Spatial P in English

Peter Svenonius*
CASTL, University of Tromsø

June 16, 2007

1. Introduction

The syntactic structure of prepositional phrases is quite rich, as has been demonstrated in numerous recent detailed studies of individual languages. In this paper I present an analysis of the prepositional system of English, focusing on spatial expressions and applying a cartographic approach (of the sort pioneered by Cinque 1999).

A recurring observation is the basic distinction between what can be called Place (associated with stative locational meanings) and what is often called Path (associated with directed motion).[1] Place elements give information about the physical configuration of the relationship between a Figure (an object whose location is at issue) and a Ground (the reference landmark for the location of the Figure). This is illustrated in (1a), where *the elephants* is the Figure and *the boat* the Ground. Path elements give information about a trajectory; Path elements may specify whether a Place is a Goal (1b) or a Source (1c), and may specify the orientation of a trajectory (1d).

(1) a. The elephants remained **in** the boat.
b. They cast a wistful glance **to** the shore.
c. The boat drifted further **from** the beach.
d. Their ears sank **down** several notches.

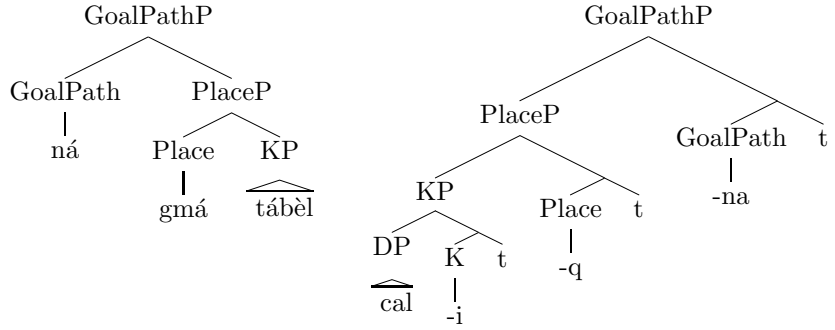
Because I will be needing to make finer-grained distinctions between the kind of Path in (1b)-(1c) and the kind in (1d), I will refer to the former as GoalPath (with *to*) or SourcePath (with *from*) to distinguish them from other types. The expression PATH then includes GoalPath and SourcePath but also other types.

When Path and Place elements cooccur, Path is outside Place — either further away from the nominal stem, in a local case system (cf. Kracht 2002), or further away from the noun phrase, when they are unbound morphemes (van Riemsdijk and Huybregts 2002). This can be illustrated with a pair of languages as in the example here.

*Thanks to Gillian Ramchand and the other Moving Right Along seminar participants in Tromsø for discussion, and to Marcel den Dikken and Joost Zwarts for comments on an earlier draft. Thanks also to Walter Schweikert and Guglielmo Cinque and the other participants in the Adpositions Workshop in Venice, where this material was first presented.

[1] *Path* and *Place* is the terminology used by Jackendoff 1983 and Koopman 2000; compare the *dir[ectional]* and *loc[ative]* of Wunderlich 1991, van Riemsdijk and Huybregts 2002, and den Dikken 2006; and cf. also Kracht's (2002) *mode* and *configuration*.

(2) a. ná gmá tábèl (Zina Kotoko, Holmberg 2002)
to on table
'onto the table'
b. cal-i-q-na (Tabasaran, Comrie and Polinsky 1998, 99)
wall-ERG-*behind-to*
'to behind the wall'



In (2a), the base order of GoalPath and Place is preserved at the surface. In (2b), both are affixal and the tree is represented in 'roll-up' fashion (in the tree for Tabasaran, I represent the case morpheme as a K head, on the inessential assumption that the 'ergative' morphology projects).

In this paper I examine the detailed structure of English Place and Path projections and the words that appear in them. I concentrate on spatial expressions, setting temporal uses and other P elements aside. In particular, I consider four classes of P elements, as presented in the table below.

(3)

PLACE	BOUNDED	EXTENDED	PARTICLE
behind	among	around	up
in front of	between	through	down
inside	next to	across	on
outside	beside	along	off
above	upon	over	in
below	near	under	out
beyond	against	past	away

Within each of these classes, there are further distinctions; for example *under* and *over* have some properties which distinguish them from the other 'extended' Ps (which I call PathPlaces, below). Also, *in* and *on* have 'Bounded' place uses which are distinct from their particle uses, and *near* has several properties which distinguish it from the other 'bounded' Ps. Nevertheless, the table above gives an approximate first categorization; the distinction between the first and second columns is laid out in §2; the character of the elements in the third column is discussed in §3 (along with Path elements like *to* and *from*); and the particles in the fourth column are discussed first in §2 and then further in §4.

2. Place

2.1. Distribution of PlaceP

I will assume that the elements in the leftmost column in the table in (3) (the column headed 'Place') head a class of syntactic entities called PlaceP which can express locational relations in certain contexts in English. One external diagnostic for PlaceP is that it can be the complement of stative verbs expressing location, such as *remain* or *be located*, and can also occur as a locative adjunct to verb phrases which imply no motion.

(4) a. The boat remained **behind** the hill
b. The boat was located **inside** the cave
c. The boat stood **below** the bend
d. The boat burned **beyond** the city limits
e. The boat was painted **in front** of the palace
f. The boat remained **above** the dam

This is also true of certain more complex expressions which are discussed in §4.

(5) The boat remained six miles **up** the river

Verbs can be organized into obligatory direction (e.g. *go*), optional direction (e.g. *fly*), and non-direction (e.g. *stay*), on the basis of the interpretations of expressions like those in (6) below; the first example is obligatorily directional, the second ambiguously directional or locative, and the third obligatorily locative (I discuss the P element *over* later).

(6) a. The plane went over the city.
b. The plane flew over the city.
c. The plane stayed over the city.

The most natural interpretation for a PlaceP with an optional motion verb is the locative one, though a directional reading is often freely available.

(7) a. The plane flew behind the trees.
b. The rabbit jumped inside the cage.
c. The submarine sailed below the ice.
d. The marathoners ran beyond the city limits.
e. The revelers danced in front of the palace.
f. The mountaineers climbed above the dam.

All of the PlaceP expressions in (4) can also serve as the complement to the preposition *from*:

(8) a. The boat drifted from behind the hill
b. The boat drifted from inside the cave
c. The boat drifted from below the bridge
d. The boat drifted from beyond the city limits
e. The boat drifted from in front of the palace
f. The boat drifted from above the dam

Furthermore, PlaceP expressions can appear with ordinary common nouns, as restrictive modifiers.

(9) a. the boat behind the hill
b. the boat inside the cave
c. the boat below the bridge
d. the boat beyond the city limits
e. the boat in front of the palace
f. the boat above the dam

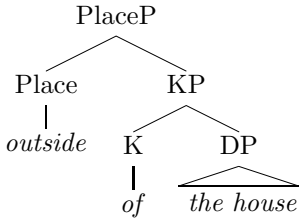
When these sequences (i.e. PlacePs) take on a directional or path-denoting meaning, as with motion verbs like *drift*, I assume it is due to a null path head with the approximate semantic value of overt *to*. In fact, overt *to* is marginally licit in these contexts.

(10) a. The boat drifted (?to) behind the hill
b. The boat drifted (?to) inside the cave
c. The boat drifted (?to) below the bridge
d. The boat drifted (?to) beyond the city limits
e. The boat drifted (?to) in front of the palace
f. The boat drifted (?to) above the dam

On the cartographic approach to phrase structure, it seems quite clear that there is at least roughly a category Path over a category Place, in a functional sequence. In addition, there is another category below Place, which I call K for case, manifested by a genitive marker in many languages (as with English *of* in *outside of the house*).

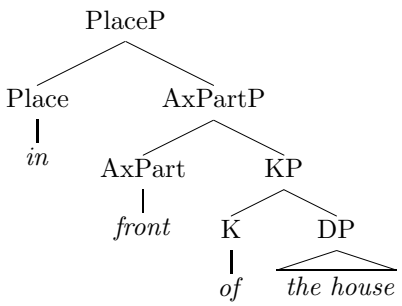
Some Place heads take a null K, others take an overt one (compare Starke's 1993 structures for French prepositional phrases, and Yadroff's 1999 ones for Russian, which both postulate a functional head below a more contentful one).

(11)



Complex expressions like *on top of* and *in front of* can be analyzed as in (12) (see Svenonius 2006 on Ax[ial]Parts).

(12)

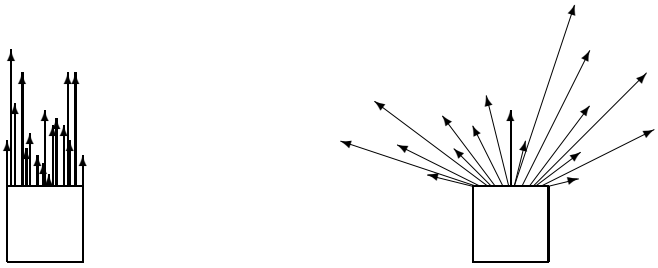


Elements like *outside* might similarly be decomposed into *out* plus *side* (an AxPart implying sidelike boundaries).[2]

2.2. PlaceP and vector spaces

Zwarts (1997) and Zwarts and Winter (2000) develop a vector space semantics for location PPs. A spatial preposition is modeled as a function from points in space (one defined directly on the Ground or Landmark) to points in space (those picked out by the preposition); for example, to calculate the space picked out by the preposition *above*, one projects vectors of all lengths pointing upward from the Ground (the complement of *above*), as illustrated in (13) for a PP like *above the window* (two alternative conceptions are illustrated, one with vectors pointing straight, and another with vectors pointing upwards at various angles). Each vector ends at a point in space, and this collection of points picks out the place *above the window*.

(13)

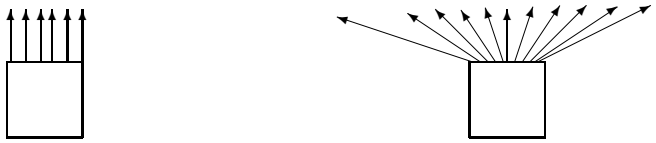


An argument for using vectors is the possibility of measure expressions with PPs; *one meter* can be assumed to pick out a subset of vectors, those which intersect a plane defined by the length *one meter* measured on the vertical vectors. Thus, if you were told to look for a bug one meter above the window, you might look in the space indicated by the arrowheads in (14) (again, diagrammed twice, once on the assumption that vectors point straight up and again on the assumption that they point upward at varying angles).[3]

[2]In that case *side* in *inside, outside* and *alongside* is a contentful morpheme. Of a person standing in a box one can say *She is in the box* even if the box is not large enough to contain her, because of the encyclopedic associations we have with boxes and the way they are used to carry things; but one cannot say *She is inside the box* in the same situation, because *inside* invokes the space as defined using the sides of the box; furthermore, a bird can be *in the air* but not *inside the air* because the air has no sides. I also assume that it is in the functional area that I am calling AxPart that frames of reference are fixed, since e.g. a *front* can be identified either relative to the viewer or on the intrinsic properties of the Ground; cf. Levinson 1996a, 2003.

[3]I present both options to illustrate a complication with the vector-based analysis: if the vectors project at angles and the measure expression gives their length, then *one meter above the window* picks out an arc, but this does not conform to intuition. If vectors project at angles and a line is picked out, as in the diagram to the right in (14), then the measure expression does not directly measure the vectors. The simplest analysis would seem to be that the vectors project directly upward, as in the diagram to the left in (14), and any sense that something diagonally above is 'above' is due to vagueness. The horizontal line picked out by the vectors would be salient and extensible in a way that would mimic the effect of the diagram to the right.

(14)



Adopting the vector space analysis, I assume a strictly compositional semantics of PlacePs, based on a detailed syntactic decomposition. K is a function from a DP object (a Ground) to a REGION in the sense of Creary et al. (1989) or Nam (1995) — a contiguous set of points in space. Specifically, K returns what Wunderlich (1991) call an *eigenplace*, the space occupied by the Ground.[4] An AxPart (words like *front* and *top*, mentioned in the previous section) is a function from eigenplaces to subparts of them.

A Place head is then a function from regions to vector spaces, composed of vectors pointing away from the region (upward for *above*, backward for *behind*, and so on). Finer discriminations about precise angles, distance and so on is (I assume) left up to pragmatics and conditions of language use, e.g. someone may feel that some of the vectors in (14) are too oblique, or that some are be preferred over others as more canonically picking out 'above,' but I am not concerned with these details (see e.g. Carlson et al. 2003 for evidence that functional consideration affect intuitions about spaces described by prepositions).

Measure expressions restrict vector spaces, and I will assume that a Deg[ree] head introduces measure expressions in its specifier, as in Koopman (2000). As a locative PP must identify a region in space on the basis of those vectors, there must be another function mapping vector spaces onto the regions picked out by the relevant vectors (the loc^{-} function of Zwarts and Winter 2000); this function could be performed by the independently motivated Deg head, or could be distinct.

Since a locative PP is relational, a Figure argument must be introduced; I assume that this function is performed by a head p (Svenonius 2003, 2004), which introduces a Figure in Neo-Davidsonian fashion (parallel to Kratzer's 1996 voice head in the verb phrase). This p is the natural locus of relational notions of containment, attachment, and support which are commonly expressed by prepositions such as *in* and *on* and their counterparts crosslinguistically (cf. Levinson 1996b). I assume that p is above Deg, as discussed below (this hierarchy is discussed further in Svenonius 2007).

Above p and Deg is the Path head, canonically *to* or *from*. A path is an organized collection of spaces, normally arranged with a directionality (see Krifka 1998, Zwarts 2005 and references there; see also Gawron 2006 on stative uses of paths). In a Source expression (e.g. *from the frying pan*), the complement of *from* is interpreted as the initial part of the path; in a Goal expression (e.g. *to*

[4]Wunderlich 1991, 598 claims that the eigenplace function (my K) is never expressed overtly, but I assume that genitive case in many languages is an overt expression of K; see Svenonius 2006.

the fire), the complement is the endpoint. To keep the semantics of these Path heads constant, it can be assumed that when they appear to combine directly with a DP Ground (as in *to the store*), there is a null Place head (and also null Deg and *p* heads, and perhaps a null AxPart and K as well); but nothing much in the present account hinges on this.

2.3. Degree in PlaceP

Essentially all locative PPs (including both locative and directional ones) allow the degree expression *right*, approximately meaning that the location or direction is archetypal.

(15) a. We remained right in front of the palace.
b. My clothes are right below the bridge.
c. They came from right between the trees.
d. They opened the door right next to the stage.

The Place expressions in the first column in (3) (*in front of, below*, etc.) but not the Bounded expressions from the second column (*between* and *next to*, etc.) can also be modified by measure expressions which, as already noted, basically give the lengths of vectors (subject to the caveat in n. 3).

(16) a. We remained sixty feet in front of the palace.
b. My clothes are ten meters below the bridge.

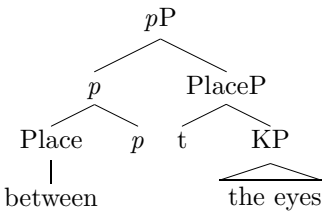
(17) a. *They came from six feet between the trees.
b. *They opened the door one meter next to the stage.

As already noted, following Koopman's (2000) and den Dikken's (2006) analyses of Dutch, I assume a Deg[ree]P above Place; *right* can be taken to be a Deg head, while measure phrases occupy the specifier of an alternative Deg head (μ, corresponding to what Svenonius and Kennedy 2006 called *Meas* in APs). I will also assume that in the absence of either *right* or μ, a null Deg head appears which has the function of mapping vector spaces onto regions picked out by the vectors (the syntactic manifestation of Zwarts and Winter's 2000 loc^{-}, as noted above).

The impossibility of a measure phrase in (17) is consistent with the fact that the Place heads all presuppose either a complex Ground (*among, between, amid*) or a very short or zero distance (*upon, beside, next to, against*). I conclude from the impossibility of measurement that these P meanings are not construed as vector spaces; they do not involve a simple Place head which is a mapping from eigenplaces to vector spaces. Instead, they include information about the relation of the Figure to the space picked out; this information includes proximity (in the case of *next to* and *beside*), adjacency (for *against*), or interpolation (for *between* and *among*). I assume that this information is encoded in *p*, the introducer of the Figure argument. For the sake of concreteness, I will assume that Bounded spatial Ps have *p* features which must be checked under head-movement from Place to *p*. This could be implemented in the framework of Borer (2005), in terms of range assignment to Place and *p* variables, or in terms of feature-checking under head movement, as illustrated in (18).[5]

[5]If Bounded spatial Ps are a lexical spell-out of Place plus *p*, then their cooccurrence with *right* seems to suggest that *p* is below Deg, contrary to what I have assumed. Note that there

(18)



2.4. Omission of Ground in PlaceP

As noted in §1, the landmark which is the complement of a preposition can be called the Ground. Omission of the Ground is possible in certain contexts; with the Place heads from the first column in (3), anaphoric identification of the Ground is generally sufficient.

(19) a. As the group approached the final summit, Espen stayed **behind** (them).
b. There was a box on the table. **Inside** (it) was fine Swiss chocolate.
c. We stood on a bridge. **Below** (it) we could see barges laden with port wine.
d. Nils looked over the snowdrift. The frozen fjord **beyond** (it) was dotted with seals.
e. I saw a line of soldiers. The one **in front** (of it) was talking on the phone.
f. There was a beach. **Above** (it), the cliffs swarmed with birds.

The 'Bounded' series of Place heads, the one listed in the second column in (3), disallows anaphoric identification of Ground.

(20) a. As the group approached the final summit, Espen stayed **among** *(them).
b. We stood below a bridge. **Upon** *(it) we could see trucks laden with port wine.
c. There were two stacks of boxes in the warehouse. **Between** *(them) was a forklift.
d. I saw a small house. **Beside** *(it) was a gas pump.
e. There was a beach. **Next** *(to it), the cliffs swarmed with birds.

The possibility of a null anaphoric Ground correlates roughly with the possibility of overt *there*.

(21) a. Get **behind/inside/in front of/?below/?above/?beyond** there.
b. *Get **among/upon/between/beside/next to** there.

Kayne (2004) notes that in expressions like *in there* and *under here*, *here* and *there* are not interpreted as the Ground; *under here* means or can mean something like "here, under something" rather than "under this place."[6] This suggests that in at least some expressions like (21a), the Ground is null, and the

is also a position for *right* above Path, in *right to the store*. I assume, following Koopman 2000 and den Dikken 2006, that there is another, higher, Deg position for *right*.

[6]However, this is not true of e.g. *?above here*, which means "above this place," not "here, above something." Interestingly, this seems to correlate at least somewhat with reduced acceptability, as indicated.

deictic element is introduced higher up; assuming that higher material is introduced on the left (Kayne 1994), the preposition in (21a) has moved to the left, as Kayne (2004) suggests.

The spatial words *here* and *there* can appear in a PP to the left of the preposition, as seen in (22).

(22) a. Come here inside the closet.
b. Lie there behind the dresser.

Note that the Ground must be overt in such cases.

(23) a. ??Come here inside.
b. ??Lie there behind.

The words *here* and *there* can also be added to full DPs, but not easily to pronouns.

(24) a. the house there
b. the man here
c. *it there
d. *him here

On the basis of these observations, we can see that (25a) must involve a DP with *here* inside it, since (25b) is ungrammatical, except on a reading where *here* is not interpreted outside the PP altogether (i.e. with a structure like the one in *get inside the spacecraft at this end*).

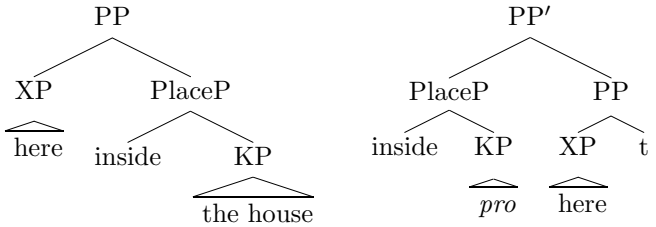
(25) a. Get inside the house here.
b. *Get inside it here.

Now, taking (25b) to show that PP-internal *here* cannot appear to the right of a full PP with overt Ground, it can be concluded from (26a) and (26b) that a PlaceP with a null KP must move across the position of PP-internal *here*, and furthermore that this movement is only possible when KP is null.

(26) a. Get inside here.
b. *Get here inside.

What appears to be two facts (appearing with a null KP and appearing with a following *here* or *there*) then reduces to a single one, namely the obligatory movement of PlaceP with null KP to a position left of the deictic element (illustrated here using shorthand labels PP and PP′ for as-yet unidentified categories, to be discussed in §2.5).

(27)



Suppose, then, that it is this movement which somehow licenses the null KP. This will be an important assumption in the analysis sketched below.

It remains to be explained why this option is available for some Ps and not others: why Place heads like *above* are compatible with a null anaphoric KP which means something like *there*, while 'Bounded' heads like *beside* are not. In addressing this, I turn to some cross-linguistic observations below, after introducing some general facts about degree measurement.

2.5. A Deictic projection

I pointed out in §2.4 above that the simple Place heads, but not the Bounded ones, allow a null KP, through movement to a PP-internal position. In §2.3, it was shown that the same two classes are also distinguished by the possibility of measure modification.

(28) a. He was a hundred meters behind the bus.
b. We were a few inches in front of the bull.

(29) a. *He was a hundred meters between the airplanes.
b. *We were a few inches next to the bull.

I have presented a plausible semantic reason for why the Bounded Ps do not allow measures: they do not denote vector spaces at the Place level and so cannot combine with μ, the Deg head which introduces measures. The question to be addressed here is why this same property should also prevent Bounded Ps from having null KPs. The answer I propose is based on the assumption, outlined above, that a Bounded Place head expresses features which must be checked on a higher head (namely, the p features). If PlaceP moves as a phrase to a specifier position below p, then the right configuration for checking p features cannot be achieved (assuming that a head cannot move out of a specifier, cf. Baker 1988). In this section, I try to bolster the plausibility of that account by showing in a little more detail some of the evidence for a fine structure above the Place head.

There is evidence from other languages for a layer of functional structure below Deg which can express different degrees of proximity to a deictic center (Svenonius 2006); for example, in Korean, a demonstrative can be added to a PP structure, adding a proximal or distal interpretation, as exemplified in (30) (originally from Son 2006).

(30) Ku sangca-nun oscang ce mit-ey twu-ess-ta.
the box-TOP *chest* DIST *bottom*-LOC *place*-PAST-DC
'I put the box over there under the chest'

Similarly, in Tsez, there is a distal morpheme which separates the Place suffix from the Path suffix in the local case system (examples constructed on the basis of Comrie and Polinsky 1998).[7]

(31) a. besuro-ƛ-āy
fish-under-from

[7]For a suitable context of use, imagine that you have misplaced your scaling knife in a large kitchen, and somebody produces it from under a fish, which in the distal case would be distant from the speaker, for example across the kitchen. Thanks to Maria Polinsky (personal communication) for verifying that these are possible words in Tsez, and for providing attested examples.

'from under the fish'

b. besuro-ɤ-āz-ay
fish-under-DIST-*from*
'from there under the fish'

Suppose that these distal and proximal morphemes are the spell-out of features in a layer called Deix[is]. There is evidence that Deix is below Deg, at least in Persian (see Pantcheva 2006a,b on Deix elements in Persian), as shown by the order of the measure phrase and the distal marker in (32a) (data from Marina Pantcheva, personal communication).

(32) a. dær 10 metri-ye un birun-e xane
at *10 meters*-EZ DIST *outside*-EZ *house*
'there, 10 meters outside the house'

b. *dær 10 un metri-ye birun-e xane
at DIST *10 meters*-EZ *outside*-EZ *house*

On a generally cartographic approach to PP structure, we might then expect that if a language like English introduced proximal or distal information into a PP structure, it would do so in the same region.

PlaceP which precedes Deix in English cannot also precede Deg.

(33) a. a few centimeters under here
b. *under a few centimeters here

Thus, it seems that the movement of the Groundless PlaceP is to a specifier below Deg but above Deix; somehow, this movement licenses a null complement of Place. PlacePs headed by the non-vector based Bounded Ps cannot move to the specifier of Deg, because those Ps must head-move to *p*, which by assumption is higher than Deg (if *p* were lower than Deix, then the Bounded Ps should be able to satisfy both conditions, so this can be taken as evidence that *p* is at least higher than Deix).

Thus, Place heads and 'Bounded' heads differ in how much functional structure they spell out, in keeping with an approach to lexical variation that has been pursued in much recent work (see for example Cardinaletti and Starke 1999, Longobardi 2001, or Ramchand 2006).

2.6. Particles with Place

I have suggested that the central uses of the words *in* and *on* in English are expressions of *p* heads, perhaps with additional features; I will not discuss that use further in this paper. They also appear in Place in expressions like *in front of* and *inside*. The same words are also used as so-called particles in expressions like *put the coat on* or *take the laundry in*, so I treat them together with particles here, along with *up, down, off*, and *out*. I also include some examples with *over*, which has particle uses, though it was not listed with the particles in (3).

All of these expressions can have locative meanings in simple PP constructions.

(34) a. The cat is up the tree.
b. The horse is down the hill.
c. The dog is out of the house.

d. The parrot is off its perch.
e. The monkey is on the roof.
f. The polar bear is in the wine cellar.

These expressions have much the external distribution as other locative PPs, e.g. those headed by Place heads like *above*. Null complementation, degree modification, combination with other elements, and directional meanings will be addressed in other sections.

Place expressions like *in front of* (and also now including bounded place expressions like *between*) do not generally combine easily with each other.

(35) a. *the boat behind in front of the rock
b. *the cabin inside behind the mast
c. *the rudder above beyond the porthole
d. *the clouds beyond above the skylight

On the other hand, Particles like *up, down on, off*, and so on combine more freely with Place expressions:

(36) a. The boat drifted from **back** behind the hill
b. The boat drifted from **down** inside the cave
c. The boat drifted from **off** below the bridge
d. The boat drifted from **out** beyond the city limits
e. The boat drifted from **over** in front of the palace
f. The boat drifted from **up** above the dam

Particles which modify locative PPs do not restrict the space denoted by the PP. Instead, particles introduce viewpoint for the space, generally as a presupposition. To determine whether a Figure, say someone's stray reindeer, is *inside the cave*, it is sufficient to examine the location of the reindeer and the spatial extent of the cave. If the reindeer occupies the space bounded by the cave, then it is inside. In evaluating an assertion that a reindeer is *down inside the cave*, the truth conditions are essentially the same, but it is presupposed that the region bounded by the cave is lower than some logophoric center, e.g. the speaker or the subject is above the cave, or imagines himself at the mouth of the cave, looking downward.

Similarly, looking down from a mountaintop at a boat in the higher part of a dammed river, one can describe the boat as *above the dam*, but not *up above the dam*, without invoking the perspective of someone below the dam. The vector space for *above the dam* is calculated by considering the dam as a region, and projecting vectors upward from it. If the boat is in that space, it is *above the dam*. In principle, then, the hiker on the mountaintop could call attention to it as *that boat down above the dam*. Similarly, a diver could refer to something, for example his clothes, as *up below the bridge*, though these situations are of course unusual. Far more common is a strengthening effect with a supportive particle: *down below, up above, out beyond, back behind*.

The point is further illustrated in (37).

(37) a. A plane flew low (up) above the treetops.
b. A bee flew low (#up) above the clover.

In (37), the particle most naturally suggests that the event is taking place

somewhere which is 'up' from the speaker's point of view, making it absurd in (37b) unless the speaker is shorter than the clover. In fact, it seems just possible to say *The bee flew low down above the clover*, though examples in which the particle 'matches' the Place head tend to sound more natural.

These examples show that the particles in locative PPs with Place heads do not take the PlaceP as their complement (cf. also Hendrick 1976 and van Riemsdijk 1978 for insightful observations about headedness in complex PPs). The Ground of *up* in (37) is not the PlaceP *above the treetops*; rather, it is a logophoric space, generally understood from context, often the space that the speaker is in. I will assume that these particles reside in the specifier of the Deix projection introduced earlier.

I return to particles below in §3 and §4.

2.7. Lexical versus functional heads

den Dikken (2006), building on Koopman (2000), proposes the following structure for analogous constructions in Dutch:

(38) C_{Place} — Deg_{Place} — Place — P_{loc} — DP

For den Dikken, P_{loc} is the lexical locus of prepositions including (locative uses of) *naast* 'beside,' *in* 'in,' *onder* 'under,' *over* 'over,' *op* 'on,' and *achter* 'behind,' while Place simply provides a landing site for moved elements including the locative pronoun *er*. Similarly, C_{Place} seems mainly to be used as a landing site. I am using the label Place for a head which denotes a function from regions to vector spaces, and assuming that in some cases the complement of Place is an AxPart, which is a function from regions to regions; its complement K is a function from DP denotations to regions. I have also adopted Koopman's Deg and postulated layers *p* and Deix.

(39) *p* — Deg — Deix — Place — AxPart — K — DP

It seems to me that the most important difference is that on my account, the contentful material of spatial adpositions is distributed over a series of functional heads, much as in Ramchand's (2006) analysis of verbs. On the assumption that rich 'encyclopedic' or conceptual content can be associated with vocabulary items which are inserted under functional heads, there is no need for a special lexical root at the bottom of a sequence of functional heads.

To a certain extent my account resembles one in which P is part of the extended projection of N, as in Grimshaw (1991).

Apart from this difference between the present model and those of Koopman (2000) and den Dikken (2006), my analysis of English looks very much like their analyses of Dutch in the richness of the functional structure postulated, an encouraging convergence as the accounts were developed using rather different approaches.

3. Paths

3.1. PathPlaces

I pointed out in §2 that examples with Place heads, like (7) (repeated here as (40)) are most naturally interpreted as locative even when appearing with motion verbs.

(40) a. The plane flew **behind** the trees.
b. The rabbit jumped **inside** the cage.
c. The submarine sailed **below** the ice.
d. The marathoners ran **beyond** the city limits.
e. The revelers danced **in front** of the palace.
f. The mountaineers climbed **above** the dam.

There is another series of prepositional elements in English with equally rich spatial content for which the most natural interpretation in these same contexts is directional. These heads, illustrated in (41), were introduced under the label 'Extended' in the table in (3) (Zwarts 2005 groups them together with uncontroversial Path heads *to* and *from*).

(41) a. The plane flew **around** the trees.
b. The rabbit jumped **through** the cage.
c. The boat sailed **under** the bridge.
d. The marathoners ran **along** the river.
e. The revelers danced **across** the palace.
f. The mountaineers climbed **over** the dam.

A difference between the prepositions in (40) and those in (41) is that on the directional reading, those in (40) can be paraphrased with *to* (*to behind the trees*, etc.), while those in (41) cannot (i.e. the path meaning of *through the trees* does not mean 'to through the trees').

The two classes behave differently with (non-path and non-vehicular) nominals.

(42) a. The climb above the dam was arduous.
b. The climb over the dam was arduous.
c. A dive below the bridge would be refreshing.
d. A dive under the bridge would be refreshing.
e. Kari's flip in front of the mat brought applause.
f. Kari's flip across the mat brought applause.

The examples with Place heads (here, *above*, *below*, and *in front*) are (nearly) obligatorily interpreted as locative, while the directional reading is favored in the examples with the Extended heads (*over*, *under*, and *across*).

The Extended prepositions, which I will refer to as 'PathPlace' heads, combine properties of Paths with properties of Place expressions.

Like Place expressions, PathPlaces have rich descriptive content regarding a spatial configuration based on topological or physical properties of a Ground object; for example, *through* is based on the identification of the outer limits of a three-dimensional Ground, and picks out a region that connects opposite sides of the object, and *across* does something similar in two dimensions. A

PathPlace like *over* can have intrinsic or relative frames of reference, another property of Place expressions (or of AxParts, below Place; cf. n. 2).

On the assumptions outlined in §2, a locative expression of the category DegP can be assumed to denote a region, a contiguous set of points; a Figure introduced by p is understood to be located at any one or more of the points. PathPlaces, on the other hand, typically do not pick out points but contiguous sequences of points; in this way they are like Paths (*under* and *over* are exceptions in that they can also pick out points; I assume that this is some kind of polysemy, cf. Tyler and Evans 2003 on the polysemy of *over*). This is true even in the static, locative senses of PathPlaces; in order to determine whether a log is *across* a stream, it is necessary to consider whether the stream is bisected by the log. Similarly, it is quite clear that to evaluate whether something is *around* or *through* something else, it will not be sufficient to identify a vector space and assert that the Figure occupies some point in that vector space.

Thus, it can be assumed that PathPlaces spell out both Path and Place, in the extended functional projection of P.

For concreteness I will continue to assume that Ps which combine two or more categorial features spell out complexes created by head movement; thus a PathPlace involves movement of Place to Path (presumably via Deix and Deg and p). This correctly predicts that they should not cooccur with each other nor with pure Place heads (**across in front of, *through behind*, etc.).

Furthermore, it is correctly predicted that PathPlaces do not easily cooccur with *to*, and several of them do not easily cooccur with *from*, either. I will return to *to* and *from* below.

3.2. G-Locations

It is clear that Paths contain Places, as observed by Jackendoff (1983) and as I have repeatedly sketched in this paper; but there is also evidence that Places can sometimes be formed from Paths, which may lead to recursion. Cresswell (1978) investigated examples like that in (43).

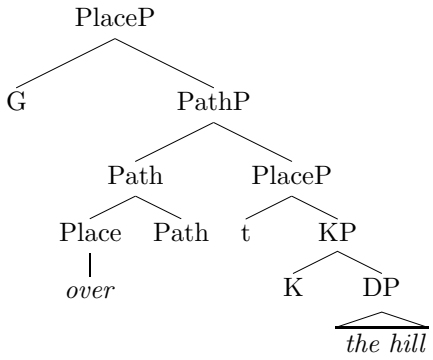
(43) Across a meadow a band is playing excerpts from *H.M.S. Pinafore*.

There is a locational interpretation of *across*, in which the band is stretched out in a line from one end of the meadow to the other, certainly not the most salient reading. The more natural reading is that the band is standing at a point which is on the other side of the meadow from some point of view (e.g. the speaker's). Cresswell defines a function G which handles the natural locative interpretation of *across* in this case, which he paraphrases as 'at the end of a journey across the meadow.' The start point of the hypothetical journey is generally logophorically determined, or can be made explicit by use of a *from*-phrase, as illustrated in (44).

(44) a. The library is very noisy. There's a sawmill right over the hill.
b. The sawmill is over the hill from the library.

Cresswell did not suggest a syntactic manifestation of G, but I will: G is like a Place head in what it projects, but with the special property that it selects a Path complement, meaning something like Cresswell's 'at the end of a journey.'

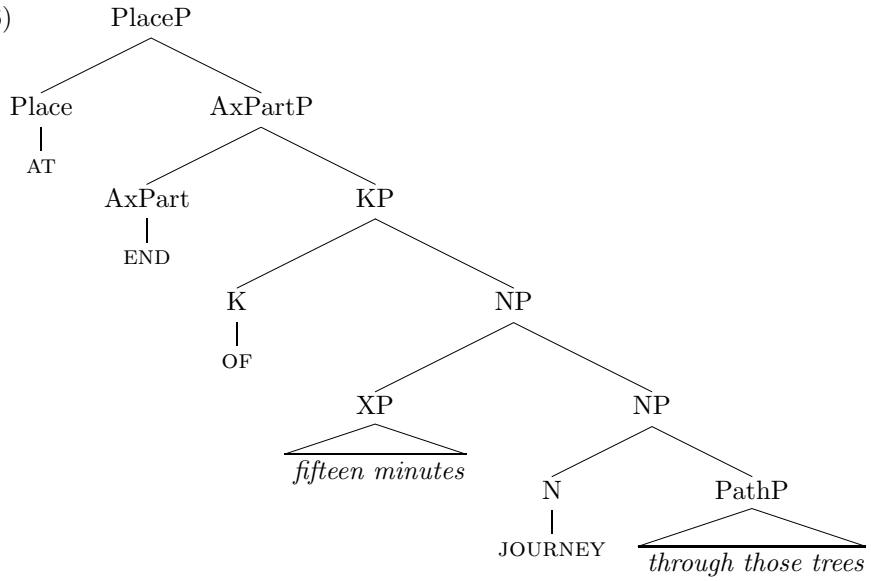
(45)



The function G disrupts what has otherwise been a highly consistent cartographic functional hierarchy of projections. A hierarchy could be preserved by decomposing the Path-to-Place expression in the syntax. There is some evidence for internal structure in G, for example time expressions can be used to measure G-locations, e.g. *Fredrik's house is fifteen minutes through those trees* means that Fredrik's house is at the end of a fifteen minute journey through those trees.

An option, then, would be to structurally represent G locations as involving a null noun (corresponding to Cresswell's 'end of a journey') which in turn takes the path-denoting PathP as its complement.

(46)



The obligatory plural on *fifteen minutes* here is unexplained, however (cf. *a fifteen-minute journey* vs. **fifteen-minute through those trees*).

Something which will become important later in conjunction with a full understanding of particles is a constraint on the Path-to-Place function G, namely that it does not operate on all paths.

(47) a. A band is playing from the town hall.
b. A band is playing into the town hall.

While these sentences are grammatical, neither of them has the meaning expected if the G function could apply to GoalPaths or SourcePaths, e.g. 'A band is playing at the end of a journey from the town hall' (which could, perhaps, be anywhere). Compare these with the sentences below.

(48) a. A band is playing sixty yards from the town hall.
b. A band is playing sixty yards into the woods.

Here, the interpretation is clearly locative in the intended sense, and roughly true to the paraphrase 'at the end of a sixty-yard journey from the town hall' etc. It seems that the Path-to-Place operator cannot operate on GoalPaths or SourcePaths, in the absence of a measurement.

Compare the following set as well; in (49), no Path-to-Place reading is possible, which in (50), such readings are readily available.

(49) a. A band is playing beside the town hall.
b. A band is playing between the trees.

(50) a. A band is playing past the town hall.
b. A band is playing through the trees.

Recall that the Place heads like *beside* and *between*, though they may form Paths with null TO, do not permit measure expressions, because (I suggested) they do not provide simple vector structures for measure expressions to limit. Here, the contrast with the PathPlace heads *past* and *through* shows that they are also inappropriate complements for the G function.

I suggest that these two observations can be unified if what the G function requires is a measured scalar structure (cf. Kennedy 1999, Hay et al. 1999 on scalar structures in adjectives); since *between* and *beside* provide no such structure, they are inappropriate for it. GoalPathP and SourcePathP provide scalar structures, but not measured ones. To see where the measure comes from in PathPlaces, consider the other locative interpretation that PathPlaces provide.

The other locative interpretation is paraphraseable as 'occupying the whole of a path' — for example, a pencil which is through a cushion occupies the whole of the path which goes through that cushion. Similarly for the other examples in (51). Call it the 'extended location' use.

(51) a. The pencil is all the way through the cushion.
b. There is a fence around the house.
c. We found a log across the stream.
d. The cloth lay over the table.

The extended location meaning is also not available for GoalPaths and SourcePaths (not even with measures). In this use, the scalar structure made available by the PathPlace is mapped onto the extent of the Figure, which must be extended in space (cf. Gawron 2006 on non-canonical mappings of paths to scales other than time).[8] I will assume that extended location meanings are denoted by PathPs (lexicalized by PathPlace elements), not PlacePs (alternatively, there could be another Path-to-Place function G′).

[8]Special thanks to Gillian Ramchand for pointing out to me the relevance of Gawron 2006 to the extended location interpretations.

I suggest that the G-function interpretation of PathPlaces without measure expressions (as in (43) and (44)) is possible because of the availability of the extended location sense in examples like (51); that is, G requires a measured path, and PathPlaces can map the paths that they denote onto the Figure, which provides them with a measure. I return to the possibility of locative readings of PathPs in §4 below.

3.3. *To* as a Path head

PPs built around the preposition *to* generally cannot express a stative Place; they are not good after *from*, and not good as complement to verbs like *remain*.[9]

(52) a. *The boat drifted from to the edge.
b. *The boat drifted from onto the shoals.
c. *The boat remained to the edge.
d. *The boat remained up to the cave.

As a restrictive modifer to common nouns, prepositional phrases with *to* may denote a route or path of travel.

(53) a. the boat to Narvik
b. the tracks into the cave
c. the path up to the summit

If these readings are not available, then *to*-phrases are bad as noun modifiers.

(54) a. *The cat to the edge was incautious.
b. *The butter onto the knife was soft

Since at least Jackendoff (1983), such PPs have often been referred to as Paths. I have been trying to navigate between this and a distinct notion of Path, that typified by *across* and *through* (cf. (41)). In order to retain the familiar name Path, while at the same time distinguishing the two types, I have resorted to mnemonic compounds, PathPlace for the more descriptively rich Paths, and GoalPath or SourcePath for the PPs headed by *to* and *from*. They may actually belong to different projections in a fine-grained functional structure, but for present purposes I will assume that PathPlace lexicalizes a combination of Place and Path, and GoalPath and SourcePath simply lexicalize Path.

GoalPathPs denote Paths of motion when they appear with motion verbs.

(55) a. The boat drifted to Narvik.
b. The boat sailed onto the shoals.
c. The boat moved up to the ship.
d. We steered the boat into the cave.
e. We shoved the boat down to the shoreline.

As noted in §2, just about any PlaceP can also have a directional meaning in English. I suggested above that this implies a kind of null *to* dominating the PlaceP.

[9]Exceptions include constructions with *next to*, for which I assume an idiosyncratic K pronounced like *to*, and *to the right of* etc., for which I tentatively assume *to* contained within a phrasal left branch.

(56) a. The boat drifted behind the hill
b. The boat drifted inside the cave
c. The boat drifted below the bridge
d. The boat drifted beyond the city limits
e. The boat drifted in front of the palace
f. The boat drifted above the dam

These would then be fully parallel to the examples in (8) in §2.1 above (repeated here as (57)).

(57) a. The boat drifted from behind the hill
b. The boat drifted from inside the cave
c. The boat drifted from below the bend
d. The boat drifted from beyond the city limits
e. The boat drifted from in front of the palace
f. The boat drifted from above the dam

Thus, there are at least three heads in English which fairly freely select PlacePs: *from, to*, and a null variant of *to* which is licensed by verbs of motion. These Path heads all combine fairly freely with various PlaceP complements. In line with Jackendoff (1983), there may also be a Path head meaning *via*, in order to allow *He ran between the trees* (on the reading where the endpoint is beyond the space between the trees) and similar meanings (cf. Kracht 2002).

3.4. Loc as a 'Path'

Many languages which decompose Path and Place have an overt morpheme in locative PPs which occupies the same positions as Path heads do. For example, in Zina Kotoko (Holmberg 2002) the *to* head is null with certain prepositions (it is pronounced *ná* with others), but in locative expression the overt head *a* appears. I gloss it here as LOC[ative].

(58) a. gmá
on
'onto' (directional)
b. má gmá
from on
'from on' (source)
c. a gmá
LOC *on*
'on' (locative)

(59) a. mwá
under
'under' (directional)
b. má mwá
from under
'from under' (source)
c. a mwá
LOC *under*
'under' (locative)

Possibly, all locative expressions contain a Path head, containing a null LOC in languages like English: a "locative" Path, or an "at" Path. If so, then the label Path is perhaps misleading; Kracht's (2002) term MODE is more suitable. It represents a family of functions which convert spatial configurations into useable linguistic expressions of exactly the right type.

When Paths appear in active sentences, a motion event is mapped onto the Path. A Goal Path (Kracht's 2002 COFINAL mode) is one in which the progress of the event tracks the progress of the Figure towards the (denotation of the) complement of Path, while a Source Path (COINITIAL) is one in which the progress of the event tracks the progress of the Figure away from the complement. A VIA Path (TRANSITORY mode) intersects the complement, and with a LOC Path (STATIC mode), the entire event is contained in space denoted by the complement; see Kracht (2002) for the complete formalization.

3.5. Path with Particles

The same Particles which combine with PlaceP (see §2.6) also combine with PathP composed of Place and *from* or null or overt *to*, as shown in (60), (61), and (62), respectively.[10]

(60) a. The boat drifted **over** from behind the hill
b. The boat drifted **off** from below the bend
c. The boat drifted **in** from beyond the city limits
d. The boat drifted **back** from in front of the palace
e. The boat drifted **down** from above the dam
f. The boat drifted **up** from inside the cave

(61) a. The boat drifted **back** behind the hill
b. The boat drifted **off** below the bend
c. The boat drifted **out** beyond the city limits
d. The boat drifted **over** in front of the palace
e. The boat drifted **up** above the dam
f. The boat drifted **down** inside the cave

(62) a. The boat drifted **up** onto the shoals.
b. The boat drifted **down** to the edge.
c. The boat drifted **off** into the cave.

They may furthermore appear with the richer PathPlace heads of (41), repeated here as (63).

(63) a. The plane flew **out** around the trees.
b. The rabbit jumped **down** through the cage.
c. The boat sailed **back** under the bridge.
d. The marathoners ran **off** away from the city.

[10] In addition to its directional meaning, there is a reversative use of *back* which can occur in PathP, optionally cooccurring with Particles.

(i) a. She went back to the city where she was born.
b. They swam back down to the wreckage.

This use implies a return to an earlier location. This is not necessarily the case for the uses of *back* as a Particle illustrated in (60) and (61).

e. The revelers danced **in** across the palace.
f. The mountaineers climbed **up** over the dam.

The meanings here seem to restrict the Path denotations, in contrast to what was observed in §2.6 for particles in PlacePs. That is, if *into the room* denotes the set of paths with end in the room, then *up into the room* denotes that subset of those paths which are oriented upward. Thus, particles can serve a path-to-path function.

Apart from restitutive *back*, which can combine with other particles, there seems to be a limit of one per Place and one per Path. One particle in each of the two regions can be seen in (64).

(64) a. The boat drifted **out** from **over** behind the hill
b. The boat drifted **off** from **down** below the bridge
c. The boat drifted **in** from **off** beyond the city limits
d. The boat drifted **over** from **up** in front of the palace
e. The boat drifted **down** from **up** above the dam
f. The boat drifted **down** from **back** inside the cave

With null TO, this gives sequences of two particles in a row.

(65) a. The boat drifted **out over** behind the hill
b. The boat drifted **off down** below the bend
c. The boat drifted **away off** beyond the city limits
d. The boat drifted **up over** in front of the palace
e. The boat drifted **along up** above the dam
f. The boat drifted **down back** inside the cave

In such sequences, I think, the first particle always modifies the Path and the second always has the deictic reading discussed in §2.6. Therefore, it seems that particles cannot recursively modify Path, as might be expected if they were Path-to-Path functions which attached as adjuncts. This might motivate assigning them to a distinct category, Dir[ectional], which dominates Path. I discuss particles further in the next section.

4. Particles

4.1. The importance of overt Grounds for Locative readings

I suggested above that Path heads in English include *from, to*, and a null TO licensed by verbs of motion. The overt heads, at least, do not easily license null PlaceP complements.

(66) a. *The boat drifted from.
b. *The boat drifted to.

However, Particles quite freely express Path without any overt Path head, as already illustrated in (61) in the previous section, and in fact also freely express Path without any overt PlaceP.

(67) a. The boat drifted **over**.
b. The boat drifted **off**.

c. The boat drifted **in**.
d. The boat drifted **back**.
e. The boat drifted **down**.
f. The boat drifted **up**.

The implicit Ground can correspond to a suitable location.

(68) a. They slid off (the boat).
b. They jumped on (the back).
c. They rolled down (the drainpipe).
d. They bounced up (the wall).
e. They ran away (from the rhinoceros).
f. They spilled over (the lip of the bucket).

The implicit Ground in these examples is freely contextualizable, as illustrated below.

(69) a. What a high fence! A cow could never jump **over** (it).
b. Listen to the glacier! A chunk is about to break **off** (it).
c. Watch the ice hole! A seal is about to pop **out** (of it).
d. Smell the well! I think an opossum must have fallen **in** (it).
e. Keep away from the hill! There's a lot of snow ready to slide **down** (it).
f. That ladder looks too wobbly for anybody to climb **up** (it).

This is not true of particles when used as locative expressions. Although locatives allow Particles as modifying elements (cf. §2.6), Particles cannot typically be the sole overt element in a locative PP (taking the complement of *from* in (70b) to be a locative PlaceP).

(70) a. What a high fence! I wonder what is **over** *(it).
b. Look at the glacier! I bet all these ice chunks came from **off** *(it).
c. Look at the seal! It looks like it has a bite **out** *(of it).
d. Smell the well! I think there must be a dead opossum **in** *(it).
e. Smell the well! I think there must be a dead opossum **down** *(it).
f. That ladder looks too wobbly for anybody to stay **up** *(it).

There are idiosyncratic, stative meanings associated with most of the Particles, but there is no simple locative meaning (except perhaps with *on*). The idiosyncratic meanings are often different for animates and inanimates.

(71) a. She's off (*off shift*; or, *mistaken*)
b. He's up (*awake*)
c. He's down (*depressed*; or *prone*; or *(lying) on the ground*; not *downstairs*)
d. She's in/out (*of house* or *office*)
e. We're away (*from home*)
f. We're on (*performing*; not easily, e.g., *on a boat*)
g. She's over (*visiting me*)

(72) a. It's off (*of an electric appliance or motor*; or, *spoiled*; or, *cancelled*)
b. It's on (*motor or electric*)
c. It's up/down (*in up or down position*, e.g. of a switch or a signpost)

d. It's in (*fashionable*)
e. It's away (*launched*)
f. It's over (*ended*)

Although these idiosyncratic meanings are also available in dynamic contexts, the unavailability of simple Place meanings for bare Particles is in stark contrast to the Path use, where Path contexts systematically license a vague meaning for Particles (in which Place can easily be understood as any suitable location, with a little bit of context).

My solution to the pattern noted here is based on the assumption that the locative uses of particles are derived by the G-function (the Path-to-Place function inspired by Cresswell 1978, introduced in §3.2). This distinguishes the particles from simple Place heads like *above* and so on, which can express locations easily, with or without complements. This means that *The pirates are up the ladder* means something like, 'The pirates are at the end of a journey up the ladder,' and *My orangutan is out of his cage* means roughly 'My orangutan is at the end of a journey out of his cage.'

Now, recall that the G-function does not apply freely to all PPs. Specifically, I suggested in §3.2, it can only apply to PPs which have a measured scalar structure. This was provided either by a measure expression with a GoalPath or SourcePath, in the case of *six feet from the wall* or *sixty meters into the woods*, or else by a PathPlace head together with a Ground, in the case of *across the meadow* and *over the hill* and so on. In those cases, the measure is provided directly by the Ground; the extent of the meadow or the hill measures the path (in what I called the 'extended location' reading). In the next section I show how this account extends to particles.

4.2. Degree with Particles

Degree expressions are freely combinable with particles, with or without overt Grounds.

(73) a. They slid two centimeters off (the center of the picture).
b. They jumped way off (the back).
c. They rolled twenty feet down (the drainpipe).
d. They bounced partway up (the wall).
e. They ran miles away (from the rhinoceros).
f. They flew twenty meters out (of the yard).

Strikingly, measure expressions enable locative readings with particles, even in the absence of an overt Ground.

(74) a. They were two centimeters off (the center of the picture).
b. They were way off (the back).
c. They were twenty feet down (the drainpipe).
d. They were partway up (the wall).
e. They were miles away (from the rhinoceros).
f. They were twenty meters out (of the yard).

The measure expressions are necessary in the absence of a Ground, for a general locative reading. In the absence of both the overt Ground and the overt measure

expression, each of these sentences takes on a narrower meaning, less contextually dependent, more like the idiosyncratic meanings of the particles discussed above; because of this, examples like *They were off* are perfectly grammatical, but with a completely different meaning. Therefore, the bad examples must be shown in context.

(75) I threw a dart at the target with my eyes closed, and when I opened them, ...
- a. *...the dart was off.
- b. ...the dart was off the target.
- c. ...the dart was one inch off.
- d. ...the dart was one inch off the target.
- e. *...the dart was right off.

(76) We lost a frisbee in the wind. We looked all over for it at the top of the hill but we finally found it ...
- a. *...down.
- b. ...down the hill.
- c. ...sixty yards down.
- d. ...sixty yards down the hill.
- e. *...right down.

As indicated, the Degree expression *right* does not facilitate locative readings. Since *on* implies contact, and is therefore incompatible with measurement of distance, *on* cannot have a contextually specified locative meaning without an overt Ground.

(77) I bumped the table hard, but when I looked, ...
- a. *...all the glasses were still (right) on.
- b. ...all the glasses were still (right) on the table.
- c. *...all the glasses were still ten centimeters on (the table).

The pattern here recalls the connection, discussed in §2.4 and §2.3, between the omissibility of the Ground and the measurability of distance in PlaceP, as illustrated in (78) (cf. also (17) in §2.3).

(78)
- a. We were (*six feet) against/among/upon/beside the trees.
- b. We were against/among/upon/beside *(them).
- c. They were (six feet) below/above/inside/beyond/in front of the cave.
- d. They were below/above/inside/beyond/in front of (it).

There seem to be three classes of elements. One, the core Place elements like *above*, allow null Ground freely, with locative meanings. Another, the non-measurable Place elements like *against*, do not allow null Ground at all. The third class, including both the PathPlace heads and the Particles, allow a null Ground freely only in their directional use; with a locative meaning, they require either an overt Ground or an overt measure expression.

Recall that the particles can only get their locative meanings in conjunction with G, as I suggested above, unlike Place heads like *above* and *in front*, which are basically locative, picking out simple vector spaces. Recall, too, that G requires a measured scalar structure to operate on: either through an overt

measure expression, or a PathPlace head like *across* or *through*, which by assumption have internal structure. Combining these two observations, it seems that the mysterious distribution of the null complement of the particle can be explained if it can be shown that the DP complement to a particle provides a measured scalar structure.

This seems to be the case, and is clearest with particles like *up* and *down*. These particles only combine with DPs which can be understood to describe the ground traversed; thus, one can go up a hall, a ladder, a staircase, or a hill, but not up a table or a house, unless the table or house is actually climbed (as in *the mouse climbed up the table*). I suggested above that the basic meaning of particles is as a Path-to-Path function; essentially, a particle combines with a DP only when the DP itself can be construed as a Path (similarly, a DP which can be construed as a Path can be the complement of a verb like *walk*, as in *I walked the Appalachian Trail*; cf. Ramchand 2006).

5. Conclusion

I have proposed a structure for a rather rich class of locative expressions in English. I have used different labels for the different subtypes, using distributional evidence as my chief criterion, but noting that the semantic interpretation of the members of each class shares important features. In the end, I postulated a category K, for functional prepositions and case-markers; a category Place, for mapping Grounds to vector spaces and similar objects well suited to denote locations; a category *p*, for bounded locative prepositions; a category PathPlace, for rich heads which map Grounds onto Paths; a few higher Path heads like *to* and *from*, which give orientations on paths, rather than indicating anything about their shape; and the particles, which I analyze as primarily Path to path functions of a category Dir. These heads appear to be fairly rigidly ordered in a hierarchical way, recalling much recent work on the architecture of other categories.

Some indications emerged that the order might not be entirely rigid. Importantly, there is the possibility of recursion. But even apart from that, it appears that degree expressions and measures, and possibly also particles, may attach either to projections of Path or of Place (see in particular den Dikken 2006 on Deg in Path).

Another recurring complication is the fact that many elements appear to be multiply ambiguous, with most of the particles doubling as Place heads, most of the K heads appearing elsewhere in the system, and so on. It is a very interesting question to what extent this reflects homophony, polysemy, or the possibility of inserting the same head into different parts of a functional structure.

The complications of recursion and polysemy aside, the consistency within each group of adpositional elements of certain aspects of the semantic contribution of the heads raises the hope that the various complex cooccurrence restrictions could be completely derived from a proper understanding of the semantics of these elements. If that is the case, then it might be expected that some of the elements here could occur in different locations in the hierarchy — the hierarchy itself being epiphenomenal.

References

Baker, Mark C. 1988. *Incorporation: A Theory of Grammatical Function Changing*. University of Chicago Press, Chicago.

Borer, Hagit. 2005. *In Name Only (Structuring Sense, vol. I)*. Oxford University Press, Oxford.

Cardinaletti, Anna and Michal Starke. 1999. The typology of structural deficiency: A case study of three classes of pronouns. In *Clitics in the Languages of Europe*, edited by Henk van Riemsdijk, pp. 145–233. Mouton, Berlin.

Carlson, Laura, Terry Regier, and Eric Covey. 2003. Defining spatial relations: Reconciling axis and vector representations. In *Representing Direction in Language and Space*, edited by Emile van der Zee and John Slack, pp. 111–131. Oxford University Press, Oxford.

Cinque, Guglielmo. 1999. *Adverbs and Functional Heads: A Cross-Linguistic Perspective*. Oxford University Press, New York.

Comrie, Bernard and Maria Polinsky. 1998. The great Daghestanian case hoax. In *Case, Typology and Grammar: In Honor of Barry J. Blake*, edited by Anna Siewierska and Jae Jung Song, pp. 95–114. Benjamins, Amsterdam.

Creary, Lewis G., J. Mark Gawron, and John Nerbonne. 1989. Reference to locations. In *Proceedings of the 27th Annual Meeting of the Association for Computational Linguistics*, pp. 42–50. Association for Computational Linguistics, Morristown, NJ.

Cresswell, M. J. 1978. Prepositions and points of view. *Linguistics and Philosophy* 2: 1–41.

den Dikken, Marcel. 2006. On the functional structure of locative and directional pps. Ms. CUNY.

Gawron, Jean-Mark. 2006. Generalized paths. In *Proceedings of SALT XV*, edited by Effi Georgala and Jonathan Howell. CLC, Ithaca, NY.

Grimshaw, Jane. 1991. Extended projections. Ms. Brandeis University.

Hay, Jennifer, Christopher Kennedy, and Beth Levin. 1999. Scalar structure underlies telicity in "Degree Achievements". In *Proceedings of SALT IX*, edited by Tanya Matthews and Devon Strolovitch, pp. 127–144. CLC Publications, Ithaca, NY.

Hendrick, Randall. 1976. Prepositions and the X′ theory. In *UCLA Papers in Syntax, vol. 7*, edited by Joseph E. Emonds, pp. 95–122. UCLA, Los Angeles.

Holmberg, Anders. 2002. Prepositions and PPs in Zina Kotoko. In *Some Aspects of the Grammar of Zina Kotoko*, edited by Bodil Kappel Schmidt, David Odden, and Anders Holmberg, pp. 162–174. Lincom Europa, München.

Jackendoff, Ray. 1983. *Semantics and Cognition*. MIT Press, Cambridge, Ma.

Kayne, Richard S. 1994. *The Antisymmetry of Syntax*. MIT Press, Cambridge, Ma.

Kayne, Richard S. 2004. Here and there. In *Lexique Syntaxe, et Lexique-Grammaire/Syntax, Lexis, & Lexicon-Grammar: Papers in Honor of Maurice Gross*, edited by C. Leclère, E. Laporte, M. Piot, and M. Silberztein, pp. 253–275. John Benjamins, Amsterdam.

Kennedy, Christopher. 1999. *Projecting the Adjective: The Syntax and Semantics of Gradability and Comparison*. Garland, New York. (1997 UCSC Ph.D. thesis).

Koopman, Hilda. 2000. Prepositions, postpositions, circumpositions, and particles. In *The Syntax of Specifiers and Heads*, edited by Hilda Koopman, pp. 204–260. Routledge, London.

Kracht, Marcus. 2002. On the semantics of locatives. *Linguistics and Philosophy* 25: 157–232.

Kratzer, Angelika. 1996. Severing the external argument from the verb. In *Phrase Structure and the Lexicon*, edited by Johann Rooryck and Laurie Zaring, pp. 109–137. Kluwer, Dordrecht.

Krifka, Manfred. 1998. The origins of telicity. In *Events and Grammar*, edited by Susan Rothstein, pp. 197–235. Kluwer, Dordrecht.

Levinson, Stephen C. 1996a. Frames of reference and Molyneux's questions: Cross-linguistic evidence. In *Language and Space*, edited by Paul Bloom, Mary A. Peterson, Lynn Nadel, and Merrill F. Garrett, pp. 109–169. MIT Press, Cambridge, Ma.

Levinson, Stephen C. 1996b. Relativity in spatial conception and description. In *Rethinking Linguistic Relativity*, edited by John J. Gumperz and Stephen C. Levinson, pp. 177–202. Cambridge University Press, Cambridge.

Levinson, Stephen C. 2003. *Space in Language and Cognition: Explorations in Cognitive Diversity*. Cambridge University Press, Cambridge.

Longobardi, Giuseppe. 2001. Formal syntax, diachronic minimalism, and etymology: The history of French *chez*. *Linguistic Inquiry* 32 2: 275–302.

Nam, Seungho. 1995. *The Semantics of Locative PPs in English*. Ph.D. thesis, UCLA.

Pantcheva, Marina. 2006a. Persian preposition classes. In *Nordlyd, Tromsø Working Papers in Language & Linguistics: 33.1, Special Issue on Adpositions*, edited by Peter Svenonius and Marina Pantcheva, pp. 1–25. University of Tromsø, Tromsø. Available at http://www.ub.uit.no/baser/nordlyd/.

Pantcheva, Marina. 2006b. The place of PLACE in Persian. Ms. CASTL, University of Tromsø, available at www.hum.uit.no/mra/.

Ramchand, Gillian. 2006. Verb meaning and the lexicon. Ms., University of Tromsø; available at http://ling.auf.net/.

van Riemsdijk, Henk. 1978. *A Case Study in Syntactic Markedness: The Binding Nature of Prepositional Phrases*. Foris, Dordrecht.

van Riemsdijk, Henk and Riny Huybregts. 2002. Location and locality. In *Progress in Grammar: Articles at the 20th Anniversary of the Comparison of Grammatical Models Group in Tilburg*, edited by Marc van Oostendorp and Elena Anagnostopoulou, pp. 1–23. Meertens Instituut, Amsterdam. www.meertens.knaw.nl/books/progressingrammar/.

Son, Minjeong. 2006. Syntactic status of spatial terms in Korean locative expressions. Handout from Moving Right Along seminar in Tromsø.

Starke, Michal. 1993. Notes on prepositions and clause-structure. Memoire de Diplôme, University of Geneva.

Svenonius, Peter. 2003. Limits on P: *filling in holes* vs. *falling in holes. Nordlyd, Tromsø Working Papers on Language and Linguistics. Proceedings of the 19th Scandinavian Conference of Linguistics* 31 2: 431–445.

Svenonius, Peter. 2004. Adpositions, particles, and the arguments they introduce. Ms. University of Tromsø; to appear in a volume on Argument Structure (*John Benjamins*); available at http://ling.auf.net/lingBuzz/000042.

Svenonius, Peter. 2006. The emergence of axial parts. In *Nordlyd, Tromsø Working Papers in Language & Linguistics: 33.1, Special Issue on Adpositions*, edited by Peter Svenonius and Marina Pantcheva, pp. 49–77. University of Tromsø, Tromsø. Available at http://www.ub.uit.no/baser/nordlyd/.

Svenonius, Peter. 2007. Projections of P. Ms. CASTL, University of Tromsø.

Svenonius, Peter and Christopher Kennedy. 2006. Northern Norwegian degree questions and the syntax of measurement. In *Phases of Interpretation*, edited by Mara Frascarelli, pp. 133–161. Mouton de Gruyter, Berlin.

Tyler, Andrea and Vyvyan Evans. 2003. *The Semantics of English Prepositions*. Cambridge University Press, Cambridge.

Wunderlich, Dieter. 1991. How do prepositional phrases fit into compositional syntax and semantics? *Linguistics* 29: 591–621.

Yadroff, Michael. 1999. *Formal Properties of Functional Categories: The Minimalist Syntax of Russian Nominal and Prepositional Expressions*. Ph.D. thesis, Indiana University.

Zwarts, Joost. 1997. Vectors as relative positions: A compositional semantics of modified PPs. *Journal of Semantics* 14: 57–86.

Zwarts, Joost. 2005. Prepositional aspect and the algebra of paths. *Linguistics and Philosophy* 28: 739–779.

Zwarts, Joost and Yoad Winter. 2000. Vector space semantics: A model-theoretic analysis of locative prepositions. *Journal of Logic, Language, and Information* 9: 169–211.