Spatial P in English

Peter Svenonius
CASTL, University of Tromsø

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1. Introduction

The syntactic structure of prepositional phrases is quite rich, as has been demonstrated in detailed studies of individual languages (see e.g. Koopman 2000, Dikken 2003 on Dutch, Starke 1993 on French, Yadroff 1999 on Russian, Holmberg 2002 on Zina Kotoko).

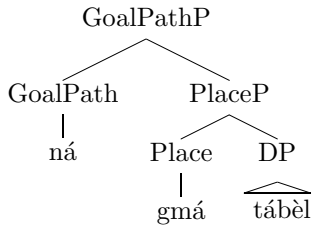
A recurring observation is the basic distinction between what can be called Place (associated with stative locational meanings) and what is often called Path (associated with directed motion). Place elements give information about the physical configuration of the relationship between a Figure (an object 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).

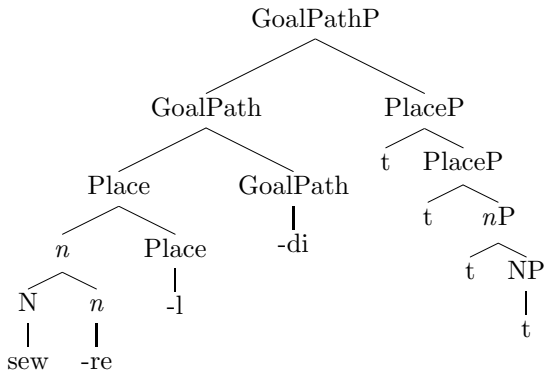
(1) a. The elephants remained **in** the boat.
b. They cast a wistful glance **to** the shore.
c. The boat drifted further **from** the beach.
d. Their ears sank **down** several notches.

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*) and to the latter as PathPlace. The expression Path then refers to all these types.

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

(2) a. ná gmá tábèl (Zina Kotoko, Holmberg 2002)
to on table
'onto the table'
b. sew-re-l-di (Lezgian, Haspelmath 1993)
bear-aug-on-to
'onto the bear'

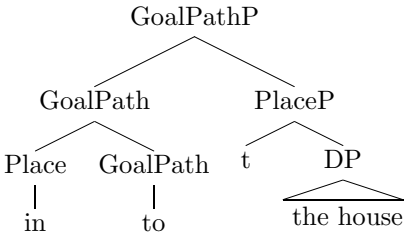


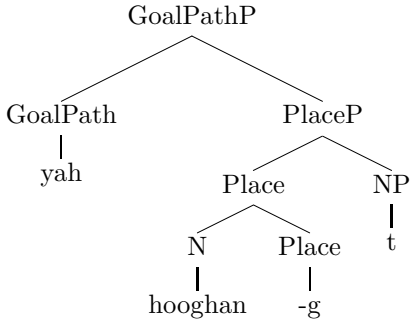


In (2a), the base order of GoalPath and Place is preserved at the surface. In (2b), both are affixal and the head noun incorporates into Place, which incorporates into GoalPath (I represent the complement of GoalPath as an *n*P, on the assumption that the 'augment' morphology projects).

Examples of partial incorporation are illustrated in (3).

(3) a. into the house (English)
b. hooghan-g yah (Navajo, Riemsdijk and Huybregts 2002)
house-in to
'into the house'





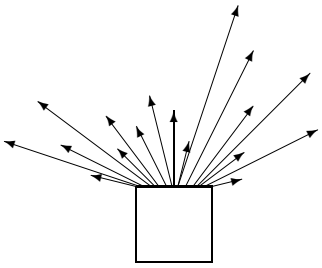
In English (3a), it can be assumed that a Place head *in* incorporates into a Path head *to*, as indicated in the tree in (3). In Navajo, van Riemsdijk & Huybregts argue, N incorporates into Place, but GoalPath is a free morpheme, as represented in (3b) (the GoalPath head is actually realized to the right of the PlaceP, as Navajo is generally head-final, but represented here to the left for the sake of comparison with the other structures).

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.

2. Vector space

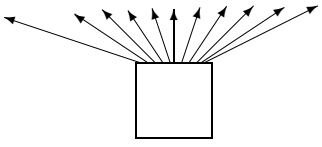
Zwarts (1997) and Zwarts and Winter (2000) develop a vector space semantics for location PPs. A spatial preposition is modeled as a function from points in space (the Ground or Landmark) to points in space; for example, to calculate the space picked out by the preposition *above*, one draws vectors of all lengths pointing upward (at various angles) from the Ground (the complement of *above*), as illustrated in (4) for a PP like *above the window*. Each vector ends at a point in space, and this collection of points picks out the place *above the window*.

(4)



An argument for using vectors is the existence 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 (5).

(5)



Any other discriminations, decisions 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 (5) 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.

A path is an organized piece of space, arranged with a directionality (see Zwarts 2004 for insightful discussion). It can be modeled as a sequence of vectors. A path to the store, for example, would be a series of vectors, which could be drawn outward from the store (the Ground). In a straight path, all the vectors point in the same direction, while in a curved path, the vectors point in different directions. The difference between a Source expression (e.g. *from the frying pan*) and a Goal expression (e.g. *to the fire*) is in the orientation of the path, rather than its shape. Both *to* and *from* can combined with Ground DPs or with Place PPs. To keep the semantics of these Path heads unambiguous, we might assume that when they appear to combine directly with a DP Ground, there is a null Place head; but nothing much hinges on this. Various other conditions can be placed on paths to make them more natural (e.g. that the points they pick out be contiguous), but again it is possible that these conditions are pragmatic rather than truth-conditional.

In order to capture the possibilities for combining different prepositional elements, I will modify Zwarts & Winter's assumptions somewhat. As noted earlier, I will need to distinguish between the GoalPath and SourcePath elements *to* and *from* and certain other kinds of path-denoting elements.

3. Place

3.1. Distribution of PlaceP

I will assume 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.

(6) 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 §5.

(7) 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 (8) 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).

(8) 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.

(9) 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 (6) can also serve as the complement to the preposition *from*:

(10) 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
g. The boat drifted from six miles up the river

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

(11) 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
g. the boat six miles up the river

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.

(12) 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
g. The boat drifted (?to) six miles up the river

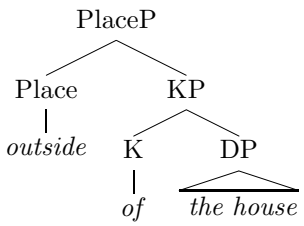
The comments here apply in general to corresponding elements in Norwegian. Note that all the Norwegian Place elements here are morphologically complex, being parseable into *bak-om*, *inn-i* etc.

(13)
a. Båten kom fra **bakom** bakken.
the.boat came from behind the.hill
b. Båten kom fra **inni** grotta.
the.boat came from inside the.cave
c. Båten kom fra **nedfor** brua.
the.boat came from below the.bridge
d. Båten kom fra **utenfor** bygrensen.
the.boat came from outside the.city.limits
e. Båten kom fra **foran** palasset.
the.boat came from in.front.of the.palace
f. Båten kom fra **ovenfor** dammen.
the.boat came from above the.dam
g. Båten kom fra ei mil **oppover** elva.
the.boat came from one 10km up the.river

The semantics of the Place head, following Zwarts (1997), is a mapping from a space (denoted by KP) to a set of vectors. The vectors are anchored at the Ground and project away from it in a direction specified by the Place head (back from the Ground, for *behind*, toward the interior of the Ground, for *inside*, etc.). The Figure is asserted to be within the space defined by these vectors.

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). Overt oblique case in English is manifested by *of*, the same *of* which appears with adjectival and nominal complements.

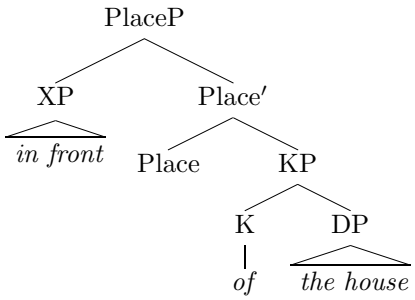
(14)



In the Norwegian examples in (13), the content morphemes (*bak* 'behind,' *inn* 'in,' *ned* 'down,' *ut(en)* 'out,' etc.) would represent Place and the following prepositional morpheme (*om* 'around, about,' *i* 'in,' *for* 'for,' *an* 'on,' *over* 'over') would represent K. The identity of K in these cases seems to be idiosyncratically determined for each Place head, so that in a sense e.g. *bakom* ("back.about") 'behind' must be stored as a unit even if it comprises two heads.

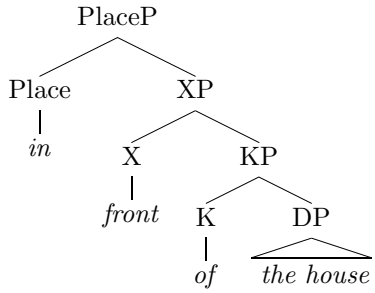
Complex expressions like *in back of* and *in front of* might reside in specifier positions of a null Place head (in fact, all overt Place elements might be specifiers).

(15)



Another alternative is that *in* in *in front of* takes a complement headed by *front*.

(16)



This would be consistent with the general pattern that DP complements of N appear with *of*. Support for this might be found in the fact that the Norwegian Place elements in (13) all seem to be complex, as noted. Elements like *inside* would be decomposed into *in* (close location with some presupposition that the Ground be a container) plus *side* (a function from spaces to enclosed spaces with sidelike boundaries).[1] However, I will continue to use the simpler trees, placing Place elements directly below a Place head, for exposition.

3.2. 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 discussed so far, anaphoric identification of the Ground is generally sufficient.

(17) 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.

[1] Thus, 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; but one cannot say *She is inside the box* in the same situation, because *inside* essentially requires enclosure; furthermore, a bird can be *in the air* but not *inside the air* because the air has no sides.

f. There was a beach. **Above** (it), the cliffs swarmed with birds.

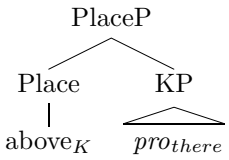
A different series of Place heads, not previously mentioned in this paper, disallows anaphoric identification of Ground.

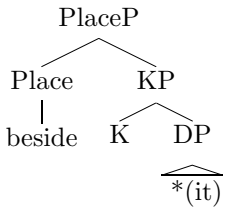
(18) a. As the group approached the final summit, Espen stayed **among** *(them).
b. We stood below a bridge. **Upon** *(it) we could see trucks laden with port wine.
c. There were two stacks of boxes in the warehouse. **Between** *(them) was a forklift.
d. I saw a small house. **Beside** *(it) was a 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* as a Ground.

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

I will assume that Place heads like *above* license a null KP which means something like *there*, while heads like *beside* do not. This might be indicated by annotating the former with a subscript 'K' as in the tree diagram here.

(20) a.


b.


The possibility of licensing null KP correlates with a semantic property. Note that the Place heads which allow null KP also allow measure phrases.

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

Place heads which disallow null KP do not.

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

I return to this property in §3.4, where I suggest that the conditions placed on Grounds by Place heads like *between* and *next to* are reponsible both for the incompatibility with null KP and the impossibility of measure expressions.

3.3. Particles with Place

The words *in* and *on* are among the most basic prepositions in English. I am assuming that they normally occupy the position I have been calling PLACE, but they are also used as so-called particles in expressions like *put the coat on* or *take the laundry in*, so I treat them separately here, along with *up, down, off*, and *out*.

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

(23) 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.

Vector spaces are calculated for these expressions as for other PlacePs. Null complementation, degree modification, combination with other elements, and directional meanings will be addressed in other sections.

Place expressions like *between* and *in front of* do not generally combine easily with each other.

(24) 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:

(25) 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

This is again true for Norwegian.

(26) a. Båten kom fra **nede** bakom bakken.
the.boat came from down behind the.hill
b. Båten kom fra **nede** inni grotta.
the.boat came from down inside the.cave
c. Båten kom fra **borte** nedfor brua.
the.boat came from away below the.bridge
d. Båten kom fra **borte** utenfor bygrensen.
the.boat came from away outside the.city.limits
e. Båten kom fra **oppe** foran palasset.
the.boat came from up in.front.of the.palace
f. Båten kom fra **oppe** ovenfor dammen.
the.boat came from up above the.dam

Note that locative Particles in Norwegian are suffixed with *-e*, unlike Particles with directional meaning, discussed in a later section.

Particles which modify locative PPs do not generally restrict the vector space, which is calculated entirely by projecting vectors from the Ground, in a direction specified by the Place head. So-called 'projective' modifers (cf. Herskovits 1986) allow for a viewpoint perspective to determine the axes up/down,

right/left, and front/back (e.g. *behind the house* might mean at the back of the house or on the other side of the house from a viewer's perspective), but once the axes are fixed, truth conditions can be determined by a consideration of the vector space. Particles, on the other hand, introduce viewpoint for the vector space taken as a whole. 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 vector space bounded by the cave, then it is inside. But in order to know whether a reindeer is *down inside the cave*, it is necessary also to know whether the vector space 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 space, and drawing vectors at acute upward angles from every part of 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 (27).

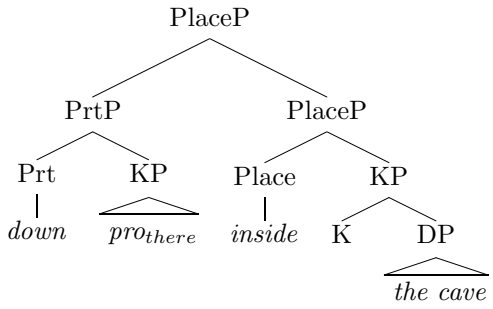
(27) a. A plane flew low (up) above the treetops.
b. A bee flew low (#up) above the clover.

In (27), 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 (27b) 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 such examples do not take the PlaceP as their complement. The Ground of *up* in (27) 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 this is another use of the null KP resembling *there* which I discussed in the previous section.

Thus, I assume that Particles take null KP as their complement, and attach as phrases above the Place head in examples like (25). They might be introduced by a null functional head, but I will represent them as adjoined to PlaceP, or in the specifier of Place.

(28)



Of course, particles can also take overt DP (or KP) complements, as in (23) above. However, there are distributional differences between the Place elements which appear with null KP and the particles; for example, PlaceP does not typically make a good PlaceP modifier (cf. (24)). I return to the correct categorial classification of the particles below.

3.4. Degree in PlaceP

All Place expressions (including *between* and *next to*) allow the Degree expression *right*, approximately meaning that the location is archetypal for that Place expression.

(29) 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 first type (*in front of, below*, etc.) but not the second (*between* and *next to*, etc.) can also be modified by measure expressions which basically give the lengths of vectors.

(30) a. We remained sixty feet in front of the palace.
b. My clothes are ten meters below the bridge.
c. *They came from six feet between the trees.
d. *They opened the door one meters next to the stage.

Following Koopman's (2000) and den Dikken's (2003) analyses of Dutch, I assume a DegreeP above Place which hosts degree heads like *right* and measure phrases like *ten meters*.

The semantics of measure expressions are discussed in some detail by Zwarts & Winter (2000). Measure expressions define subsets of vectors; the Place head *below*, for example, defines vectors projecting at acute downward angles from the Ground (the bridge), and the degree modifier *ten meters* selects that subset whose endpoints are contained in a plane at a ten meter distance on the down axis.

When degree expression and Particle cooccur within PlaceP, it must generally be in that order, as in (31); the reverse order, as in (32), is generally bad.

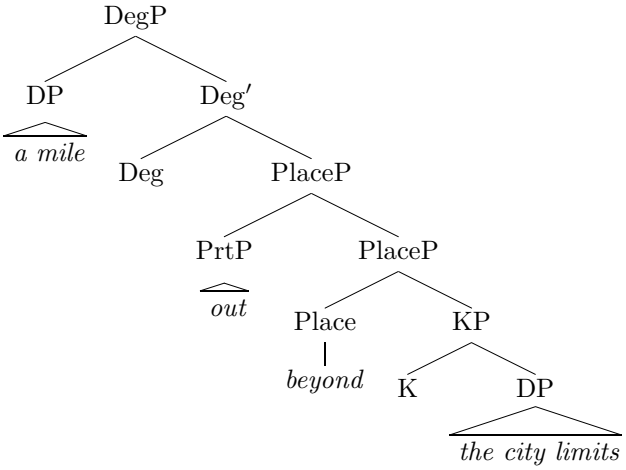
(31) a. The boat drifted from (**a mile**) **back** behind the hill
b. the boat (**right**) **down** inside the cave

c. The boat remained (**far**) **off** below the bend

(32) a. The boat drifted from **out** (*a mile) beyond the city limits
b. the boat **over** (*right) in front of the palace
c. The boat remained **up** (*far) above the dam

This suggests a Degree head above the Particle.

(33)



This will be modified below. Note also that there may be an alternative parse, *[a mile out] beyond the city limits*, in which the measure expression modifies the particle rather than the Place projection, confirming the supposition that the particle is phrasal here rather than a head in the extended projection. This also permits structures like *[two meters down] against the fence* or *[way down] between the sheets*.

In the meantime, the structure sheds little light on the correlation between degree modification and omission of the Ground element (discussed in section §3.2); the Place elements that cannot appear with measure phrases require obligatorily overt Ground elements.[2]

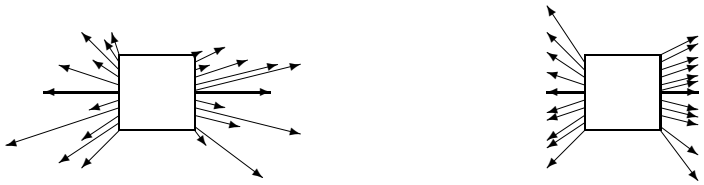
(34) a. We were (*six feet) against/among/upon/beside the trees.
b. We were against/among/upon/beside *(them).
c. They were (six feet) below/above/inside/beyond/in front of the cave.
d. They were below/above/inside/beyond/in front of (it).

The impossibility of a measure phrase in (34a) 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*). Interestingly, *beside* also resists measure expressions (**five inches beside the window*), though if *beside* is defined in terms of a vector space it is unclear why. Consider the vector space in (35), for *beside the window*. A measure function which picked out vectors of a certain length could in principle operate on such structures. For example, if you were told to look for a light switch beside a window at a distance of one meter, you might scan the space indicated by the arrowheads in

[2] I am setting aside a specialized meaning of 'against' as in *I voted against*, considering only the spatial sense.

the diagram to the right in (35); but **one meter beside the window* is ungrammatical.

(35)



I conclude from these facts that the application of measure phrases to PlacePs is not commonsensical, but rather mechanical, and that the semantics of measure phrase modification requires a very simple vector space with a single Ground and a single direction of vectors (cf. **The fence is ten meters around the house*, with the intended meaning, 'The fence is around the house and ten meter away from it').

3.5. Previous proposals

Dikken (2003), building on Koopman (2000), proposes the following structure for analogous constructions in Dutch:

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

For den Dikken, P_{loc} is the 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 number of complex expressions including *in front of* and so on, where the final *of* might head its own projection, as in Starke's (1993) analysis of similar constructions in French (cf. 3.1).

Despite the major difference that I locate the main contentful material in Place where den Dikken and Koopman place it lower down, my analysis of English looks very much like theirs, an encouraging convergence as the accounts were developed on independent grounds.

4. Paths

4.1. PlacePaths

I pointed out in §3 that examples with Place heads, like (9) (repeated here as (37)) are most naturally interpreted as locative even when appearing with motion verbs.

(37) 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.

(38) 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 **away** from the city.
e. The revelers danced **across** the palace.
f. The mountaineers climbed **over** the dam.

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

(39) 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 heads (*over*, *under*, and *across*).

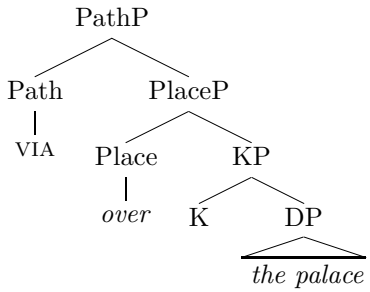
Furthermore, the boldfaced Place heads in (38) have a different semantics from those in (37), which I will call PlacePaths. For the Place heads, a vector semantics maps the Ground to a set of points in space, and the Figure is asserted to be located in that space—idealized, we might think of every Figure as being located at a point, and say that to predicate a PlaceP of a Figure is to assert that the Figure is located at one of the points in the vector space denoted by the PlaceP, simple set membership. The PPs in (38), on the other hand, pick out structured spaces; one way to model them is to define sets of vectors which map out contiguous spaces. 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.

This is less clear with *under* and *over*, though empirically they do seem to favor Path interpretations. Possibly, this is because of their rigid directionality. Unlike *above* and *below*, which pick out large conical areas projecting upward and downward respectively, *under* and *over* pick out locations which are directly up and directly down. Below a bridge you might or might not be in its shade, but under a bridge you would remain dry in the rain.

Since motion in such a confined space is unusual, it may be more natural to interpret motion verbs with *under* and *over* as involving Paths which cross through a point directly under or over the Ground.

This suggests that at least for *under* and *over*, the PlacePath meaning is one constructed from two parts, a Place (straight up or down) and a Path (VIA, meaning that a vertical vector is included in the Path).

(40)



I assume that the other PlacePaths also consist of two parts in the syntax, and I will return briefly to this possibility below, but since they normally occur with a Path head I will generally refer to all the elements in (38) as PlacePaths and treat them syntactically as if they were the amalgam of Path and Place in a tree like that in (40). This predicts that they should not cooccur with each other nor with pure Place heads (**across in front of, *through behind*, etc.).

The path-denoting expressions in (38) 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.

4.2. Creswellian Places

It is clear that Paths can contain Places, as I have repeatedly sketched; 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 (41).

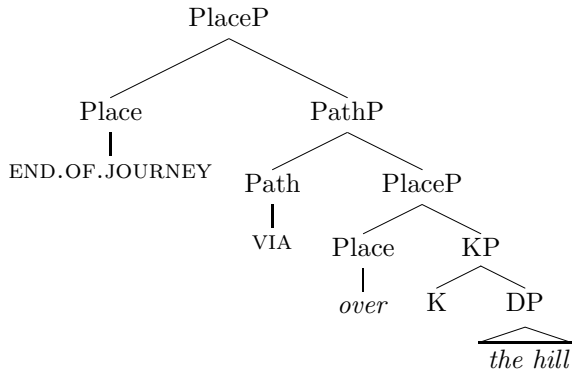
(41) Across a meadow a band is playing excerpts from *H.M.S. Pinafore*.

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 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 (42).

(42) a. The library is very noisy. Theres a sawmill right over the hill.
b. The sawmill is over the hill from the library.

To distinguish the most natural readings of *through the cushion* versus *through those mountains*, I postulate a Path-to-Place functor, meaning something like Cresswell's 'at the end of a journey via.'

(43)



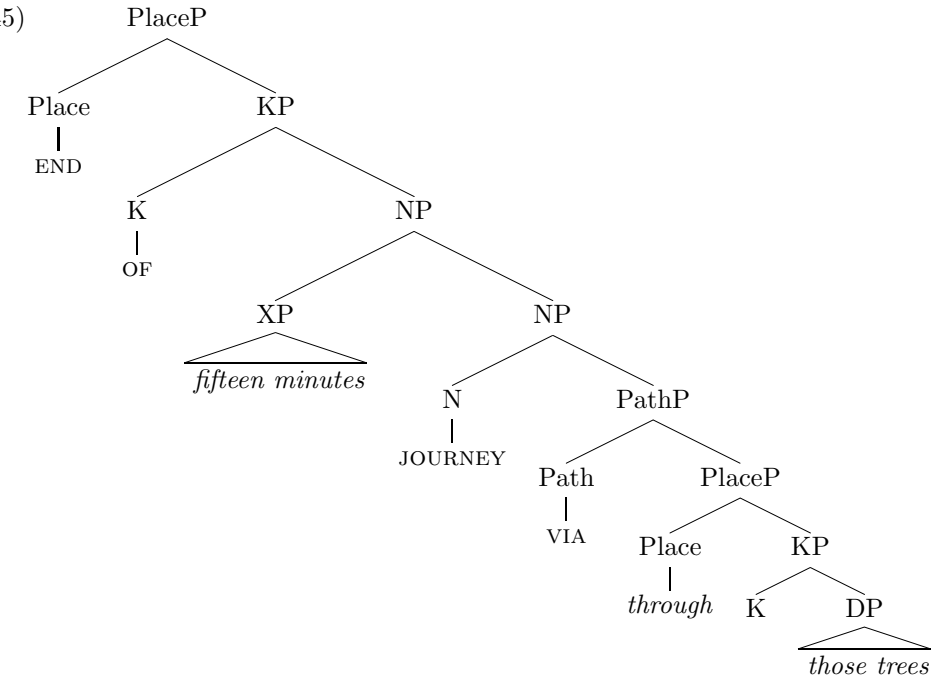
The difference between the examples with and without the Path-to-Place functor is brought out in the following examples, where the simple locative interpretation of PlacePath elements *through* and *around* is contrasted with the Creswellian 'at the end of a journey' interpretation.

(44) a. The pencil is all the way through the cushion.
b. Bardu is right through those mountains.
c. The fence is around the house.
d. The post office is around the hill.

There may be reasons, furthermore, to decompose the Path-to-Place expression in the syntax. For example, time expressions can be used to measure Creswellian 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 Cresswellian locations as involving recursion in which a null Path AT (i.e. a location) takes an abstract complement (corresponding to Cresswell's 'end of a journey') which in turn takes the path-denoting PathP as its complement.

(45)



The obligatory plural on *fifteen minutes* here seems to be a problem, 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 operator, namely that it does not operate on all paths.

(46) 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 Path-to-Place 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.

(47) 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, unless they provide an overt measure phrase.

Compare the following set as well; in (48), no Path-to-Place reading is possible, which in (49), such readings are readily available.

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

(49) 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 forms Paths with null TO, do not permit measure expressions, perhaps because they do not provide simple vector structures for measure expressions to limit. Here, the contrast with the PlacePath heads *past* and *through* shows that they are also inappropriate complements for the Path-to-Place function.

I suggest that these two observations can be unified if what the Path-to-Place function requires is a scalar structure (cf. Filip (to appear), Hay et al. 1999, Součková 2004); since *between* and *beside* provide no such structure, they are inappropriate for it. Nor do GoalPathP or SourcePathP provide scalar structures, though the measure expressions they combine with may. I will return to this matter below.

4.3. *To* as a Path head

I have been using *to* and *from* as diagnostics, and vaguely alluding to them as Paths, of a kind, but I have not been fully explicit about their function. As we will see, they are rather different from the PlacePath elements.

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*.[3]

(50) 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.

(51) 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.

(52) 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. (38)). In order to retain the familiar name Path, while at the same time distinguishing the two types, I have resorted to mnemonic compounds, PlacePath for the more descriptively rich Paths, and GoalPath or SourcePath for the PPs headed by *to* and *from*.

Thus, I will refer to expressions like these PPs with *to* as GoalPathPs. They denote Paths of motion when they appear with motion verbs.

(53) a. The boat drifted to Narvik.
b. The boat sailed onto the shoals.
c. The boat moved up to the ship.

[3]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 assume *to* contained within a phrasal left branch.

d. We steered the boat into the cave.
e. We shoved the boat down to the shoreline.

As noted in §3, 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.

(54) 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
g. The boat drifted six miles up the river

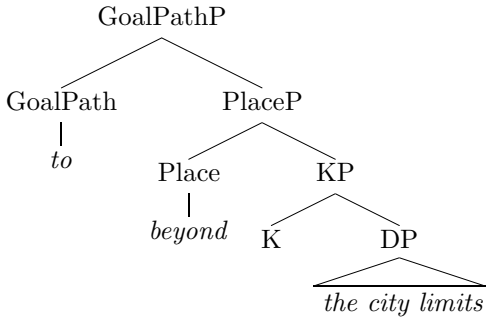
These would then be fully parallel to the examples in (10) in §3.1 above (repeated here as (55)).

(55) 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
g. The boat drifted from six miles up the river

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. As noted briefly above, there may also be a null 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.

Setting aside the Degree and Particle positions, this suggests a structure looking something like this.

(56)



However, as has often been noted (e.g. Folli and Ramchand 2001), the directional meanings illustrated in (54) are only available in certain contexts, for example with verbs expressing some kind of motion. The examples in (57) can only be read as locative, but the examples in (58) also have a possible directional reading.

(57) a. The runners sweated behind the hill.
b. Miners coughed inside the mineshaft.
c. The truck smoked above the underpass.

(58) a. The clouds raced beyond the city limits.
b. Revolutionaries danced in front of the palace.
c. The cable car lurched above the dam.

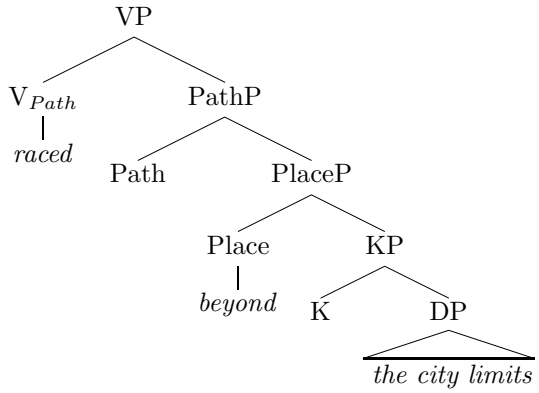
It is not often acknowledged, but I believe that the examples in (59) also have possible directional meanings, and though they sound creative or coerced, they contrast with (57).

(59) a. The runners sweated onto the hilltop.
b. Miners coughed along the mineshaft.
c. The truck smoked over the underpass.

Thus, the necessary Path meaning can come from the verb, as in (58) or the preposition, as in (59), but if the verb is non-motional and the preposition is a simple Place head, then no directional reading is possible, as in (57).

Using the notation adopted above for Place heads that license a null KP, we might annotate motion verbs with a subscript *Path* to indicate that they license a null Path head.

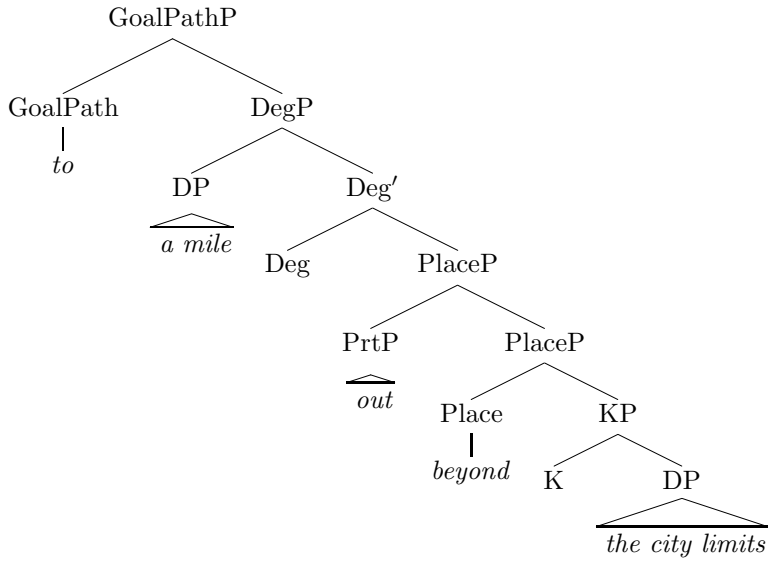
(60)



Another way of thinking of this is to say that the motion verbs include in their lexical representation a Path feature which projects, perhaps optionally; as do the PlacePath heads.

Including the Degree and Particle projections already suggested, we have constructions like the following.

(61)



4.4. *At* 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 'at.'

(62) a. gmá
on
'onto' (directional)

b. má gmá
from on
'from on' (source)

c. a gmá
at on
'on' (locative)

(63) a. mwá
under
'under' (directional)

b. má mwá
from under
'from under' (source)

c. a mwá
at under
'under' (locative)

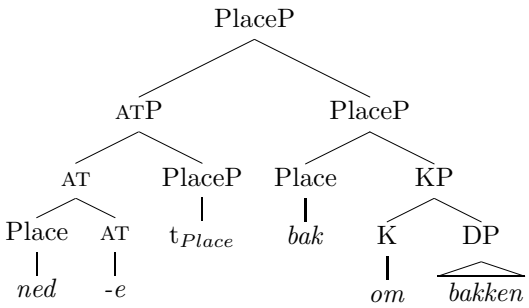
Possibly, all locative expressions contain a Path head, containing a null AT in languages like English. If so, then the label Path is perhaps misleading.[4]

[4]It seems that languages can also have null FROM. In Northern Sámi, various postpositional phrases are systematically ambiguous between locative and source readings (exx. from Nickel

When Paths appear in active sentences, a motion event is mapped onto the Path. A Goal Path is one in which the progress of the event tracks the progress of the Figure towards the Ground, while a Source Path is one in which the progress of the event tracks the progress of the Figure away from the Ground. If a VIA Path intersects the Ground, then possibly an AT Path is included in the Ground.

There is a morpheme in Norwegian that may correspond to something like an AT function, but it only combines with particles. The Norwegian locative particles discussed in (26), such as **nede** in *nede bakom bakken* 'back behind the hill' always have an *-e* after them, compared with the corresponding directional particles (e.g. *ned* 'down').

(64)



A variation on this analysis would be to take the suffix as a head below the particle, above Place, which is phonologically fused to the particle in its specifier, contra the orthography, which treats *nede* as a single word.

4.5. Path with Particles

The same Particles which combine with PlaceP (see §3.3) also combine with PathP composed of Place and *from* or null or overt *to*, as shown in (65), (66), and (67), respectively.[5]

(65) 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

1990:176). I gloss the relevant postposition as *chez*, meaning 'at the house of' (related to the noun *geahči* 'end').

(i) a. Mun ledjen áhku geahčen.
I was grandmother chez
'I was at grandmother's'
b. Mun boaðán áhku geahčen.
I come grandmother chez
'I'm coming from grandmother's'

[5]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 presupposes that a traversal of the same trajectory by the same Figure has already occurred (in the reverse direction). This is not necessarily the case for the uses of *back* as a Particle illustrated in (65) and (66).

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

(66) 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

(67) 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 PlacePath heads of (38), repeated here as (68).

(68) 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.
e. The revelers danced **in** across the palace.
f. The mountaineers climbed **up** over the dam.

It is not entirely clear whether multiple particles can appear in a single extended projection of P. Certainly, multiple particles can appear in one prepositional phrase.

(69) 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

The question, however, is whether these involve recursion; for example, if *from over behind the hill* is a path-denoting SourcePathP, it can be turned into a Cresswellian location meaning 'at the end of a journey from over behind the hill,' which by assumption involves a superordinate PlaceP, which could then have *out* adjoined to it. In that case, particles might only attach to PlaceP, one per extended projection of P.[6] The same process could give sequences with null

[6]I cannot rule out the possibility that the examples in (70) involve right adjuncts. Constituency tests give uncertain results.

(i) a. (*Out) over behind the hill went the boat.
b. (?Off) down below the bend came the boat.
c. Away (?off) beyond the city limits drifted the boat.
d. Up (?over) in front of the palace sailed the boat.

Examples with *from* seem easier to front.

(ii) a. ?Out from over behind the hill came a boat.
b. ??Off from down below the bend came a boat
c. ?**Over** from **up** in front of the palace came a boat

TO.

(70) 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

Each particle would then appear in a separate PlaceP. On the other hand, the adjunct-like nature of the particles in these constructions makes it perfectly plausible that they might adjoin equally freely to PlaceP and to PathP. A neo-Cresswellian analysis of *He ran up to the top* as involving 'He ran TO [up THERE] AT-THE-END-OF-A-JOURNEY to the top' would seem unnecessarily baroque, so I will tentatively assume that particles may adjoin to Path, for the time being. The concern has to do with questions about the rigidity of *fseq*; see Svenonius (2004) for discussion of a model in which categories are expected to be very strictly ordered.

5. Particles

5.1. 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.

(71) 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 (66) in the previous section, and in fact also freely express Path without any overt PlaceP.

(72) 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 virtually any suitable location.

(73) 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).

d. **Down** from **up** above the dam came a boat
e. **Up** from **back** inside the cave came a boat

f. They spilled over (the lip of the bucket).

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

(74) 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. §3.3), Particles cannot typically be the sole overt element in a locative PP (taking the complement of *from* in (75b) to be a locative PlaceP).[7]

(75) 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.

(76) a. She's off (*off shift*; or, *mistaken*)
b. He's up (*awake*)
c. He's down (*depressed*; or *prone*; or *(back) 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*)

(77) 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).

[7]The examples here with *down* are not perfectly parallel, since for some reason locative *down* requires a chute-like Ground, while directional *down* resists it.

My solution to the pattern noted here is based on the assumption that the locative uses of particles are strictly Cresswellian; 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.' This may not be completely intuitive, but what is important is that the path or directional nature of the particles is primary, their locative meaning derived.

Now, recall that the path-to-place function that I postulated in §X does not apply freely to all PPs. Specifically, I suggested there, it can only apply to PPs which have some sort of visible scalar structure. This scalar structure was provided either by a rich PlacePath head, in the case of *across the meadow* and *over the hill* and so on, or by a measure expression, in the case of *six feet from the wall* or *sixty meters into the woods*.

If the locative senses of the particles are derived by application of the Path-to-Place function, then measure expressions should facilitate the locative senses, and indeed they do, as I detail in the next subsection, before moving on to solve the riddle raised here.

5.2. Degree with Particles

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

(78) 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.

(79) 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.

(80) 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.

(81) 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.

(82) 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 §3.2 and §3.4, between the omissibility of the Ground and the measurability of distance in PlaceP, as illustrated in (83) (repeated from (34) in §3.4).

(83) 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 PlacePath 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 a Path-to-Place operator, as I suggested above, unlike Place heads like *above* and *in front*, which are basically locative, picking out simple vector spaces. Recall, too, that the Path-to-Place operator requires a scalar structure to operate on: either 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 could be explained if it could be shown that a particle without an overt complement lacks a scalar structure that a particle with an overt complement has.

I suggest that this pattern should be understood in the light of what we know about telicity in the verbal domain. In verb phrases, properties of objects are quite typically mapped onto events (Krifka 1992, Ramchand 1997, Kratzer forthcoming, etc.). There appears to be a close connection between this mapping and case assignment. Prepositions do clearly have the same kind of eventual structure that verbs do, but they do assign case, and if the assignment of case entails such a mapping, then it also entails the creation of some sort of scalar structure. In Svenonius (2003) I proposed that in order to assign case, P must be combined with a second element, p, analogous to the v which is assumed to facilitate the assignment of accusative case in transitive verbs. Regardless of the technical details, the intuition is that a P which is involved in a case assignment relation with a complement DP (or an analogous complement mapping) will be associated with a scalar structure, which will provide appropriate input to the Path-to-Place operator.

6. 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 PlacePath, 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 might simply be a subclass of the PlacePath heads. 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.

Another chink in the armor of the rigid order 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.

In fact, the consistency within each group 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.

At that point, it would be possible to generalize over all these elements again and say they are all members of the category P, rather than being distinct categories dominating a lexical P.

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