1 The background to the study of the language of space

Stephen C. Levinson and David P. Wilkins

1.1 Spatial language and cognition

Spatial cognition is a fundamental design requirement for every mobile species with a fixed territory or home base. And there is little doubt that it plays a central role in human thinking and reasoning. Indeed, the evidence for that centrality is all around us, in our language where spatial metaphors are used for many other domains, in the obvious cognitive utility of diagrams and tables, and in the special role of place in memory. The idea that space is a fundamental intuition built into our nature goes back at least to Kant (1768), and the idea that our apperception of space is governed by cognitive universals informs much current cognitive science.

But in some ways human spatial cognition is puzzling. First, it is unspectacular – we are not as a species, compared to bees or pigeons, bats or whales, particularly good at finding our way around. Second, human spatial cognition is obviously variable – hunters, sailors and taxi-drivers are in a different league from the ordinary city-dweller. This suggests that many aspects of effective spatial thinking depend on cultural factors, which in turn suggests limits to cognitive universals in this area.

The language of space becomes an important focus of research, then, for a number of reasons. First, it may help to reveal the underlying conceptual structure in human spatial thinking, which may be much harder to extract from an inarticulate species. Naturally, universals of spatial thinking should be reflected in universal conceptualizations in spatial language. Second, and contrastively, the very variability of language promises an interesting insight into the possible cultural variability of spatial thinking. Third, this reasoning presumes a close correlation between spatial language and spatial thinking – essentially, a (possibly partial) isomorphism between semantics and conceptual structure. Where we have linguistic universals, the correlation may be presumed to be driven by cognitive universals. But where we have cultural divergences, language may not so much reflect underlying cognition, as actively drive it.

All this suggests a natural line of research, namely a parallel, independent investigation of spatial language and human spatial thinking. In a concerted

effort over nearly a decade, in a project involving over forty researchers and as many languages, researchers at the Max Planck Institute (MPI) for Psycholinguistics have tried to pursue these parallel investigations in as many cultures of independent tradition as possible. The outcome has been surprising. Human spatial thinking is indeed quite variable, sometimes based on incommensurate conceptual systems. Languages reflect this variability, for semantic distinctions do indeed closely match conceptual structure. Moreover, sometimes there is a good case for supposing that language, and more broadly communication systems, are causal factors in inducing specific ways of thinking about space. These correlations between language and cognition, and the methods employed to probe non-linguistic spatial thinking, are the subject of the companion volume to this book, *Space in language and cognition*.

These findings give the subject of spatial language a new and vital interest. Since linguistic differences can have cognitive consequences, what exactly are the limits to the variation? What kind of semantic typology can be constructed to encompass the variation? If fundamental spatial concepts are not given in advance but vary from language to language, how can children acquire such notions? Is there a conceptual bedrock of spatial ideas on which children build? These and many further fundamental questions arise.

This books deals centrally with linguistic variation in this domain. It illustrates in detail how languages may mismatch on fundamental spatial distinctions. But it also suggests a number of constraints and a restricted inventory of possibilities. It demonstrates a method of controlled comparison which can reveal both recurrent regularities and contrastive differences across languages. In the conclusions to this volume, both universal patterns and axes of variation will be reviewed and illustrated from the material elsewhere in the book.

1.2 Nature of this book

This book collects together in one volume closely comparable descriptions of spatial language in a dozen languages, nearly all from unrelated stocks. It allows one to see more or less at a glance how differently languages may treat a single important semantic domain. Curiously, information of this kind has never before been made available – instead comparisons have focussed on particular parts of speech (like spatial adpositions), or have focussed on the particular resources of an individual European language. Information on spatial description can, of course, be found in grammars, but it is distributed and always incomplete, and one cannot reliably compare one such description with another. In contrast in this book, in order to achieve close comparison, the papers each touch upon a series of key topics, and the researchers have all used a shared set of elicitation techniques. In each case, fieldwork has been undertaken specifically

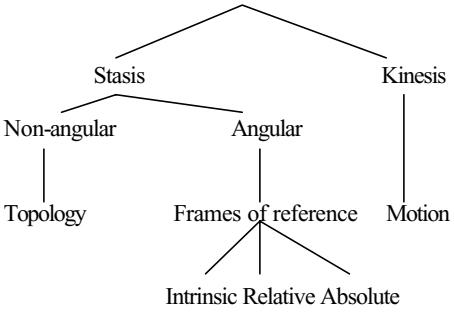

Figure 1.1 Conceptual subdivisions of the spatial domain

to illuminate the issues at hand, and each paper represents a summary of in-depth research, which has been subject to extensive mutual discussion. This kind of collaborative work is rare in the social sciences, and we hope that it will inspire more joint efforts of this kind.

This book therefore provides a unique window on how an important conceptual domain may be coded differentially across languages. For many researchers in linguistics and cognitive science the degree of diversity will come as a profound surprise. On the other hand, the existence of underlying constraints on the spatial imagination is also clearly revealed in the very extent to which close comparison and contrast is possible.

The basis of comparison has emerged from a long-term project on spatial language and cognition at the MPI for Psycholinguistics. The reader will find that the spatial domain has been partitioned into 'topological description', 'motion description' and 'frames of reference'. This partition does not exhaust the domain – spatial deixis, for example, is orthogonal and will be treated in a sister publication – but we have selected these sub-domains because they cover the major themes in the literature. The partition itself reflects major conceptual cleavages in the domain: stasis vs. kinesis on the one hand, and angular vs. non-angular static descriptions on the other (see Figure 1.1).

Leibniz and Newton (through his protégé Clark) had a heated exchange on the essential nature of spatial concepts, Newton insisting that space was an abstract envelope, while Leibniz insisted that it was relational. Most (but not all) natural language descriptions of spatial scenes are Leibnizian – that is, they describe the location or motion of one thing with respect to other things. Thus in a spatial description, something – call it the 'figure' (theme or trajector) – is generally located with respect to something else – call it the 'ground' (or landmark).

The conceptually simplest spatial description simply indicates a spatial coincidence of figure and ground. This is the core concept in the topological

sub-domain, but we can also subsume relations of propinquity, contact and containment – thus English prepositions 'at', 'on' and 'in' are usually considered to lie at the heart of the topological sub-domain (Herskovits 1986).[1] Once figure and ground are separated in space, such non-angular specifications are not of much use – we want to know in which direction from a ground we need to search to find the figure. Some kind of coordinate system now comes into play. One way to specify an angle is to name a facet of the ground and indicate that the figure lies on an axis extended from that facet, as in 'The statue is in front of the cathedral'. We call this the 'intrinsic' frame of reference, since it relies on a prior assignment of 'intrinsic' or inherent parts and facets to objects. Another way to specify an angle is to use the viewer's own bodily coordinates, as in 'The squirrel is to the left of the tree'. This is, of course, useful where an object seems to lack intrinsic facets useful for horizontal discriminations, like trees. A third way to specify angles is to use fixed bearings – independent of the scene – to specify a direction from a ground or landmark, as in 'The coast is north of the mountain ridge'. We call this the 'absolute' frame of reference, because the names and directions of the fixed bearings are fixed once and for all. Although there are many intriguing variants of these three kinds of coordinate systems or 'frames of reference', these three types (intrinsic, relative, absolute) seem to exhaust the major types used in natural languages.

Nearly all descriptions of motion also involve Leibnizian reference to landmarks or ground locations (exceptions are statements like 'In the summer the geese fly west', where 'west' is not a place but a direction). Motion is typically specified as motion to (or towards) a 'goal', or from a 'source'. Specification of both (as in 'He went from Antwerp to Amsterdam') determines a unique vector – so one can specify a direction without employing frames of reference. Deictic verbs of motion (as in 'He came late') may specify a goal (or source), namely the place of speaking. Often, though, frames of reference will be employed either exclusively (as in 'In the summer the geese fly west') or as part of, or in addition to, goal or source specification (as in 'He ran off behind the building'). Apart from deictic contrasts, verbs of motion may build in 'attainment of goal' as in 'reach, arrive', or departure from source as in 'leave'. Verbs of motion may also package other semantic material, like manner of motion, and even languages with very restricted verbal inventories seem to have a set of contrastive motion verbs (see the description of Jaminjung in Chapter 3).

There are many other kinds of variation in spatial coding across languages, as the reader will find exemplified in this volume. First, within each of these sub-domains, there are quite variable conceptual distinctions. For example,

[1] 'Topology' is here used with some departure from the well-defined mathematical concept. The term came into linguistic description through Piaget's analysis of the spatial concepts of children and includes a number of spatial relations that are not strictly speaking topological.

the topological relationships encoded in specific languages overlap and cross-cut one another – there is no one-to-one mapping of spatial relators cross-linguistically. In the frame-of-reference domain, not all languages utilize all three frames of reference, and each frame of reference may be instantiated in quite distinct concepts across languages. For example, where languages have a 'left'/'right'/'front'/'back' system used in such expressions as 'behind the tree', 'behind' and 'left' can mean exactly the converse of what they mean in English. And in the motion domain, languages differ in what is conceptually grouped or packaged in motion verbs.

A second major axis of variation is how these concepts are coded linguistically. Existing literature on spatial language gives the impression that the heart of spatial description is generally encoded in a set of contrastive spatial adpositions. Thus in English we use the same kind of prepositional phrases in topology ('in the bowl'), frames of reference ('in front of the building') and motion description ('into the building'). But many languages deploy distinct grammatical and lexical systems in these different domains. Further, some languages have no spatial adpositions. Others have only one general-purpose adposition. Such languages perforce code spatial relations elsewhere in the clause, frequently in the verb, or in local cases, or in special spatial nominals, or in adverbials. In general, most languages distribute spatial information throughout the clause. For example, a topological relation (as in 'The cup is on the table') may often be expressed through the simultaneous deployment of a number of contrastive choices in lexicon and morphology – one may say in effect something like 'The cup table top-AT stands', where 'top' is drawn from a set of contrastive spatial nominals, AT is expressed by case or adposition, and 'stand' contrasts with 'sit', 'hang' and other locative predicates.

There are no simple, hard generalizations about exactly where in the clause different kinds of spatial information are encoded. Nevertheless, as a generalization, one can say that the shape of the figure is normally encoded in locative predicates, and only occasionally in adpositions, while the shape and geometry of the ground is typically coded in adpositions and spatial nominals; the spatial relation between figure and ground may be encoded in locative verbs and case, but is especially to be found in adpositions and spatial nominals.

It is the combination of these two axes of substantial variation – semantic and grammatical – that is illustrated throughout this book. This variation raises the fundamental cognitive questions alluded to in the prior section – how are we to reconcile incommensurable semantic parameters with 'the psychic unity of mankind'? How do children then learn semantical concepts for which they cannot be prepared by independent cognition? The variation also raises a series of questions within comparative linguistics:

- What constraints are there on the *semantic parameters* involved – in short, what does the *semantic typology* of space look like?

As we shall see, despite a great deal of variation, the high-level typology here seems quite constrained. But at a greater level of detail there is sufficient variation to ensure that comparable expressions in different languages scarcely ever have the same meaning and extensional range.

- What constraints are there on the formal expression of these semantic types – what does the morphosyntactic typology of spatial expression look like?

  Contrary to the literature, we will find that spatial notions are not universally encoded in specific parts of speech like adpositions or case inflections but are distributed throughout the clause.
- Are the various kinds of conceptual domain in spatial description (as in Figure 1.1) formally distinguished in languages?

  As already hinted, the answer is not always, but the distinctions exist often enough to suggest that these domains do mark natural cleavages.
- How much spatial information is coded in language and how much inferred, and are the patterns the same across languages?

  What we will find is that although the same kind of pragmatic principles are arguably universally in play, languages do not universally code semantically to the same level of specificity. For example, in many languages the distinction between 'on the table' vs. 'in the bowl' will not normally be coded, but rather left to pragmatic inference from expressions of the kind 'table-LOCATIVE' vs. 'bowl-LOCATIVE'.

1.3 The language sample

It is not possible in a volume of this kind to have sketches from a representative sample of the world's languages – such a book would have perhaps 400 chapters! Instead, what we have collected here is something of an opportunistic sample, which has arisen from the chance the authors have had to work closely together, and thus produce closely matched descriptions of the languages in which they are expert. Nevertheless, it is a happy sample, in the sense that the languages are geographically distributed over five continents, representing cultures with major variations in environment and land use. Both small-scale and large-scale societies are represented, and there is a bias to relatively little-known languages, so that nearly all the material presented here is new, and not to be found properly laid out in existing grammars. Altogether, seven language families are represented, along with two isolates. Some regional and linguistic clusters of languages (Australian and Mayan) allow readers to come to their own conclusions about the importance of areal and genetic factors in semantic typology. Table 1.1 gives some basic details about the languages and their speakers. From a grammatical point of view, the languages offer a wide spectrum of linguistic types. There are languages with most of the predominant word orders:

Table 1.1 *Grammars of space – language sample*

Language	Language affiliation	Country where research was done	Number of native speakers
Arrernte (Eastern and Central)	Australian, Pama-Nyungan	Australia	2,000
Jaminjung	Australian, non-Pama-Nyungan	Australia	100
Warrwa	Australian, non-Pama-Nyungan	Australia	2
Yélî Dnye	Papuan, Isolate	Papua New Guinea	4,000
Kilivila	Austronesian	Papua New Guinea	23,000
Tzeltal	Mayan	Mexico	200,000
Yukatek Maya	Mayan	Mexico	800,000
Tiriyó	Cariban, Taranoan	Brazil, Surinam	2,000
Ewe	Niger Congo, Kwa	Ghana	2,000,000
Tamil	Dravidian	India	70,000,000 (world-wide)
Japanese	Isolate? / Altaic?	Japan	118,000,000
Dutch	Indo-European, Germanic	Netherlands	15,000,000 (in the Netherlands)

PHRASE ORDER IN TRANSITIVE CLAUSES (S=subject, O=Object, V=Transitive verb)

Ewe: SVO

Yélî Dnye: SOV tendency; *Japanese*: SOV [canonical]; *Tamil*: SOV

Tzeltal: VOS [both prefixes and suffixes]; *Yukatek Maya*: VOS; *Kilivila*: VOS

Jaminjung: Free Phrase Order; *Arrernte*: Free Phrase Order [V-final tendency]

Tiriyó: Free Phrase Order

There are languages of both 'head-marking' and 'dependent-marking' types (where S=subject and O=object):

ARGUMENT MARKING ['cross-referencing'] ON VERB/IN VERB PHRASE:

Ewe – No; *Japanese* – No; *Arrernte* – No [optional number marking for subject]

Kilivila – Yes, just S; *Dutch* – Yes (reduced), just S; *Tamil* – Yes, just S [suffix]

Jaminjung: Yes, both S and O; *Tzeltal*: Yes, both S and O; *Yélî Dnye* – Yes, both S and O, by free particles in VP; Tiriyó – Yes, S and O.

From a morphological point of view, within the sample there are languages of isolating vs. agglutinating vs. (mildly) polysynthetic types. And there

are various forms of morphological ergativity vs. morphological nominative-accusative patterns. In short, most of the major formal types of language are represented in the sample.

1.4 Controlled comparison: the stimuli

Cross-linguistic (and more generally, cross-cultural) comparison is fraught with difficulties. Although isolated features or traits may be readily extracted and compared, their value or function depends on the system in which they play a part. But comparing whole systems is like comparing apples and oranges, and anyway is rarely possible. Comparative linguistics and linguistic typology proceed, nevertheless, most confidently across related languages, or in areas where there are intrinsic limits to variation (like phonetics) or where there seem to be strong universals or limited types (as in morphosyntax). Comparative semantics as a systematic enterprise has hardly begun – there are only isolated domains like colour, ethnobotany or kinship where we have any overall idea about patterns of variation across unrelated languages. In these domains, the structure of the natural world (colour and its perception, the differentiation of species, biological reproduction) gives us some 'etic' metalanguage of comparison. An 'etic' metalanguage (coined on the model of 'phonetic' by Pike) is some objective description of the domain which makes maximal discriminations, so that we can specify precisely how a language groups these discriminations within its own 'emic' (cf. 'phonemic') concepts. These groupings are most easily appreciated extensionally, that is, by looking at the range of denotation for a native term; to understand the meaning or intension, we need to look at the kinds of contrasts the terms make with one another.

The semantic domain of space is altogether more complex and abstract than these more referential domains and, as we have seen, is internally differentiated into sub-domains. A simple 'etic' metalanguage is not available. Nevertheless, there are obvious ways in which to proceed. A good sample of unrelated languages will give us a sense of which kinds of discriminations are likely to be made. We can then build these maximal contrasts into a series of spatial 'scenes', and see for any one language whether they are in fact discriminated, and if so how. We can then readily compare these extensional groupings, and then (not quite so readily) explore the intensional principles upon which the groupings are made.

During the course of the space project at the MPI for Psycholinguistics, many specialized stimuli have been developed for exploring spatial language. These include specialized stimuli for eliciting deictic motion verbs, a specific instrument for deciding on the precise semantics of enter/exit verbs, various methods for eliciting demonstratives, stimuli geared to discriminations in contrastive locative verbs, and so forth. All the papers in this volume are informed

by these systematic stimuli and mutual discussions about results. But here we have chosen to focus on three main stimuli, as an illustration of the method and the kinds of comparative results that can thus be obtained.

1.4.1 Topology Series 'Picture-Book'

This stimulus is a book of seventy-one line drawings, 'The Topological Relations Picture Series', to be used in elicitation sessions with three or more native speakers. Each picture shows principally two objects, one of which is designated (by an arrow, or coloured yellow in the original) to be the figure object, the other the ground. The native speaker is asked how one might colloquially answer the question 'Where is the X (the figure object)?', given the kind of association between figure and ground indicated in the picture. This is not intended to be a mechanical elicitation procedure – the investigator may need to choose alternative local items to be found in similar configurations, and a range of answers should be collected, noting which occur in which order, and which are said to be preferred or most normal. Three or more consultants allow some qualitative and quantitative analysis of preferred solutions.

The edition used in the chapters below is the 1993 version from the MPI for Psycholinguistics (the original design is by Melissa Bowerman, with supplementary additions by Penelope Brown and Eric Pederson). The book was specifically designed to investigate the maximal range of scenes that may be assimilated to canonical IN- and ON-relations (and thus includes a number of scenes unlikely to be so assimilated). English, for example, might be held to have a prototype ON-relation at the heart of the preposition *on* (as exemplified in *The cup is on the table*), but many other kinds of spatial relations – like a ring on a finger, a picture on a wall, a shoe on a foot – are assimilated to the same preposition. Not surprisingly, perhaps, even closely related languages like Dutch prefer other contrastive adpositions for many of these scenes. The full set of pictures include spatial relations that contrast on a range of partially overlapping dimensions:

+/− horizontal support
+/− vertical support (hanging)
+/− adhesion
+/− liquid/mastic adhesion
+/− marks on surface
+/− living creature on non-horizontal surface
+/− attachment of projecting figure to ground
+/− attachment by cord
+/− encirclement
+/− envelopment
+/−clothing/adornment

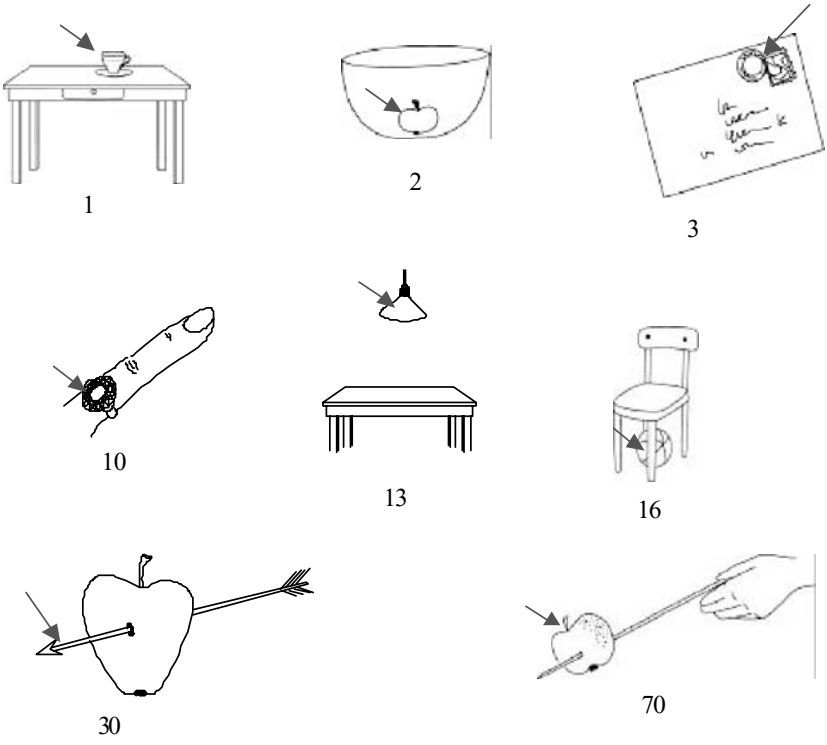

Figure 1.2 Set of pictures from the 'Topological Relations Picture Series'

+/− complete containment
+/− partial containment
+/− containment in liquid or mass
+/− containment in encircling boundary
+/− attachment by piercing
+/− negative spaces (holes, cracks)
+/− vertical non-contact (above)
+/− behind
+/− in front of
+/− under
+/− next to

For reasons of space, we have chosen just eight of these pictures to form a set over which the languages represented in each chapter can be compared. They are reproduced in Figure 1.2, with their original numbers (Pictures 1, 2, 3, 10, 13, 16, 30, 70). Authors of the chapters below occasionally mention other pictures, and the full set can be found in Appendix 4 at the end of the book. The pictures were selected on the basis of a prior study which showed