis, see Mervis, Rosch (1981).
16. Shifting of basic level may occasionally occur. This consists of the inclusion of some sub- or super-ordinate kind among the basic ones, and vice versa. Confined to specific domains of experience, such shifts depend on different weighings of perceptual cues due to over- or under-specialization (as with experts or subjects deprived of a domain-specific experience). Optimality of information storage, for recognition tasks and imagery, places lower and upper boundaries that may be affected by cultural biases. The possibility of up-and-down shifting of basic level still depends on an imprinting competence made possible by the salience of basic kinds.
17. In what follows, it is assumed that if the core subset of (proto)typical instances of a kind is non-empty, it reduces to a singleton. It is worth recalling that the typicality of a token is a more general phenomenon than its being a prototype.
18. If also the converse of (\*) holds, either  $p$  or  $\chi$  can be dispensed with. Thus, an argument for the mutual irreducibility of  $p$  and  $\chi$  is needed and it cannot be the mere fact that certain kinds lack any prototype. No such argument seems to be at hand.
19. Other definitions are possible (e.g., by 'norms'). Yet they do not affect the argument.
20. On the other hand, the fact that two morphisms differing only on elements of  $A$  of degree zero of membership are different (even with respect to fuzzy extensionality) is not a drawback at all.
21. For the purpose of the present discussion, the specific categorical structure of  $I$  and  $K$  has been left indeterminate.

22. Assigning each individual the upward closed poset of kinds to which it belongs is mathematically sound (the collection of such posets is a co-Heyting algebra), but here our strategy is to incorporate additional cognitive constraints.

23. That Gestalts of in-built nature concern kinematic patterns no less than patterns of static form was suggested by Albert Michotte's experiments, successively confirmed by Alan Leslie in tests with six-month-old children. In this connection, the cartoon films of Fritz Heider and Marianne Simmel are also an extraordinary source of intuition on the geometric roots of semantics, particularly for understanding of 'intention' as associated with kinesthesia of basic kinds of co-motion — the meaning of verbs like 'follow', 'meet', 'diverge', 'align', is not inductively inferred, which counters empiricistic claims about causality.

24. Reasoning about the *generic* instance of a property is a widespread expedient in ordinary language no less than in mathematics — 'Take an arbitrary triangle ABC...', any proposition proved for it extends automatically to every other triangle. Discussions of this sort of reasoning have a long history. In fact, the explicit formalization of 'genericity' has encountered various obstacles. For example, S. Lesniewski argued that, if general objects possess just the properties possessed by the range of objects they represent, then their existence leads to contradiction. The assumptions of Lesniewski have been criticised in their turn, but always from a 'narrow' logical point of view. In my formulation, the cognitive aspects of prototypes are taken into account and placed within a categorical setting different from both set theory and mereology. In the resulting formalization, universality becomes as natural as the concept of the generic model of a geometric theory. See Peruzzi (1991).

25. *Time* is essentially conceived here as parametrization of change, thus, primarily, of motion in (state) space: proprioception of bodily changes and consciousness of the inner 'flow' of thought are fundamental instances of this system-relativity of time.

26. Events are described by propositions. They involve causal/relational state or change of state, localized in time, of some system of objects, and are such that the source- and target-states are endowed with a figural effect.

27. Here is another manifestation of how the structure of time is described in spatial terms: 'Better times are *coming*. So, don't look *back* to the past'.

28. For the simultaneous presence of pointlike and non-pointlike location, consider a sentence like 'I am going to Florence [pointlike] for I live there [non-pointlike]'. The same flexibility is required by temporal anaphora, as argued by Moneglia, Peruzzi (1981) in a study of the relationship between when-clauses and verbal aspect in Italian.

29. See Talmy (1978).

30. Hassler Whitney first saw in 1955 that (sufficiently) smooth maps of a surface into the plane can have two fundamental types of singularity (fold and cusp) that persist under small deformations, and *any* such map, suitably perturbed, gives rise to one of these singularities. The decisive advance in singularity theory occurred when it was associated with Poincaré's approach to phase spaces of dynamical systems: this led to study of the conditions governing the dependence of a family of systems on a given set of parameters (bifurcation theory). The number of singularity types grows with the number of parameters and yet remains finite.

31. Roughly speaking, the notion of attractor for a dynamic system  $S$  can be described as follows: take the phase space  $M$  of  $S$  and a flow  $X$  (as a smooth vector field) on  $M$ . A subset  $A$  of  $M$  is an attractor if:  $A$  is closed (or stable) under trajectories in  $M$ , for any point  $p$  belonging to some neighbourhood of points in  $A$ ,  $A$  attracts  $p$  asymptotically, and finally  $A$  is minimal for such properties. The basin of  $A$  is the set of points in  $M$  attracted by  $A$ . Now, the set  $\Sigma$  of singular points induces a decomposition of the system into cells associated with basins of structural stability. A quality  $q_i$  may become unstable as it crosses  $\Sigma$  (and for each point in  $\Sigma$ , this is true of at least one quality).

32. "Un de leur préjugés fondamentaux est qu'il n'existe pas de physique qualitative des formes." On the contrary, many-layered natural systems show that "le niveau 'macro' du (global, grossier, en général finiment descriptible) émergeant, à travers des comportements collectifs ordonnées et coopératifs, du niveau 'micro' sous-jacent (local, complexe, en général non finiment descriptible) est essentiellement organisée autour des singularités des processus physique 'macro'. Les singularités *structurent morphologiquement* les phénomènes. Elles sont *phénoménologiquement dominantes* et soumises à des contraintes *abstraites et universelles* (Petitot 1990: 144–5). Through this phenomenological physics of forms, the dialectics of quality and quantity are restored as an ingredient of objective reality, and somatic abstraction avoids a platonic interpretation of the above constraints.

33. Semantic fields (such as colour, shape, kinship, communication) have already been investigated in structural semantics. The idea of meaning so conceived — i.e. as functional role in a system of mutual oppositions — left the system's *genesis* and the *hierarchy* of fields unexplained, while the mere existence of algebraic models for that functional role provided few opportunities to achieve a theory of the superposition of fields.

34. What still seems to be lacking is a general description of attractors in terms of adjoints.

35. Consider (1) 'John let Mary have the book. He was glad' versus (2) 'John let Bill have the book. He was glad'. The reference of 'he' is fixed in (1) but indeterminate in (2), though the possible values are confined to either John or Bill. True, (1) is also elliptic in many respects (What precisely did John do? Which book?), yet (1) can be taken as an instance of the following pattern: transition  $\tau$  of object  $X$  from (a fibre over)  $p$  to (a corresponding fibre over)  $q$  under the action  $g$ , where  $A$  is the source of  $g$ , and the effect of  $\tau$  is that  $A$  passes to state  $s$  at  $q$ . In case (2), the second clause leaves open the possibility that the effect of  $\tau$  is on  $B$ ; but, again, univocal completion is achieved by simply filling the slot, for example with 'to receive it' (effect of  $\tau$  on  $B$ ) or 'to make this gift' (effect of  $\tau$  on  $A$ ).

36. The point-set  $X$  can be replaced by a lattice  $\Omega$  of regions.

37. Since, for any individual  $a$  of kind  $K$ , a subalgebra of  $A(K)$  is assigned to  $a$ , formed by all the attributes that  $a$  instantiates — namely those localized at  $a$  — 'Ann is pretty' can thus be read also as: prettiness is localized at Ann, depending on whether the reference space, fibred on the base, is taken to be composed of states or individuals.

38. Emphasis by Gestalt theory on cases of indeterminacy (ambiguous figures, like the infamous duck/rabbit) only proves that if certain clusters of (visual) information are detached from the (local) background, their 'meaning' is definite no longer: Gestalt theorists are *not* Kant's sons. Indeterminacy of interpretation is evidence for the contribution of the knowing subject as much as it is for the molecular (non-atomistic) character of objectivity.

39. The classification theorem of closed surfaces without boundary (compact 2-manifolds in 3D space) states that any such surface can be generated by connected unions of a finite number of spheres, tori and Möbius strips. Thus two parameters suffice: Euler characteristic and orientability.

## CHAPTER 10

1. One should not forget that the standards of rigour and explication in modern science have only been developed in recent centuries (namely in the natural sciences).
2. Lakoff's (1987) image schematization comes close to the *Malfeld* discussed by Bühler.
3. "...wenn ein einzelner Kristallisationspunkt gewonnen ist, um den sich alles übrige herumgruppiert ('Gesetz der Zentralisation') oder wenn ein reicheres Beziehungsschema (Gegensatzpaar, Steigerungsreihe, Viererschema wie zu einer Analogie: a:b=c:d) rein stofflich angedeutet ist und aufscheint dem Suchenden, dann ist die Rekonstruktion in der Regel schon im vollen Zuge." (English translation W.W.)
4. At a conference held in Urbino in 1992, Jean Petitot showed that the technique of neural net dynamics can be used to simulate the cognitive process of finding such stable patterns in the perception of three-dimensional scenes.
5. The dominance of an attractor is defined by the relative depth of the attractor (if we start with a negative gradient dynamics).
6. Cf. Wildgen (1999b) for a review of the literature on this topic and the sketch of a research program.
7. In November 1998 I was guest at the MPI of psycholinguistics in Nijmegen and had the opportunity to discuss this topic with my colleagues: G. Senft, S. Levinson, D. Wilkins and others. I thank Wolfgang Klein for his invitation. The results of my preparatory work on the lexicon of HAND and EYE are summarized in Wildgen (1999b).
8. In fact most of the metaphors enumerated by Lakoff and his co-workers are not recursive and have a low degree of compositionality.
9. In Wildgen (1982, 1985) the level of topological semantics was projected onto a field called 'attribution dynamics' (cf. Wildgen 1982: 25ff, and 1985: 104ff, 117ff).
10. Cognitive semantics in the style of Lakoff follows the tradition of Chomsky's generative grammar, which assumes that language is the central cognitive skill and that it is in a certain sense self-contained. Although Lakoff criticises the hypothesis of an independent syntax and language capacity, he goes even further and tries to explain cognition by the analysis of language.

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# Glossary

**Active zone:** those facets of an entity which most directly and crucially participate in a relationship involving it.

**Abstraction:** Langacker's term for **scalar adjustment**.

**Adjoint functor:** in category theory a functor  $F$  from a category  $C$  to a category  $D$ , denoted  $F: C \rightarrow D$ , is *left* adjoint to a functor  $G: D \rightarrow C$ , provided there is a natural bijection between  $D$ -maps  $F(A) \rightarrow B$  and  $C$ -maps  $A \rightarrow G(B)$ , for any object  $A$  in  $C$  and any object  $B$  in  $D$ . Such a  $G$  is also said to be *right* adjoint to  $F$ . The notation is:  $F \dashv G$ .

For instance, let  $1$  be the category consisting of only one object, with identity as its unique arrow (map). There is exactly one functor from any category  $C$  to  $1$ . When this functor has a right adjoint  $G$ ,  $C$  has a terminal object  $1 = G(*)$ . The 'global' *elements* of an object  $A$  in  $C$  are the maps  $1 \rightarrow A$ . In the category of sets,  $1$  is any singleton; in other toposes  $1$  can be an object much richer in structure.

**Attention:** one of the four major classes of construal operations; the mental ability to focus on concepts to different degrees in different contexts (see **salience**).

**Attention distribution:** concerns the nature of attention and the modes of considering the scene, from both the point of view of its segmentation into figure/ground and its diverse conceptualizations, as well as the procedures relative to causal transparency, the causal or cognitive distance from the scene, etc. The mechanisms governing the distribution of attention are levels of attention, centre of attention, purpose of attention, and windowing.

**Background:** conceiving of one situation in relation to another one already established or invoked, e.g. a presupposition or prior discourse.

**Base:** a structured area of knowledge against which concepts are profiled; same as **domain** (see **profile**).

**Basic (level) kind:** a kind of object/action endowed with a special perceptual saliency. Unlike kinds of other levels, each basic kind has a prototype. In the vertical structure of categories the basic level is the level at which most of the information is stored, and it represents the most usual level.

**Category:** in category theory a category  $C$  is given by a collection of objects  $A, B, C, \dots$ , and a collection of arrows (maps)  $f, g,$

$h, \dots$ , between the objects, provided the two collections satisfy the following conditions. Each arrow has a unique object as its domain and a unique object as its co-domain. We write  $f: A \rightarrow B$  to indicate that  $A$  is the domain and  $B$  the co-domain of the arrow  $f$ . If  $g: B \rightarrow C$  and  $h: D \rightarrow A$  are two other arrows, the compositions  $g \cdot f$  and  $f \cdot h$  are defined. Composition is associative, when defined. For each object  $A$  there is a map  $1_A: A \rightarrow A$  such that, for any  $g$  and  $h$  as above,  $g \cdot 1_A = g$  and  $1_A \cdot h = h$ .

**Common ground:** the set of mutual beliefs of the speaker and hearer(s) against which assertions are situated.

**Comparison** — see **judgement**

**Component structures:** simpler symbolic structures which are *integrated* to form a more complex *composite* symbolic structure by virtue of *correspondences* established between facets of their meanings and forms.

**Composite structure:** a higher-order symbolic structure which emerges from the integration of two or more component symbolic structures.

**Compositionality:** the extent to which the meaning of a sentence can be predicted from the meanings of its parts by virtue of rules sensitive to their grammatical arrangement.

**Conceptualization** — see **construal**

**Conceptual Universal Hypothesis (CUH):** the hypothesis that cognition is essentially the same for speakers of all languages.

**Construal:** a cognitive operation whereby structure is imposed on conceptual content. Also, the ability to conceive and portray the same situation in alternate ways. Some aspects of construal are *specificity*, *direction of mental scanning*, *viewing arrangement*, *background*, *metaphor* and *prominence*. The four major classes of construal operations are **attention**, **judgement**, **situatedness** and **constitution** (see).

**Constructional schema:** a conventional pattern for the integration of component symbolic structures to form composite structures. It is a schematized representation of the abstract commonality observable across a set of complex expressions whose formation is parallel in certain respects.

**Conventional imagery:** the conventionalized construal of conceptual contents; these are encoded in the semantic structures of particular language expressions.

**Deixis:** describing a concept relative to elements of the subject's situation (more specifically, the subject *qua* speaker in a speech event).

**Domain** — same as **base**

**Epistemic ground** — same as **common ground**

**Extensity:** topological character of the perceptual space, comprising phenomena of stretching, elasticity, dislocation, etc., of the perceptive images and phenomena.

**Experimental phenomenology:** a psychological discipline which is part of the Gestalt school. It analyses the structures and the laws of organization of the phe-

nomenic world. Its experimental variables are mental contents of direct experiences rather than physical stimuli or physiological processes.

**Fictive motion:** conceptualizing a static scene dynamically, as in *The road winds through the valley*.

**Figure-ground:** in cognitive grammar, the construal of one entity as central in comparison to another entity functioning as a reference point.

**Focal adjustments:** Langacker's analysis of construal operations; his three major classes are **selection**, **perspective**, **abstraction** (see).

**Force dynamics:** the construal of processes as involving different kinds of forces acting in different ways upon the participants of an event.

**Functor:** in category theory a functor  $F$  from a category  $C$  to a category  $D$ , denoted  $F: C \rightarrow D$ , maps  $C$ -objects to  $D$ -objects and  $C$ -arrows to  $D$ -arrows in such a way as to preserve composites and identities, that is:

- (i) for any object  $A$  in  $C$ ,  $F(A)$  is an object in  $D$ ,
- (ii) for any arrow  $f: A \rightarrow B$  in  $C$ ,  $F(f): F(A) \rightarrow F(B)$  is an arrow in  $D$ ,
- (iii)  $F(g \cdot f) = F(g) \cdot F(f)$ , for any composable  $C$ -arrows  $f$  and  $g$ .
- (iv)  $F(1_A) = 1_{F(A)}$ , for any  $C$ -object  $A$ .

**Gestalt** — see **constitution**

**Judgement:** one of the four major classes of construal operations; the ability to compare one entity to another.

**Imaging systems:** Talmy's analysis of construal operations; his four imaging systems are **structural schematization**, deployment of **perspective**, distribution of **attention**, **force dynamics** (see).

**Inference:** a sequence of sentences  $A_1, \dots, A_n$  such that  $A_n$  is regarded as justified, or assertible, whenever  $A_1, \dots, A_{n-1}$  are.

**Intentional reference:** ontological (non propositional) theory of intentionality based on internal, actual direction of an act of presentation toward an object of some kind, which may be real, unreal, possible, impossible, etc., according to conceptualization.

**Landmark:** the *secondary* focal participant in a profiled relationship, with respect to which the *trajector* is located or characterized (see).

**Lifting:** the process of somatic abstraction by which meaning is projected from the 'base' of perceptual schemes to the cognitive 'fibers'. Thus conceived, the notion of 'lifting' originates in topology.

**Linguistic Relativity Hypothesis (LRH):** the hypothesis that the semantic representations for the sentences of particular languages are largely determined by the grammatical and lexical structure of the sentence and are therefore language-specific.

**Machine theory** — see **representationalism**

**Mental scanning:** the order in which a conceptualizer mentally accesses the elements in a complex conceptualization.

**Metaphor:** a *background* phenomenon in

which a conceptual mapping is established between two cognitive domains. The *source domain* is evoked as background for understanding or portrayal of the *target domain*. Also, the ability to structure concepts in one domain of experience in terms of the concepts of another domain.

**Metonymy:** the use of an expression to denote, not the entity that it is normally understood as designating, but some other entity for which its normal referent serves as a conceptual **reference point** (see).

**Optical illusion:** an illusion affecting spatial relations, especially the group designated as geometrical illusions, examples being the Müller-Lyer, the Hering or the Poggendorf illusions.

**Orientation:** the alignment of the scene with respect to the axes of the visual field.

**Partial compositionality:** the view that the meanings of component elements evoke and constrain the meaning of a sentence but do not actually constitute it. The sentence's full import results from an elaborate process of *meaning construction* that draws upon all available conceptual and contextual resources.

**Perspective** — see *situatedness*

**Point of view:** the vantage point from which the scene is viewed and which involves differentiation between figure and ground, the subject's orientation, the axis of direction along which the scene is oriented (e.g. horizontal or vertical), and the subjective/objective opposition in the construction of the scene.

**Profile:** the concept that is designated against a background semantic frame or base (see **base**). Also, the entity that an expression is construed as designating, i.e. its referent within the conception that it evokes as the basis for its meaning (its conceptual base).

**Prominence:** a general term subsuming various ways in which one element can be salient relative to another. Special cases include profiling and the focal prominence accorded to particular relational participants.

**Prototype:** the best example of a given category.

**Prototype-extension:** the organization of a category where new members (extensions) are included by comparison with central members (see **prototype**).

**Radial category** — see **prototype-extension**

**Reference point:** an entity with sufficient cognitive salience to be invoked for purposes of providing mental access to other associated entities.

**Relationality:** the degree to which a concept implies the existence of another, participating concept.

**Representationalism:** the hypothesis that understanding and reason involve the manipulation of objective, context-free symbols whose meaning is independent of human involvement.

**Salience:** related to **attention** (see), but emphasizing the properties of the concept attended to rather than the mind's active process.

**Sanction:** the process of comparing a new member of the category to the existing category prototype (see **prototype-extension**).

**Scalar adjustment:** our ability to take a coarse-grained vs. fine-grained construal of the event.

**Scheme:** a primitive representational structure encoding a bodily pattern of interaction with the environment and acting as a meaning generator.

**Schematicity:** degree of abstraction in regard to the level of precision and detail with which a situation is characterized.

**Schematization:** in cognitive grammar, viewing something by means of a more encompassing category; related to **scalar adjustment** (see).

**Semantic field:** a spatial description of a certain class of phenomena characterized by continuity: *red* and *green*, for example, belong to the semantic field *colour* because there is a continuous modulation from one to the other.

**Selection:** the ability to ignore aspects of experience that are irrelevant to the purpose at hand.

**Sequential scanning:** scanning of a scene in conceived time, which is not the same as objective time; the opposite of **summary scanning** (see).

**Situatedness:** one of the four major classes of construal operations; the encoding of aspects of the relationship between the conscious subject and his/her objective experience.

**Structural schematization:** the individuation of entities and their topological and meronomic structure.

**Subjectivity/objectivity:** the extent to which a concept is construed as an objective part of the scene rather than through a subjective relationship to the speech act situation.

**Summary scanning:** conceiving of a scene in its entirety; the opposite of **sequential scanning** (see).

**Symbolic fallacy:** the error committed by any view claiming that the meaning of a symbol can be given by (its relations with) other symbols.

**Symbolic structure:** the pairing of a *semantic structure* (meaning) with a *phonological structure* (form). Lexicon and grammar reside in *assemblies* of symbolic structures.

**Theme:** a positional role (of a topological-dynamic character) within a scheme. For instance, AGENT and GOAL are themes.

**Trajector:** the *primary* focal participant in a profiled relationship, i.e. the entity that a relational expression is concerned with locating or characterizing.

**Vantage point:** the position from which a scene is viewed.

**Viewing arrangement:** the presupposed circumstances in which a conceptualizer 'views' a situation being described. Such factors include an assumed vantage point, whether the viewer is static or moving, and whether the situation is being viewed in objective terms or as the viewer experiences it.



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