

## SYNTAX AND SEMANTICS OF SPATIAL PPs

### 1 Locative vs. directional PPs

There are different approaches to space in linguistics, conceptual semantics, cognitive semantics, formal semantics and generative syntax. A major contribution to the research on the structure and meaning of spatial prepositional phrases (PPs) is Jackendoff's work on the conceptual structure of such expressions (1973, 1983, 1991, 1996). In Jackendoff (1983), for example, he argues that PPs can be decomposed into ontological categories such as PLACE or PATH and functions such as TO, FROM, VIA or IN, ON, UP etc.:

- (1) a. *in the room*: [<sub>Place</sub> IN ([<sub>Thing</sub> ROOM])]  
b. *into the room*: [<sub>Path</sub> TO ([<sub>Place</sub> IN ([<sub>Thing</sub> ROOM])])]  
c. *through the cheese*: [<sub>Path</sub> VIA ([<sub>Place</sub> IN ([<sub>Thing</sub> CHEESE])])]

For example, with *into the room* a Place function IN takes a Thing as its argument (the REFERENCE OBJECT) to return a Place. The Place in turn is the argument of the Path function TO that returns a Path.

Other relevant ontological categories are Events and States (usually associated with verbs) and Things (usually associated with nouns); particular functions discussed in Jackendoff (1983) are BE, GO, STAY, CAUSE and various Thing-functions such as ROOM or CHEESE in (1). Verbs of motion and location, when combined with spatial PPs, are assumed to be associated with certain event functions:

- (2) a. *The rug lay on the floor*: [<sub>State</sub> BE ([<sub>Thing</sub> RUG ([<sub>Place</sub> ON ([<sub>Thing</sub> FLOOR])])])]  
b. *The dog entered the room*: [<sub>Event</sub> GO ([<sub>Thing</sub> DOG ([<sub>Path</sub> TO ([<sub>Place</sub> IN ([<sub>Thing</sub> ROOM])])])])]  
c. *The bird stayed in its nest*: [<sub>Event</sub> STAY ([<sub>Thing</sub> BIRD ([<sub>Place</sub> IN ([<sub>Thing</sub> NEST])])])]  
d. *The path went across the country*:  
[<sub>State</sub> GO<sub>Ext</sub> ([<sub>Thing</sub> PATH ([<sub>Path</sub> VIA ([<sub>Place</sub> IN ([<sub>Thing</sub> COUNTRY])])])])]  
e. *Amy put the flowers in the vase*: [<sub>Event</sub> CAUSE ([<sub>Thing</sub> AMY ([<sub>Event</sub> GO ([<sub>Thing</sub> FLOWERS ([<sub>Path</sub> TO ([<sub>Place</sub> IN ([<sub>Thing</sub> VASE])])])])])])]

Breaking down the conceptual structure of prepositional phrases into a locative (Place) part and a directional (Path) part in this way has had a profound influence on linguistic treatments of spatial expressions and this distinction, where relevant, is shared in one way or another by all the authors that contributed to this volume.

### 2 Verb-framing vs. satellite-framing

Another major influence on the research on PPs is Talmy's (1975, 1985, 1991, 2000) work, which became relevant not just for cognitive linguistic frameworks, but also for typology in general (most notably the typological distinction between verb-framed and satellite-framed languages), terminology issues (the notions of FIGURE and GROUND, especially in the generative syntax literature), and the idea of conflation (this can be found in the lexical syntactic framework of Hale & Keyser 1993 and subsequent work).

Talmy (1985 / 2000) addresses the issue of which semantic elements (such as Motion, Path, Figure, ground, Manner, or Cause) are expressed by which surface elements (such as verbs, adpositions, subordinate clauses, or satellites) and what kind of typological patterns and universal principles can be detected in the description of motion events. He assumes motion events to have four ingredients, Figure, Ground, Path and Motion. An object, the FIGURE, moves or is located with respect to another object, the GROUND (the reference object in Jackendoff 1983 or the landmark in Kracht 2002). The PATH is the course followed or site occupied by the Figure with respect to the ground; hence Talmy's notion of path subsumes

Jackendoff's paths and places. Finally, Talmy characterises MOTION as the presence per se in the event of motion (MOVE) or location (BE<sub>L</sub>). Hence, Talmy's term Motion is broader than generally assumed and subsumes cases where something or someone is just located and nothing is actually moving. Manner and Cause are viewed as distinct external events that can be configured as Co-Events to a Motion event. The relation in which such a Co-Event can stand to the Motion event can be manifold but the main ones discussed in Talmy (1985) are Manner and Cause (Talmy 2000 also discusses Precursion, Enablement, Concomitance or Subsequence).

Talmy (1985 / 2000) states that in a cross-linguistic perspective there are three lexicalisation types for verb roots and the way Motion events are expressed. The first type, represented by Indo-European (except Romance), Chinese, Finno-Ugric, Ojibwa, or Warlpiri, typically conflates Motion and Co-Event on the verb root. Examples are given from English (3).

- (3) *Type 1: Motion + Co-Event conflation* e.g. ENGLISH
- a. The rock **slid** / **rolled** / **bounced** down the hill.
  - b. I **hammered** the nail into the wall.
  - c. The lamp **stood** / **lay** / **leaned** on the table.
  - d. The rope **hung** across the canyon from two hooks.

A second language type typically conflates Motion and Path on the verb, but a Co-Event such as Cause or Manner is expressed separately, e.g. by a subordinate clause, or not expressed at all. Languages and language families that belong to this type include Romance, Semitic, Polynesian, Nez Perce, Caddo, Japanese or Korean, and the examples are from Spanish (4).

- (4) *Type 2: Motion + Path conflation* e.g. SPANISH
- a. La botella **entró** a la cueva (flotando).  
the bottle MOVED-in to the cave (floating)  
'The bottle floated into the cave.'
  - b. La botella **salió** de la cueva (flotando).  
the bottle MOVED-out of the cave (floating)  
'The bottle floated out of the cave.'
  - c. **Tumbé** el árbol serruchándolo / a hachazos.  
I-felled the tree sawing-it / by ax-chops  
'I sawed / chopped the tree down.'

The third type, which conflates Motion and Figure on the verb root, is only represented by a few languages such as Atsugewi and Navaho. Since this type has not prompted discussion in the subsequent literature, we will not discuss it here. Talmy (2000) also mentions the possibility of split, intermixed or parallel systems, as well as a fourth possible type, the conflation of Motion and Ground (e.g. English *emplane*, *deplane*), which does not constitute a full system though, hence these cases will not be discussed either.

In Talmy (1991/ 2000), the perspective is shifted somewhat and the question is asked as to which surface elements express the Path. This leads to the typological distinction between satellite-framed and verb-framed languages. SATELLITES are not of a particular syntactic category (they can be particles and other elements), but stand in a particular grammatical relation to the verb.<sup>1</sup> SATELLITE-FRAMED LANGUAGES such as English (lexicalisation type 1 in (3)) are characterised as having a large collection of verbs of motion,

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<sup>1</sup> Satellites are characterised as 'immediate constituents of a verb root other than inflections, auxiliaries, or nominal arguments' and are assumed to be related to the verb root as periphery (or modifiers) to a head (sister to the verb). A verb root together with its satellite, then, forms a constituent in its own right, the 'verb complex'. For a critical assessment of the term satellite, see for instance Stringer (2002).

which convey manner or other Co-Events, but not directionality. At the same time, these languages have a large collection of satellites. VERB-FRAMED LANGUAGES, on the other hand, such as Spanish (lexicalisation type 2 in (4)) have a large collection of verbs of inherited motion such as *entrar* and *salir* in (4).

Talmy's typological distinction between verb-framed and satellite-framed languages has generated much research since, from typological works trying to find more data and evidence for this distinction from additional languages and trying to fine-tune this distinction (e.g. Jones 1983, Aske 1989, Slobin 1996, 2004; Song 1997, Zlatev & Yangklang 2003, Nikitina, this volume, among others) to formal semantic or generative syntactic approaches trying to pin down the decisive factor or feature behind this distinction (Fong 1997, Mateu 2002, this volume; Mateu & Rigau 2002, Stringer 2002, Beavers 2003, Folli & Ramchand 2005, Zubizarreta & Oh to appear). For example, it has been suggested that the distinction does not hold between particular languages but is rather associated with certain types of constructions or lexical items available (e.g. Folli & Ramchand 2005). Nikitina (this volume) argues that the two patterns described by Talmy are not necessarily language types but rather describe 'alternative encoding strategies', which can be present at the same time within a single language. Her case of illustration is the use of American English *in* vs. *into* in contexts of directed motion.

Furthermore, it has been argued that it is not a directional PP per se that cannot be combined with a manner of motion verbs in satellite-framed languages, rather only PPs referring to a path that reaches an end-point (henceforth telic PPs) are excluded (Aske 1989, Stringer 2002):

- (5) a. La fille a dansé vers la chambre.  
the girl has danced towards the room  
'The girl danced towards the room.'  
b. \*La fille a dansé à la gare.  
the girl has danced to the station

In this context, it has been noted that there is a correlation between the availability of directional telic PPs with manner of motion verbs and secondary resultative predicates: languages that allow one usually also allow the other, whereas such resultative phrases are generally ungrammatical in satellite-framed languages (see Fong 1997, Mateu 2002, this volume; Folli & Ramchand 2005, Zubizarreta & Oh to appear for discussion). Mateu (2002) accounts for Talmy's typology and the correlation between the availability of resultative secondary predicates and directional PPs with manner of motion verbs, using the framework of l(lexical)-syntax as outlined in Hale & Keyser (1993) and subsequent work. In Mateu (this volume), he provides further support for the l-syntactic approach.

In the following, we will discuss issues that were raised in the literature on the syntax and semantics of spatial prepositional phrases.

### 3 The Syntax of Spatial P

The category P became a subject of debate in recent syntactic theory following the work of Jackendoff (1973). In the standard Principles and Parameters approach (Chomsky 1981, 1986, 1995) it is considered to be a lexical category, with the feature matrix [-N,-V] and an assigner of case. There are, however, many areas of controversy regarding the syntax of the category P, from the difficulty of defining the boundaries of the category, through to the mapping of its structure, and characterisation of its status as a lexical or functional category. Further discussion centres on the details of the syntactic structure of P, including the extent of the parallels between VP and PP, and the treatment of apparently noun-like behaviour of some Ps, attested in various languages. In addition to structural similarities found between VP and PP,

this parallelism is also found to extend to event structure and to case theory. Many of the papers in this volume make contributions to these theoretical debates. Each of the issues is outlined in the following sections, concluding with a sketch of the areas of general consensus.

### **3.1 Boundaries of the category P**

It is not always clear what linguistic elements should be considered members of the category P. One work aimed at comprehensively describing the range of senses for English, the Preposition Project (<http://www.clres.com/prepositions.html>), finds 847 preposition senses for 373 prepositions, including ‘phrasal prepositions’. Wikipedia, on the other hand, gives a list of 130 English adpositions, including postpositions and many ‘multi-word’ prepositions ([http://en.wikipedia.org/wiki/List\\_of\\_English\\_prepositions](http://en.wikipedia.org/wiki/List_of_English_prepositions)). The range of English prepositions which receives attention in generative linguistics is rather narrower, though the boundaries of the category are still controversial. Whilst the P-status of small spatial Ps such as *in*, *on*, *to* and *into* is generally accepted, those words and phrases derived from other categories (N, *on top of*; V, *regarding*, *considering*) are not so obvious. The identity of certain English prepositions and complementisers also led Emonds (1985) to propose the conflation of the two categories.

In a cross-linguistic perspective the picture is further complicated. Whilst nominal elements such as the example above are increasingly accepted as part of P-structure in syntax (cf. Terzi 2006, to appear, Svenonius 2006, and both Botwinik-Rotem and Pantcheva in this volume), it is difficult to be sure where to draw the line with either the nominal or the verbal elements in some languages (cf. Aboh 2006 on Kwa spatial expressions).

The ambiguous nature of such nominal and verbal Ps can often be attributed to grammaticalisation processes, as discussed below. It has been observed for various languages that the apparently more open-class style adpositions are formed via a grammaticalisation process from nouns and also verbs (cf. É. Kiss 2002 on Hungarian). As noted in Svenonius (2006), Axial Parts such as English *beside* stem from full nouns in earlier stages of the language. In this volume the issue of grammaticalisation of Ps in Igbo is raised by Uchechukwu.

Many languages seem to exhibit a two-way split amongst adpositions, some appearing more lexical and some more functional, leading to debate on whether such a split should be counted as a categorial divide. Thus Pantcheva in this volume notes a difference between to types of Persian prepositions, nominal-looking Ps and other small Ps, Zwarts (1997a) notes a split between more functional-looking and more lexical-looking Dutch Ps, and É. Kiss (2002) suggests that a class of words traditionally treated as postpositions in Hungarian be treated rather as adverbs. Further controversy surrounds the classification of verbal particles and cases, as outlined in the sections below. The strict definition of the category P remains to be worked out, but many of the papers in this volume point to possible divisions within the category and the way they can be accounted for.

### **3.2 The lexical vs. functional debate**

The status of the category P as lexical or functional has been much debated. The controversy stems from the mixed behaviour of the category with respect to common diagnostics for functional or lexical status. Typical assumptions on the behaviour of lexical and functional categories are outlined in the following table, drawn from diagnostics in Corver and van Riemsdijk (2001).

(6) Characteristics of lexical and functional categories

Lexical categories	Functional categories
relatively specific/detailed semantic content	non-conceptual meaning, grammatical function
open membership	closed membership
generally free-standing words	generally phonologically and morphologically dependent
variable c-selection (top-down)	strict c-selection
theta-mark their complement	do not theta-mark their complement
can be moved away from complement	usually inseparable from complement
license empty categories	cannot license empty categories
do not trigger movement	attract/trigger movement

Whilst verbs, nouns and adjectives emerge as clearly lexical on the basis of such diagnostics, and tense and determiners as clearly functional, it is not as simple to give a consistent classification of the category P on this basis. P appears to be a very closed class in certain languages. Tzeltal (Levinson 1996:185) and Oro Nao (Everett and Kern 1997:5), for instance, are said to have only one preposition serving spatial and non-spatial functions. On the other hand many of the familiar Indo-European languages have much larger inventories of Ps, as is the case for English, albeit still considerably smaller than the inventories of nouns, verbs and adjectives in the same languages. Adpositions also vary enormously in terms of semantic content, from comparatively vacuous, morphologically simple Ps such as *of* to comparatively contentful, morphologically complex Ps such as *into*, *behind*, *beside*.

Since Jackendoff's (1973) seminal work on prepositions, the category P has standardly been treated as a lexical category. In this line, Chomsky (1981) claims that P has the feature matrix [-N,-V]. Furthermore, the category was assumed to be a case assigner, on the basis of examples such as (7).

- (7) a. to me/him/her/them/\*I/\*he  
b. auf dem Berg (German)  
on the.DAT mountain  
'on the mountain'  
c. in urbe (Latin)  
in city.ABL  
'in the city'

Further research such as den Dikken (2003 / 2006) draws more detailed parallels with the category V, proposing that P, as a lexical category, has its own functional structure mirroring that of the other lexical categories. These approaches receive further treatment below in the discussion on structure and VP parallels.

Other recent approaches focus on the differences between P and the other three lexical categories, N, V and A, arguing that P should rather be considered a functional category. Grimshaw (1991) draws full parallels between the verbal extended projection and that of the noun, proposing that P in the nominal extended projection corresponds to C in the verbal projection. Kayne (2001) argues that prepositions are probes, with their own  $\phi$ -features. Baker (2003) dismisses P from the inventory of lexical categories based on incorporation facts. According to the Proper Head Movement Generalisation, it should not be possible to move from a functional category to a lexical category. This is used to explain the fact that only bare nouns, not inflected nouns, incorporate into the verb, and since incorporated nouns also do not combine with Ps, it is assumed that Ps are functional. Baker further notes that the category P differs from N, V and A in not having clear derivational endings in any language. English

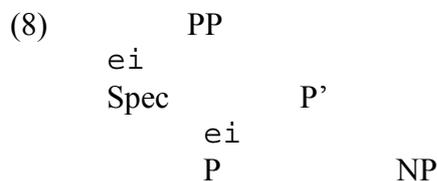
nouns, for example can be formed with *-ation*, verbs with *-ise* and adjectives with *-able*, but P-forming suffixes of this kind seem not to exist. Maintaining the position that P is a functional category, Botwinik-Rotem (2004) accounts for the diversity in functions of Ps by defining three different types: P<sub>R</sub> specifies a particular semantic relation of the noun, P<sub>C</sub> has a case checking function, and P<sub>pred</sub>. Her contribution to this volume adds further support to the uniformly functional treatment of the category, accounting for apparent challenges to this position by proposing an empty noun projection within the PP structure.

Finally some researchers, faced with the diversity of the category P, opt for a mixed analysis. Van Riemsdijk (1990) proposes that there are both lexical and functional members of the category P, making use of the notion *little p*, by analogy with *little v*, to account for Germanic circumpositions. Zwarts (1997a) proposes a more elaborate division, setting Dutch prepositions along a graded scale from the most lexical to the most functional. Others invoke the notion of semi-lexicality (cf. Corver & van Riemsdijk 2001). Zeller (2001), for example, defines a semi-lexical head as a morphologically complex element consisting of a lexical node and a functional suffix. He claims that German and Dutch postpositions are semi-lexical elements, derived from lexical prepositions via suffixation of a zero-operator, which alters the thematic properties of the P-element.

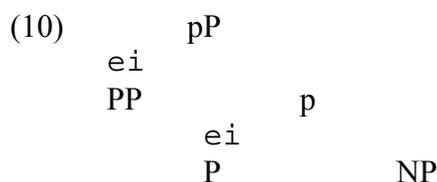
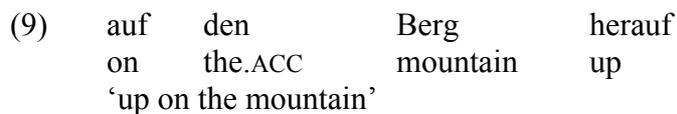
Thus the different camps remain divided in their classification of Ps as functional or lexical, the different standpoints often reflecting the different languages or types of P studied and the implicit assumptions about the boundaries of the category. The question of lexical or functional status has further consequences for the structure of the category, as shown below.

### 3.3 Structure of P

Following the line of Jackendoff (1973) and Chomsky (1981, 1986, 1995) that P is a lexical category, the structures assumed for P have developed from relatively simple X-bar structures such as those in (3) to much more elaborate and diverse structures.



In order to account for Germanic circumpositional phrases such as (9), van Riemsdijk (1990) proposes the structure in (10) with a light *p*, drawing a loose parallel with light *v*.



(van Riemsdijk 1990:239)

In later research semantic labels have been incorporated into the proposed syntactic structures for P, in recognition of the fact that there seems to be a universal ordering of path-denoting Ps and place-denoting Ps, with place appearing closer to the noun than path (van Riemsdijk and Huybregts 2001, Kracht 2002).

Koopman (2000) and den Dikken (2006) have been particularly influential in developing a rich functional structure associated with the category, finding parallels between

the verbal and prepositional extended projections. Den Dikken (2003 / 2006) thus proposes the following structures, recognising a division between Path and Place.

- (11)
- |          |                  |        |  |  |  |  |  |  |  |
|----------|------------------|--------|--|--|--|--|--|--|--|
| CP(Path) |                  |        |  |  |  |  |  |  |  |
| ei       |                  |        |  |  |  |  |  |  |  |
| C(Path)  | DegP(Path)       |        |  |  |  |  |  |  |  |
| ei       | Deg(Path)        | PathP  |  |  |  |  |  |  |  |
| ei       | Path             | PP     |  |  |  |  |  |  |  |
| ei       | P <sub>Dir</sub> | CP     |  |  |  |  |  |  |  |
| ei       | C(Place)         | DegP   |  |  |  |  |  |  |  |
| ei       | Deg(Place)       | PlaceP |  |  |  |  |  |  |  |
| ei       | Place            | PP     |  |  |  |  |  |  |  |
| ei       | P <sub>Loc</sub> | DP     |  |  |  |  |  |  |  |
- (den Dikken 2003 / 2006:23)

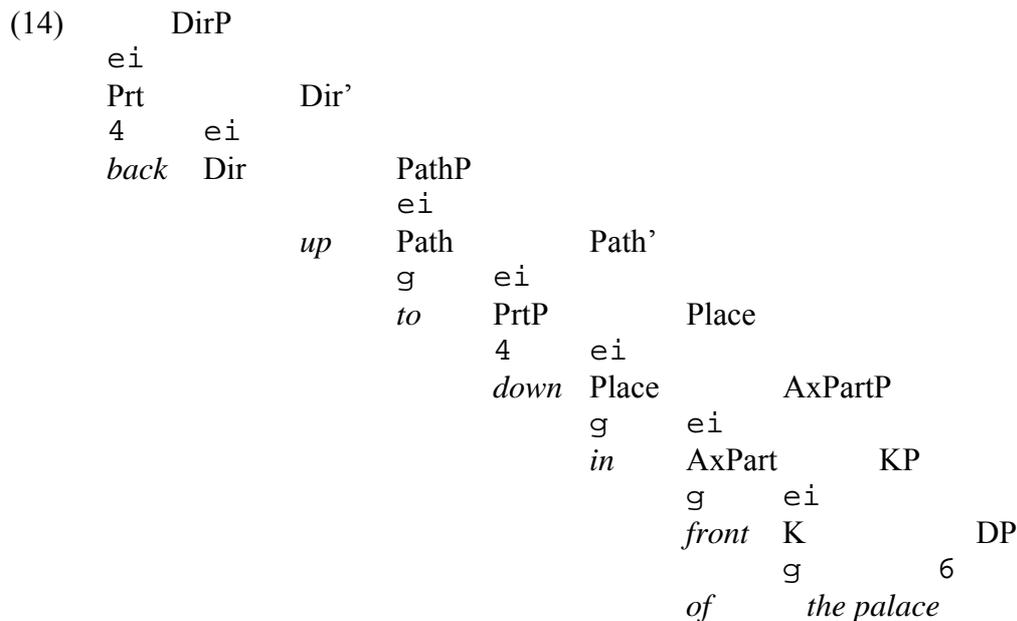
- (12) The maximal structures for locative and directional adpositional phrases
- a. [CP C<sup>[PLACE]</sup> [DXP DX<sup>[PLACE]</sup> [ASP ASP<sup>[PLACE]</sup> [PP P<sub>Loc</sub> ...]]]]
- b. [CP C<sup>[PATH]</sup> [DXP DX<sup>[PATH]</sup> [ASP ASP<sup>[PATH]</sup> [PP P<sub>Dir</sub> ...]]]]
- (den Dikken 2003 / 2006:26)

Den Dikken (2003 / 2006) draws explicit parallels between PP and both VP and NP, finding corresponding functional categories in all three domains, as illustrated in (8).

- (13)
- a. [CP C<sup>[FORCE]</sup> [DXP DX<sup>[TENSE]</sup> [AspP Asp<sup>[EVENT]</sup> [VP V ...]]]]
- b. [CP C<sup>[DEF]</sup> [DXP DX<sup>[PERSON]</sup> [AspP Asp<sup>[NUM]</sup> [NP N ...]]]]
- c. [CP C<sup>[SPACE]</sup> [DXP DX<sup>[SPACE]</sup> [AspP Asp<sup>[SPACE]</sup> [PP P ...]]]]
- (from den Dikken 2003 / 2006:24)

Various researchers now adopt a similarly rich structure, with some variation in labels and structural details (cf. Helmantel 2002, Holmberg 2002, Noonan 2004). Tortora contributes to the idea of PP-VP parallels in this volume, arguing for aspect in PPs in Spanish and Italian.

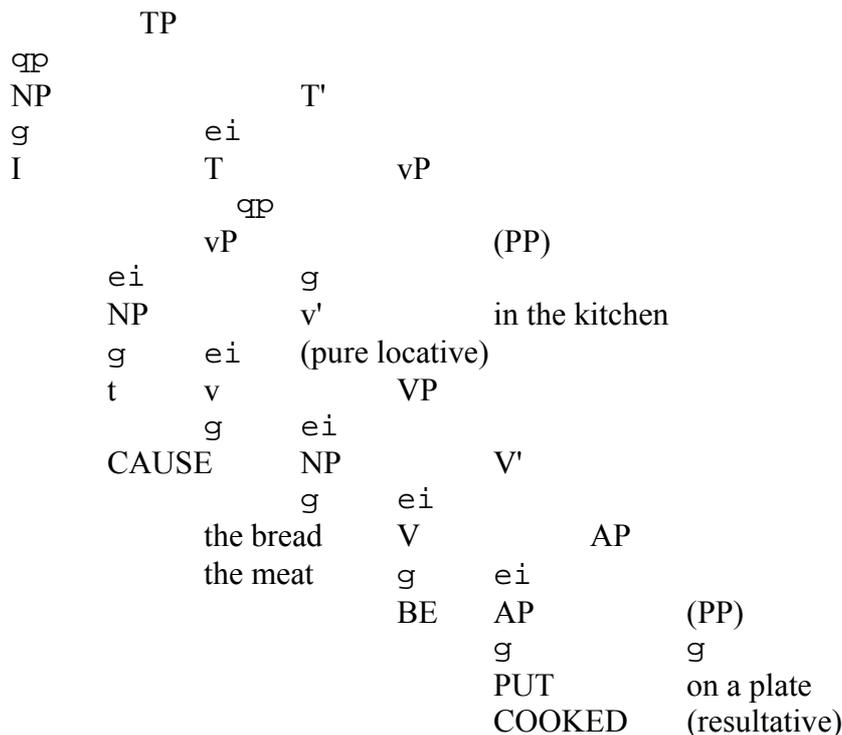
Svenonius (2004, 2006) assumes a rather simpler structure, proposing an additional space for a nominal element, termed Axial Part, low in the PP structure, along the lines of (18).



It has long been known that agreement similar to possessive agreement can appear on adpositions in certain languages, such as Finno-Ugric (cf. Marácz 1989 and É. Kiss 2002 on Hungarian), giving these adpositions an apparently nominal character. In less morphologically rich languages such as English nominal spatial expressions, such as *on top of*, also occur. Such instances of nominal behaviour of P seem only recently to have received treatment in the mainstream literature on adpositions, for example in the work of Terzi (2006, to appear), who finds evidence for an empty noun in the Greek P projection. This empty noun PLACE was earlier proposed in Katz and Postal (1964), and later developed in Kayne (2004), as part of the structure of English adverbial phrases, such as *here* and *there*. In this volume, Botwinik-Rotem argues for the same structure in Hebrew locative Ps, and Pantcheva in Persian type B prepositions.

Baker (2003), arguing for P as a functional category, proposes a very different structure. Under his view Ps select NPs ‘and make them into something like an AP’ (Baker 2003:324). He describes P in this respect as ‘rather like the syntactic equivalent of a derivational morpheme.’

- (15) Structure for the sentences:
- a. *I put the bread on a plate.*
  - b. *I cooked the meat in the kitchen.*
- Baker (2003:318)



Papers in this volume tend towards the line taken by den Dikken (2003 / 2006) and Svenonius (2004) with various refinements. Thus Botwinik-Rotem, although she agrees with Baker in treating P as functional, adopts a structure more similar to that of Svenonius (2004), differing somewhat in the analysis of the nominal element found in the projection of P, which she claims is an empty noun.

### 3.4 Case in PP

Whilst many recent approaches give relatively short shrift to the role of case in the PP, assuming a case feature or a KP projection in the structure, past analyses have explored the idea that case itself involves a PP structure. This idea was championed by Fillmore (1968), though similar ideas appear in Nikanne (1993) for Finnish cases, and more restrictively in van Riemsdijk and Huybregts (2001) for Lezgian spatial cases. The standard assumption from Chomsky (1981) onwards has been that prepositions assign oblique case. There have been a few attempts recently to account for the variety of different oblique cases found on complements of P, including the investigation of case alternations in German PPs in Zwarts' (2005b). Zwarts looks at the fact that different German prepositions assign different cases (e.g. *zu* + Dat, 'to'; *durch* + Dat, 'through'), and the fact that some prepositions can vary in the case they assign, the P itself then covarying in meaning, as in (11).

- (16) a. Anna stand in dem Zimmer.  
 Anna stood in the.DAT room  
 'Anna stood in the room.'
- b. Otto trat in das Zimmer.  
 Otto stepped in the.ACC room  
 'Otto stepped into the room.'

He concludes that case on objects in PP differs from that in VP, being more related to historical development than syntactic assignment, and that the combination of P and case cannot be analysed as semantically compositional. In this volume, Lestrade examines case alternations within PP, where one alternate is accusative, in German, Latin and Greek, arguing that the accusative spells out the Proto-Patient role and thus can in fact be seen in

parallel with case on verbal objects in differential object marking languages. This area seems to have received relatively little attention, by comparison with the detailed structure of P, and there are many more issues regarding the choice of case within PP which remain to be resolved: why, for example, do some languages, notably Indo-European languages, allow for accusative case within PP, whilst other case-rich languages in which Ps co-occur with case on the noun seem not to allow accusative (cf. Finno-Ugric).

### 3.5 Particles

(still missing)

### 3.6 PPs and event structure

(still missing – also not sure whether this should go after the semantics part)

### 3.7 The common thread

Whilst the various accounts differ a great deal in their details, reflecting different theoretical choices on the lexical-functional issue and different goals in terms of the data to be accounted for, there are several areas in which many of the contributions to this volume seem to converge, with the emergence of a structure in which a head semantically specified for Path precedes and dominates a head specified for Place, with the Place projection allowing space for a nominal head. The papers presented here make important contributions to findings on the nominal head in the PP structure (Botwinik-Rotem, Pantcheva), the aspectual parallels with the clause (Tortora), and the significance of case marking within the PP (Lestrade).

## 4 The Semantics of Spatial P

### 4.1 Locative PPs as regions, directional PPs as atemporal paths

Creary et al. (1987, 1989) treat locative PPs as denoting REGIONS and build on insights by Jackendoff (1983) that spatial expressions and DPs share a number of properties, in particular the ability to establish discourse referents to which one can refer. For example, the proform *there* can be used to pick up a contextually salient location, but it can also be used deictically, and thus behaves like a nominal anaphor; there are also location quantifiers, such as *everywhere*, *somewhere* and *nowhere*. However, locatives do not induce scope ambiguities.

Nam (1995) argues that directional PPs are interpreted as denoting PATHS or an ORIENTATIONS and builds up definitions for these based on the notion REGION. Paths, then, are sequences of regions, which are ‘time-free’, i.e. purely spatial, non-temporal. The intuitive notion of path in this system involves a movement of an object. To represent such movement, Nam introduces a predicate TRAV (which is similar to Jackendoff’s (1983) GO function). The TRAV relation is used to interpret sentences referring to ‘a path and a movement’.

A similar treatment of spatial expressions can be found in Verkuyl & Zwarts (1992), who relate Jackendoff’s (1983) conceptual semantics to the mathematical logics of model-theoretic interpretation. They interpret particular features used in Jackendoff’s conceptual structure framework as sets of model-theoretic structures.

(17) Model-theoretic interpretation of the features (from Verkuyl 1993:231ff.)

- a. [n-DIMENSIONAL]: the dimensionality of an object is the number of spatial orderings that can be imposed on the material parts of that object
- b. [+directional] is interpreted in terms of a linear ordering of the elements of a set. A set is directional if it is linearly ordered in one direction, yielding one unique beginning point and a potential end point. In localistic terms, directionality imposes a certain order on an unordered set; the linear order of a

spatial path is the result of movement through space yielding a particular order, and not the result of an intrinsic ordering of space.

Also in this approach, a spatial PATH is assumed to be atemporal. Reference to time is available, however, since it is assumed that the movement to a goal involves a bounded sequence of moments in time  $\langle t_1, \dots, t_n \rangle$ . The application of Jackendoff's GO function to the spatial Path gives a mapping from the atemporal spatial Path into the temporal Path, creating a new spatio-temporal Path  $\Pi$ , which consists of pairs of points in space and points in time:  $\langle (t_1, p_1) \dots, (t_i, p_i), \dots \rangle$  (see also Jackendoff 1996).

#### 4.2 Locative PPs are vectors, directional PPs are atemporal paths (sequences of vectors)

A more complete analysis of the semantics of spatial prepositional phrases in a model-theoretic framework is the vector semantics approach outlined in Zwarts (1997b), Zwarts & Winter (2000), and Zwarts (2005a). Since the majority of the authors in this volume refer directly to these works and often assume this kind of semantics for spatial expressions (e.g. Botwinik-Rotem, Kracht, Lestrade, Pantcheva, Svenonius?, Tomioka, Uchekukwu, Zwarts), we will outline this framework in more detail.

Zwarts & Winter (2000) argue that the vector space semantics account opens up a way of looking at algebraic properties of spatial PPs that are familiar from and relevant to inferences in other semantic domains, most notably quantified expressions. In particular, they discuss properties in the prepositional domain such as point monotonicity, vector monotonicity, or preposition conservativity. For illustration, we will discuss the relevance of vector monotonicity in the prepositional domain.

One of the reasons for Zwarts (1997b) and Zwarts & Winter (2000) to use vectors is that this allows a straightforward treatment of modification in the prepositional domain in a compositional way. A locative PP like *behind the house*, for example, is associated with the set of vectors, 'directed line segments between points in space', that go from the house to points behind it. The modified PP *5 metres behind the house*, then, is a simple composition, namely the intersection of two sets of vectors, those that are five metres long and those that are behind the house.

Zwarts & Winter (2000) furthermore note that measure phrase modification is available only with a subset of all locative prepositions. Whereas locative PPs headed by *behind* or *outside* can be modified by measure phrases, locative PPs headed by *between* or *in(side)* cannot (18).

- (18) a. **two metres behind** the car  
      **two kilometres outside** the village  
      b. \***two metres between** the houses  
          \***two metres in / inside** the house

They show that for a locative preposition to be modifiable by a measure phrase it has to be both upward and downward vector monotone (19).

- (19) **Modification Condition:** A set of located vectors  $W \subseteq V \times V$  satisfies the modification condition iff  $W$  is  $\text{VMON}\uparrow$ ,  $\text{VMON}\downarrow$  and non-empty.

This condition incorporates the fact that modification using measure phrases is possible only if the modified set of non-zero vectors and the intersection of the two sets does not lead to an empty set. The relevant notion of monotonicity is defined in (20) (with  $\mathbf{u}$  and  $\mathbf{v}$  as variables over located vectors).

- (20) **Vector monotonicity:** Let  $P$  be a prepositional function and  $X \subseteq D_{\text{pt}}$ .  
a.  $P$  is **upward vector-monotone** over  $x$  ( $\text{VMON}\uparrow$ ) iff

- $\forall A \in X \quad \forall \mathbf{u}, \mathbf{v} \in D_v [\mathbf{u} \leq \mathbf{v} \rightarrow (P(A)(\mathbf{u}) \rightarrow P(A)(\mathbf{v}))].$
- b. P is **downward vector-monotone** over x (VMON $\downarrow$ ) iff  
 $\forall A \in X \quad \forall \mathbf{u}, \mathbf{v} \in D_v [\mathbf{u} \leq \mathbf{v} \rightarrow (P(A)(\mathbf{v}) \rightarrow P(A)(\mathbf{u}))].$

The intuition behind this definition is that of truth preservation when the located object gets further from / closer to the reference object.

Zwarts & Winter (2000) furthermore show that there is a universal at play in the domain of locative prepositions (21).

(21) **Universal:** All simple locative Ps in natural language are downward monotone.

Thus, to determine, whether a locative PP can be modified by a measure phrase or not, it is enough to concentrate on upward monotonicity. English examples for upward monotone locative prepositions and those that are not upward monotone are given in (22).

(22) VMON $\uparrow$ : in front of, behind; above, over, below, under; beside; outside  
 not VMON $\uparrow$ : near, on, at; inside, in; between

For example, *outside* is upward monotone: when a vector that points to x is in the denotation of outside A, then also any lengthening of this vector is in the denotation of outside A. This does not hold for *inside* though because lengthening of vectors that go inside could eventually end up going outside again. Hence, *inside* is not upward monotone and does not meet the Modification Condition.<sup>2</sup>

The semantics of directional PPs is addressed more explicitly in Zwarts (2005a). Directional prepositions are assumed to map the reference object (**Talmy's GROUND**) to a set of sequences of vectors, PATHS, where each of these sequences determines a potential change in position of the located object (**Talmy's FIGURE**). The denotation of a directional PP is treated as an algebraically structured set of paths (see also Zwarts & Winter 2000), with path defined as in (23).

(23) A **path** is a function of type iv from the real interval  $[0,1] \subset \mathbf{R}$  (type i) to vectors (type v).

Zwarts (2005a) treats paths as direct counterparts to events, and both entities are strictly separated domains (recall from Verkuyl & Zwarts 1992 that paths are viewed as atemporal in nature).

One of the main ideas of Zwarts (2005a) is to compare the prepositional domain to the verbal and the nominal domains, and to explore parallels between these. Such parallels are also drawn in syntactic research, as discussed in the section on syntactic structure of PP above. He assumes that locative prepositions can be compared to states in the verbal domain, whereas directional prepositions are very much like dynamic events. He furthermore argues that a property like boundedness, which is relevant for distinguishing between atelic (unbounded) and telic (bounded) events in the verbal domain, or between mass (unbounded) and count (bounded) nouns in the nominal domain (e.g. Bach 1981, 1986), is also at play in the prepositional domain. This leads him to make a further subdivision of directional prepositions into atelic / unbounded and telic / bounded ones. Lestrade (this volume) draws on these parallels for his comparison of case marking in VP and PP. Independently from Zwarts' work, Tortora (this volume) addresses a similar research question from a syntactic point of view when she posits the relevance of (un)boundedness in the spatial domain.

Zwarts (2005a) provides the following examples:

<sup>2</sup> This is a bit of a simplification. There are some further complications with non-projective reference objects, with which *in*-phrases can be modified again (see Zwarts & Winter, 2000 for discussion).

- (24) a. *bounded, telic*: to, into, onto, from, out of, off, away from, past, via  
 b. *unbounded, atelic*: towards, along  
 c. *(un)bounded, (a)telic*: across, around, down, over, through, up

Following Jackendoff's terminology (1983), ROUTE prepositions refer to those prepositions that describe a trajectory but not an (initial or final) end-point of the path; these are the prepositions in (24) c. together with *past*, *via* and *along*. In contrast, SOURCE and GOAL prepositions specify where the path starts and ends, respectively. Zwarts explicitly states that SOURCE and GOAL are not thematic roles but only play a role PP-internally.

Zwarts convincingly shows that the distinguishing property between telic and atelic reference in the prepositional domain is cumulativity rather than divisivity or quantisedness. Cumulativity in the verbal and nominal domain is exemplified in (25).

- (25) *drink water* (cumulative) vs. *drink a glass of water* (non-cumulative)

A PP, then, is bounded (telic) iff it does not have cumulative reference, which is defined in the following way (with  $\mathbf{p}$  and  $\mathbf{q}$  as variables over paths):

- (26) A set of paths  $\mathbf{X}$  is **cumulative** iff (Zwarts 2005a:12)  
 (i) there are  $\mathbf{p}$  and  $\mathbf{q} \in \mathbf{X}$  such that  $\mathbf{p}+\mathbf{q}$  exists and  
 (ii) for all  $\mathbf{p}, \mathbf{q} \in \mathbf{X}$ , if  $\mathbf{p}+\mathbf{q}$  exists, then  $\mathbf{p}+\mathbf{q} \in \mathbf{X}$ .

The crucial operation involved here is concatenation (closure under sums), which is a partial operation subject to the condition that the second path has to start where the first path ends. Atelic PPs are closed under sums whereas telic PPs are not.

For example, *into* is defined as **a transition from one phase to another** (27).

- (27)  $[[ \text{into the house} ]]$  =  $\{ \mathbf{p}$ : there is an interval  $I \subset [0,1]$  that includes 1 and that consists of all the indices  $i \in [0,1]$  for which  $\mathbf{p}(i)$  is INSIDE the house  $\}$

*To* and *onto* are defined in a parallel fashion where the result is AT and ON (instead of INSIDE), respectively. These three goal-expressions are not cumulative, as they contain no paths that can be concatenated. For example, there are no two paths in the denotation of *to* that can be concatenated, since the final end-point (1) of a *to*-path is always just outside the reference object whereas the initial end-point (0) is not.

The denotations of the source prepositions *out of*, *from* and *off* do not involve any paths that can be concatenated, either, and are therefore non-cumulative as well; they are defined as the reverse of the goal ones. A full list of these definitions is given in (28).

- (28)  $\{ \mathbf{p}$ : there is an interval  $I \subset [0,1]$  including...  
 ... 0 and consisting of all the  $i \in [0,1]$  for which  $\mathbf{p}(i)$  is AT  $x$   $\}$  =  $[[ \text{from } x ]]$   
 ... 0 and consisting of all the  $i \in [0,1]$  for which  $\mathbf{p}(i)$  is ON  $x$   $\}$  =  $[[ \text{off } x ]]$   
 ... 0 and consisting of all the  $i \in [0,1]$  for which  $\mathbf{p}(i)$  is IN  $x$   $\}$  =  $[[ \text{out of } x ]]$   
 ... 1 and consisting of all the  $i \in [0,1]$  for which  $\mathbf{p}(i)$  is AT  $x$   $\}$  =  $[[ \text{to } x ]]$   
 ... 1 and consisting of all the  $i \in [0,1]$  for which  $\mathbf{p}(i)$  is ON  $x$   $\}$  =  $[[ \text{onto } x ]]$   
 ... 1 and consisting of all the  $i \in [0,1]$  for which  $\mathbf{p}(i)$  is IN  $x$   $\}$  =  $[[ \text{into } x ]]$

In other words, all of these prepositions have in common that they involve a two-stage structure, a negative and a positive phase. They all have exactly one positive phase that overlaps either with the starting point  $\mathbf{p}(0)$  or the ending point  $\mathbf{p}(1)$ . This is in some ways similar to Fong's (1997) treatment of the semantics of PPs in terms of phase quantification, which is outlined in the next sections. However, Fong explicitly argues against using space as the domain for directional PPs **(or change for that matter)**.

### 4.3 Directional PPs are (neither strictly spatial nor strictly temporal) phase quantifiers

In light of the existence of directional locative predication in non-motion context, Fong (1997, 2001) argues that directional locatives have a semantics that is more abstract than the path meaning commonly attributed to them. Instead she argues that they denote ordered structures, and are interpretable in domains that are diphasic. She mainly concentrates on Finnish and English data and assumes that English and Finnish differ in that Finnish directional locatives (DLs) (expressed by case suffixes on the noun phrase) can operate on the aspectual (or temporal) structures of the verb, while English DLs (expressed by PPs) cannot. The lexical semantics of English and Finnish verbs, however, is treated as the same.

Fong uses Löbner's (1989) concept of phase quantifiers in her analysis of DLs. According to the idea of phase quantifiers, the truth of propositions is time dependent, so phase quantifiers can be viewed as functions from the time line to the set of truth values  $\{0, 1\}$ . Given a proposition  $p$ , an interval  $I$  is *admissible* for  $p$  if the truth value changes in  $I$  and (the restriction of  $p$  to the interval  $I$ ) is a nonconstant monotonic function from  $I$  to  $\{0, 1\}$ . So,  $I$  is the disjoint union of two nonempty intervals  $J_0$  and  $J_1$  such that  $J_0$  is entirely before  $J_1$ , and  $p$  is false in  $J_0$  and true in  $J_1$ . A directional locative preposition like *into* takes a DP as a complement, and the complex denotes a set of admissible intervals. The sentence containing the DL is true if the event time is one of these intervals. Since phase quantification is defined on propositions, this analysis of DLs has wider applications than merely the spatial domain. It allows including non-spatial cases in the analysis as well, such as the Finnish *essive* and *translative*, which talk about an object having a property or acquiring it.

Fong points out several reasons why DLs should not be restricted to spatial movement. First, noun phrases in both English and Finnish (as well as in other languages) can freely be modified by DLs, even though there is nothing in motion (*a bridge into San Francisco*). Second, many verbs demand a DL even though nothing is moving. In particular, Finnish DLs appear as complements of aspectual verbs, verbs with posterior / anterior entailment properties (e.g. *find*, *forget*), and more generally, verbs that are inherently Achievements or Accomplishments (in the sense of Vendler 1957). From this, Fong concludes that verbs need some diphasic event structure to be able to combine with DLs, which in Finnish can be properly interpreted in the temporal domain. She argues that the reason why English DLs do not occur with this same class of verbs is due to the language restricting DL interpretation to only spatial or spatio-temporal domains.

Fong assumes that the interaction between the semantics of DLs and verbs of motion involves lexical aspect shift, in the sense that the verb gets associated with an accomplishment reading rather than with a process or activity reading. She states that this explanation also carries over to typological differences, discussed in Talmy 1975 and subsequent work, between languages like French, Mandarin Chinese (which do not allow the aspect shift with manner of motion verbs), on the one hand, and Finnish and English (which allow the aspect shift), on the other.

### 4.4 Directional PPs are spatiotemporal event modifiers

Kracht (2002) notes that Fong's definition of phase quantifiers is too inflexible because it matches only goals (*into*, *onto*, *to*) or sources (*out of*, *off of*, *(away) from*), whereas trajectory expressions (*through*, *along*, *past* etc.) supposedly cannot be analysed by means of phase quantifiers. He also questions the analysis of source expressions by means of phase quantification, noting that it is not the same to be not in a location as to be out of it. Whereas he agrees with Fong that directional locatives do not need something being moved, he additionally assumes that spatial expressions can be idiosyncratically selected, and that such idiosyncratic selection empties the semantics of the elements and turns the verb semantically into a transitive verb.

Kracht (2002) mainly discusses spatial cases in languages with rich case systems such as Tsez, Finnish or Hungarian. At the same time, he assumes that from a semantic point of view there is no distinction between spatial cases in these languages and spatial adpositions in other languages like English or German, so that he treats this distinction as a mere morphological distinction. The semantic structure and therefore the differentiation between modes and localisers is applicable to both.

Kracht (2002) views directionals as event modifiers, where directionality is treated as a phase quantifier with a slightly more liberal definition of phase quantifier than in Fong (1997). He assumes that locative cases are systematically organised along two orthogonal lines: one specifying the location and the other specifying the change. Universally, locative expressions consist of two layers, one for the configuration and one for the mode. The CONFIGURATION describes the way in which several objects are positioned with respect to each other. Configurations can be brought into correspondence with prepositions, which do not indicate a change of location. Examples are *at, in, on, between, in front of* etc. The MODE, on the other hand, describes the way in which an object moves with respect to the named configuration.

While there is no plausible bound on the number of configurations that a language distinguishes, the number of modes seems to be limited. Kracht addresses evidence for the static, the cofinal, the coinitial, the transitory and the approximative mode. A mode is STATIC if the object remains in that configuration during event time (Finnish & Hungarian inessive case; *in the house*); the mode is COFINAL if the object moves into the configuration during event time (Finnish & Hungarian illative case; *into the house*); the mode is COINITIAL if the object moves from the configuration during event time (Finnish & Hungarian elative case; *out of the house*). The mode is TRANSITORY if the object moves in and again out of the configuration (*through the tunnel*). Finally, the APPROXIMATIVE mode describes a movement approaching a configuration (*towards the tunnel*).

From a semantic and syntactic point of view, Kracht assumes that a locative expression is structured as in (29), where *M* is a MODALISER (specifying the mode) and *L* is a LOCALISER (specifying the configuration).

(29) [*M* [*L DP*]]

In most languages that Kracht looked at, *L* and *M* end up on the same side of the *DP*, and it is atypical for *L* and *DP* to form a unit excluding *M*. Hence, unless all three elements are morphologically free or on opposing sides of the *NP*, *M + L* is a unit, which is either an adposition or a case. For a head initial language Kracht thus assumes the structure in (30).

(30)  $V$  [*M+L*] *DP*

Locatives have the structure [*M* [*L DP*]], where [*L DP*] denotes a location. This location can be defined without reference to the path of motion. A head can govern either the modaliser alone, or the combination of a modaliser and a localiser. As soon as it governs an element, the meaning of that element becomes the identity function. The head can select a particular modaliser rather than just selecting the value of the feature DIR. There is only one hard restriction as to the co-occurrence of verbs and PPs: if the event is static no directional PP may be used. Directional verbs, on the other hand, allow nondirectional PPs.

Kracht notes that only two of the directionals (the transitory and the approximative ones) make reference to the PATH of an object, the others make reference only to the place of the object at some points of the interval. Hence, he seemingly combines insights from both Zwarts (that directionals refer to paths) and Fong (directionals are phase quantifiers). In

contrast to Fong, however, Kracht argues that a directional locative needs a moving entity, which is something which is by necessity moving in the specified event (including cases of fictive motion as discussed by Talmy 1983 and others). Events, on the other hand, have ‘a time-independent location, which is simply the union of all locations occupied by the participants during that event at their point of activity’, and ‘the location of the event can change only indirectly in virtue of its objects moving’. Therefore, he sees it as a major short-coming of previous work (Nam 1995, Zwarts & Winter 2000) that treats spatial PPs as atemporal entities. Kracht (this volume) aims at a synthesis of Fong (1997) and Zwarts (1997b, 2005a) / Zwarts & Winter (2000), generalising the idea of phase quantification.

## 5 PPs in relation to events [this part is under construction]

Following Krifka (1998) and others, Zwarts (2005a) argues that the link between verbs (denoting sets of events) and directional PPs (denoting sets of paths) is performed by a thematic function TRACE that maps events to their spatial trace. If  $e$  is a (motion) event, then TRACE( $e$ ) is the path followed by the theme of  $e$ . The compositional rule for combinations of a verb and a PP is given in (31).

$$(31) \quad [[V \text{ PP}]] = \{e \in [[V]]: \text{TRACE}(e) \in [[\text{PP}]]\}$$

Hence, a (directional) PP restricts the denotation of a verb (as set of events) to those events that have paths in the PP denotation as their trace.

A similar idea is found in Jackendoff (1996) ... say something about Hale and Keyser ???

In general, spatial expressions can be predicates, arguments and adjuncts (Bierwisch 1988):

- (32) a. predicate: Alfred ist in der Schule. GERMAN  
 Alfred is at the school  
 ‘Alfred is at school.’  
 b. argument: Der Brief liegt auf dem Tisch.  
 the envelope lies on the table  
 ‘The envelope is lying / lies on the table.’  
 c. adjunct: Ich kaufe das Buch in Berlin.  
 I buy the book in Berlin  
 ‘I am buying / will buy / buy the book in Berlin.’

Creary et al. (1989) argue in line with Jackendoff (1983) that **spatial expressions** are always arguments and deduce from this that iterated locatives must be taken conjunctively, as they predicate over the same event, not just several ones:

(33) Al works on Mass. Ave., in Boston.

Additionally, the following pattern of upward monotonicity is observed.

(34) Al works in Boston. (In) Boston is in America.  
 ∴ Al works in America.

Keenan & Faltz (1985) argue that a locative PP is an intersective modifier, which explains why the following inferences are valid:

(35) John is walking in the garden.  
 ∴ John is walking.

(36) John is walking in the garden.

∴ John is in the garden.

(37) John is in the garden.                  John is walking.

∴ John is walking in the garden.

Nam (1995) carries over this analysis to directional locatives, which he treats as intersective modifiers as well. In contrast to Keenan & Faltz, however, he assumes that spatial prepositions can also be predicate extensors, which can raise the arity of the verb by one. Examples are prepositional passives (in e.g. English) or the incorporations of locatives into the verb (e.g. in Bantu languages), where the incorporated preposition promotes the PP-complement into a direct object.

Nam discusses at length that PPs can be oriented to either the subject or the object or to both. The kind of orientation that verbs show is constrained by the type of verb in question. The results found by Nam, building on Levin (1993), are shown in the table in (38).

(38) Orientation of Locatives in Nam (1995)

Stative	Directional	Symmetric	Source
Motion-Causative Verbs, Verbs of 'Sending/Carrying' <i>drag, push, run; send, take</i>			
<i>O</i>	<i>O</i>	<i>O</i>	<i>O</i>
Verbs of Placement, Verbs of 'Hunting' <i>place, set, put; watch, hunt</i>			
<i>O</i>	<i>O</i>	<i>O</i>	*
Verbs of 'Combining/Attaching', Verbs of 'Housing' <i>mix, tape (music); contain, store, serve</i>			
<i>O</i>	<i>O</i>	*	*
Verbs of 'Perception', Verbs of 'Communication', Verbs of 'Contact' <i>find, see; call, cable; touch</i>			
<i>O</i>	*	$S \times O$	$S + O$
Verbs of 'Co-movement' <i>escort, accompany, chase, drive, follow</i>			
$S + O$	$S + O$	$S + O$	$S + O$
Verbs of 'Social Interaction' <i>meet, embrace, marry, fight, visit</i>			
$S + O$	*	*	*
Verbs of 'Judgement', Psych-Verbs, Intensional Verbs <i>criticize, honor; adore; seek, mention</i>			
<i>S</i>	*	*	*

$S + O$  means that the locative is construed with the subject and the object as one location,  $S \times O$  means that it is simultaneously construed with both the location of the subject and the location of the object.

Nam uses the terminology *stative*, *source*, *goal*, and *symmetric*. He makes the following observations.

- i. If a non-stative locative combines with a transitive verb, it is always oriented to the object argument. That is, it can be either  $O$ ,  $S + O$ , or  $S \times O$ .
- ii. If a transitive verb can combine with a non-stative locative, then stative locatives are object-oriented with that verb (that is, either  $O$  or  $S + O$ ).

- iii. Only symmetric locatives can be  $S \times O$ , that is other locatives are all reducible in terms of unary functions.
- iv. There is only one case where PPs exclusively involve subject-orientation: verbs of ‘judgment’, psych-verbs, and intensional verbs. This suggests that object-orientation is more basic than subject-orientation.

## 6 Paper summaries [three papers still missing]

**Irena Botwinik-Rotem**’s paper *Why are they different? An exploration of Hebrew locative PPs* focuses on a specific aspect that distinguishes locative PPs from their non-locative counterparts, namely their ability to function as full-fledged predicates, assigning an external semantic role. Assuming a uniformly functional classification of P, she argues that the external role of locative PPs originates in the phonetically null noun *Place* that heads the extended (nominal) projection of a locative PP. She then goes on to explore the possibility to analyse Hebrew locative PPs on a par with their Greek counterparts, arguing that Hebrew locatives are base-generated lower than  $P_{loc}$ , and raise to this position, when it is free. A variety of evidence involving complex and basic locatives and their interaction with directionals leads her to conclude that basic locatives and directionals are base-generated in the same structural position, namely in P selecting a DP which encloses *Place*.

**Bert Cappelle**’s paper *The microstructure of English particle phrases* argues that even though English particles like *back*, *down*, *off*, etc. are in a syntactic dependency relation with particular verbs, they additionally function as the syntactic non-head in verb-particle combinations, often referred to as *phrasal verbs*. Cappelle assumes that particles may themselves be the head of a *particle phrase*, that is, a phrasal structure clustering around a particle as head. He furthermore notes that particles can, in certain structural configurations, be preceded by a modifier like *right* (39), but that they can also combine among themselves (40).

- (39) a. A violent gust of wind ripped the roof *right off*.  
b. \*A violent gust of wind ripped *right off* the roof.
- (40) a. The water was too cold so I jumped *back out*.  
b. Please, come *on over* and see us soon!

Noting that these latter patterns have not been closely investigated before, Cappelle assumes that *out* in (40)a is the head of a particle phrase. This leads him to argue that *back* has the status of a modifier within that phrase. He makes the same assumption as to headedness for *over* in (40)b, where the preceding particle *on* must then likewise be some sort of modifier. Given that particles like *back* and *on* in (40) and elements like *right* in (39) may appear together (41), Cappelle concludes that it is not possible to claim that these two kinds of elements fill the same structural slot in the particle phrase.

- (41) a. The water was too cold so I jumped *right back out*.  
b. Please, come *right on over* and see us soon!

**Marcus Kracht**’s paper *The fine structure of spatial expressions* takes the metric three-dimensional Euclidean space as the basic geometrical structure to provide a complete, bottom-up picture of how spatial meanings are built up. Combining the more traditional decomposition of spatial expressions into a structure associated with directionality (Paths) and location (Places), with insights from Svenonius (this volume), Pantcheva (this volume), and Caponigro & Pearle (this volume), he posits the following structure for spatial PPs:

(42)  $[P_{dir} [P_{stat} [P_{AxPart} [P_{loc} DP ]]]]$

He assumes this structure to be established by morphological decomposition and aims at filling it with semantic detail in the course of the paper. He assumes that different objects are associated with the different structures as outlined in the following.

Locative PPs like *in the box* or *on the table* are treated to denote sets of regions, so-called neighbourhoods, which are functions from regions to truth values. The meaning of  $PP_{stat}$  is a function from time points to functions from space points to the unit interval (inner layers of a spatial PP). The time dependency monitors the position of the trajector relative to the landmark. Directionality in the outer layer of the spatial PP specifies change of the trajector with respect to the landmark.

$P_{loc}$  is the location function (loc') that, applied to an object (denoted by the DP) and a time point (to be supplied), yields a region. This region is compressed to a point (the gravitational centre), which serves as the origin of the coordinate frame. The space thus becomes structured as a vector space (the tangent space to the manifold at the origin) as spatial points can be given as vectors. An instantiation of  $P_{loc}$  is the empty P discussed in Caponigro & Pearle (this volume).  $P_{AxPart}$  is adapted from Svenonius (this volume) (see also Pantcheva this volume for discussion). Kracht assumes that this element establishes a coordinate frame, which returns the three unit vectors.  $P_{stat}$  picks out a direction, which can be established according to several criteria. It yields a goodness of fit function, a function from the three-dimensional Euclidean Space to truth values  $[0,1]$ , telling us for each coordinate triple how well it fits. This can be translated into a goodness of fit for space points. Finally,  $P_{dir}$  describes a change of goodness of fit through time.

Kracht leaves it open whether all of these projections are always present. A reason for thinking that not all have to be present are, for example, non-projective Ps like *in* or *on*, that do not seem to need a  $P_{AxPart}$ , or transitory Ps like *along* or *around*, that do not seem to have a decomposition into an inner, static part and an outer, directional part. The static meaning of *along*, for example, is the same as *near*, but the movement type is not defined using a generalised phase quantifier. The movement is then described in different terms where the directional part describes a certain kind of path in the vicinity of the landmark.

In analogue to Zwarts' work, Kracht characterises the movement patterns as certain sets of canonical paths. With the *stative* the path stays inside the location, with the *cofinal* the path is moving into the location, with the *coinitial* the path is moving out of the location, and with the *approximative* the path gets closer to the location (but not necessarily reaching it). Kracht assumes that the particular kind of motion can be recoded as a change in goodness of fit. The spatial template supplies real numbers between 0 and 1 (rather than giving the truth values), which depend directly on distance: the closer an object, the better the fit. A path is *stative* if the goodness of fit remains constant and close to 1 throughout the event time; *cofinal* if it improves (is upward monotone) during event time and reaches 1 (or some sufficiently close neighbourhood), *coinitial* if it decreases, and *approximative* if it is monotone increasing. The idea of generalised phase quantifier is defined as follows.

(43) A **generalised phase quantifier** is a function from  $[0,1]$  to  $[0,1]$  (with the domain of truth values and the co-domain of unit time intervals)

A generalised phase quantifier thus describes a change in truth value. Directionality can now be described entirely by means of the (generalised) phase quantifier that it uses. Approximative movement, then, is a monotone increasing phase quantifier, recessive movement a monotone decreasing phase quantifier, *cofinal* movement a monotone increasing phase quantifier reaching 1, and the *coinitial* movement a monotone decreasing phase quantifier starting at 1.

**Sander Lestrade's** paper *Adpositional case* looks at case marking within the PP, focusing on alternations between accusative and another case in several languages, including German, Polish, Russian, Latin and Ancient Greek. He argues for adposition phrase parallels for the verbal notions of transitivity and Proto-Patient, with accusative expressing the Proto-Patient role. The analysis is set in terms of Bi-Directional Optimality Theory, relying the constraints \*COMPLEXITY, which militates against complexity of interpretation. The intrinsic relationship between accusative case and Proto-Patient interpretation is reflected in the constraint ACC/PROTO-P. He argues that dative is a default case in PP, expressing this in terms of the constraint \*ACC<sub>PP</sub>, which is violated when the object of the adposition has accusative case. The constraint OBJ/ACC then enforces use of structural accusative on the object of the verb.

**Jaume Mateu's** paper *On the l-syntax of directionality/resultativity: the case of Germanic preverbs* offers a l(exical)-syntactic explanation of certain patterns of Germanic complex verbs that have been argued to cause non-trivial problems to Hale & Keyser's (1993, 1997) syntactic theory of argument structure. He suggests to deal with all of them in two ways. First, drawing on Hale & Keyser's (2000) insight concerning 'P as a cognate complement' in English complex verbs of the type *heat up*, he provides l-syntactic analyses for German complex location verbs of the type *einrahmen* ('in-frame'), complex denominal verbs of the type *verslumen* ('become a slum'), and complex deadjectival verbs of the type *eindeutschen* ('germanise'). On the other hand, drawing on McIntyre's (2004) and Zubizarreta & Oh's (in press) modifications of Mateu's (2001a, 2002) syntactic 'plug-in' theory of so-called 'lexical subordination processes', he reviews his previous l-syntactic analysis of complex denominal verbs of the type *vergärtnern* ('garden away') by providing a slightly modified analysis of the relevant conflation process involved. He also argues that an l-syntactic subordination process is involved in complex locatum verbs of the type *überdachen* ('roof over') and complex denominal verbs of the type *versanden* ('sand up'). Finally, he integrates the present account of Germanic preverbs into Mateu's (2002) l-syntactic approach to Talmy's (1991, 2000) typology of satellite- vs. verb-framed languages.

**Tatiana Nikitina's** paper *Pragmatic factors and variation in the expression of spatial goals: The case of into vs. in* explores the directional use of the preposition *in* in American English as opposed to the alternative strategy of marking the goal of motion by *into*. She discusses two types of significant factors that affect the choice between *into* and *in*: factors contributing to contextual inferability of the directional meaning, and factors related to event construal. The significance of the former set of factors points to the compositional nature of directional meaning. Even in a language like English, where directionality can be encoded lexically by means of a specialised preposition *into*, the same meaning need not be overtly expressed and can instead be inferred from the context, allowing speakers multiple options in describing the same event. Nikitina argues that the complex nature of variation in the expression of goals in American English demonstrates that the use of directional *in* cannot be described in terms of rigid rules and constraints. She furthermore notes that the tendency to avoid the use of *in* in descriptions that focus on manner or path of motion suggests that the choice between available options is further constrained by pragmatic factors related to conceptualisation of the event. She takes the variation in the expression of spatial goals found in languages other than English to suggest that the problem of choosing between *into* and *in* is related to a more general problem of co-existence of alternative strategies of expressing directed motion.

**Marina Pantcheva's** paper *The place of PLACE in Persian* briefly presents the prepositional system in Persian, focussing on the noun-like behaviour of so-called Class 2 prepositions. Considering silent PLACE hypotheses suggested for Greek and Hebrew locatives **in other works**, she suggests that a null PLACE element in the extended prepositional

projection can account for several nominal properties of the Class 2 Ps. She furthermore argues that Class 2 Ps are distinct from true nouns, their only nominal property being that they can modify nouns, including the silent PLACE element. Finally, she shows how the entire structure can capture various phenomena characterizing this prepositional class. The structure she proposes still allows us to maintain the distinction between Axial Parts and nouns making the former even less nominal by assuming that the only property they share with nouns is that they can be noun modifiers. Since, as Svenonius (??) shows, AxParts are cross-linguistically widely represented, Pantcheva views it as highly interesting to attempt to apply the silent PLACE hypothesis to other languages.

**Naoko Tomioka**'s paper *The distribution and interpretation of adjunct locative PPs* starts out noting that explorations of the syntax and semantics of spatial prepositions primarily focus on the internal structure of prepositional phrases, but that only scarce research has been done on the nature of the "external argument" of P, namely the so-called figure argument of the prepositional spatial expressions which determines their distribution. To focus on the latter, Tomioka presents data from Japanese and contrasts the behaviour of Japanese spatial expressions with those of English. She reports that adjunct spatial expressions in Japanese are subject to interpretive restrictions that are unexpected of phrasal adjuncts. In Japanese spatial PPs may express the location of events in the sense of Davidson (1967), but not the location of sub-events. Japanese spatial expressions thus differ from English locatives in what they can modify. She attributes this interpretive restriction to the restriction on their distribution and argues that adjunct locative PPs in Japanese are subject to the same set of distributional restrictions as so-called "small" modifiers. The exploration of the distribution of these elements leads to the second goal of the paper, namely to couch the current investigation in a larger project concerning event modification. Using the spatial expressions as one of the exemplars of an event modifier, Tomioka argues that the distribution of event modifiers correlates with the presence of the category that mediates event modification.

**Christina Tortora**'s paper *Aspect inside PLACE PPs* argues that certain PP data from Italian suggest that PLACE, like PATH, can be conceptualised as bounded or unbounded, and that this has a reflex in the grammar. This extension of the 'boundedness' feature to place allows for the more general claim that space (the supercategory that subsumes path and place; Jackendoff 1991) can be conceptualised as bounded or unbounded. This in turn reveals that boundedness is relevant to not only *events* and *entities*, but to *space* as well, suggesting that these three super-categories themselves are all potentially treatable in a similar way. This is consistent with the tradition, initiated by Bach (1986) (among others), and expanded upon by Jackendoff (1991), of unifying major linguistic categories under one abstract semantic system. Tortora takes the data under discussion to support the claim (proposed by e.g. van Riemsdijk 1990) that Ps are syntactically like Vs and Ns in the sense that they project similar types of functional categories. This similarity across categories is further corroborated by a preliminary discussion that the nature of the argument (e.g., plural vs. singular) can affect the aspectual interpretation of the entire PP.

**Chinedu Uchechukwu**'s paper *The Grammaticalization of prepositional markers in Igbo: The example of the verb root -nyé 'give'* addresses a language for which it has sometimes been claimed not to have prepositions at all. Nevertheless, over the years some researchers have identified certain elements as prepositions, and the latest list contains four prepositions (Uwalaka 1997: 69). Uchechukwu mainly argues that the Igbo language does not suffer from a 'poverty of preposition' but that, instead, it expresses the category in a different manner, through a group of 'prepositional markers'. To argue for this he uses the verb **-nyé** to illustrate the development of such markers, which occur in specific environments as the second component of compound verbs, and are sometimes also subject to the rule of vowel harmony in the identified compound verb environment.

**Joost Zwarts'** paper *Priorities in the production of prepositions* studies the semantic interaction between pairs of closely related prepositions in order to determine the priorities that determine the application of these prepositions to ambiguous situations. He proposes that the division of labour between prepositions is strongly determined by stereotypical regularities in the way notions like support, containment and superiority are related. Zwarts assumes that in order to express a spatial relation between two objects, a Figure and a Ground, a choice has to be made from an inventory of expressions, typically prepositions. Following **(mostly cognitive)** studies that shows that the choice between two prepositions for a particular spatial scene is typically the outcome of the interaction between quite complicated perceptual, geometric, pragmatic and conventional factors, Zwarts takes a production perspective on prepositions, using the theoretical framework of Optimality Theory. Thereby, the mapping from meanings (spatial relations) to forms (prepositions) is construed as an optimisation process. Given a particular spatial relation, different prepositions present themselves as candidates, competing with each other. The winner of the competition, the optimal preposition, is that candidate that best satisfies a ranked system of constraints. In the course of his paper, Zwarts goes through a range of simple two-way competitions between prepositions to derive several spatial priorities. In the end, he tries to tie these case studies together to examine the origins of these priorities more closely and draw some general conclusions.

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