Spatial P in English

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1. Introduction

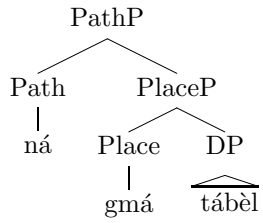
The syntactic structure of prepositional phrases is quite rich, as has been demonstrated in detailed studies of individual languages (see e.g. Koopman 1997, den Dikken 2003 on Dutch, Starke 1993 on French, Yadroff 2000 on Russian, Holmberg 2002 on Zina Kotoko).

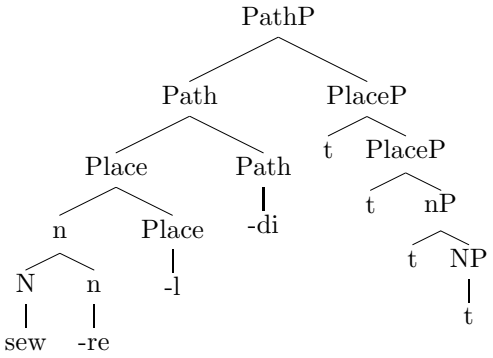
A recurring observation is the basic distinction between what can be called Place (associated with stative locational meanings) and Path (associated with directed motion). Place elements give information about the physical configuration of the relationship between a Figure (an object whose location is at issue) and a Ground (the reference landmark for the location of the Figure). This is illustrated in (1a), where *the house* is the Figure and *the family* 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.

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 (van Riemsdijk & 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'

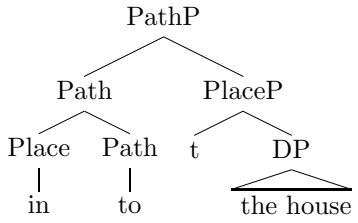


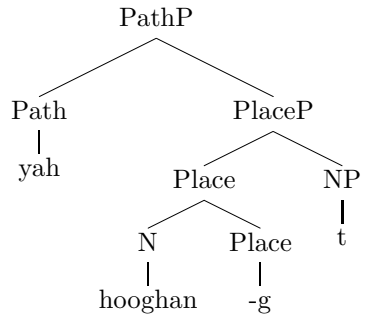


In (2a), the base order of Path and Place is preserved at the surface. In (2b), both are affixal and the head noun incorporates into Place, which incorporates into Path (I represent the complement of Path as an nP, on the assumption that the 'augment' morphology projects).

Examples of partial incorporation are illustrated in (3).

(3) a. into the house (English)
b. hooghan-g yah (Navajo, van Riemsdijk & 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 Navajo, van Riemsdijk & Huybregts argue, N incorporates into Place, but Path is a free morpheme, as represented in (3b) (the Path 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 & 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*. Each vector ends at a point in space, and this collection of points picks out *above*. Any other discriminations, decisions about precise angles, distance and so on is (I assume) left up to pragmatics and conditions of language use. Thus, if a bird is higher than a house but not directly above it, there may be some discussion as to whether it is above the house, but I am not concerned with these details.

A path is modeled as an organized collection of vectors. A path has a beginning and/or an end, so the vectors in a path are ordered. A path to the store, for example, is a series of vectors, which might be drawn outward from the store (the Ground). In a straight path, all the vectors would point in the same direction, and the longest would be the first, the shortest the last. In a curved path, the vectors would point in different directions. The preposition *to*, then, can be a function from Grounds to all ordered sequences of vectors whose final vector is of zero length. 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. I will need to distinguish between the path 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.

(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 §5.

(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 (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).

(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 (6) 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
g. The boat drifted from six miles up the river

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
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.

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

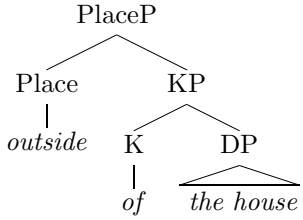
The comments here apply in general to corresponding elements in Norwegian. Note that all the Norwegian Place elements here are morphologically complex, being parseable into *bak-om*, *inn-i* etc.

(11) 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 2000 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.

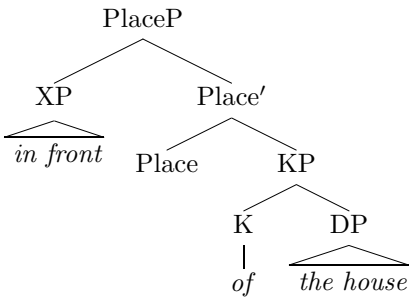
(12)



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.

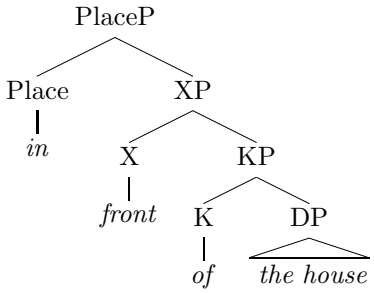
Complex expressions like *in back of* and *in front of* might reside in specifier positions of a null Place head (in fact, all overt Place elements might be specifiers).

(13)



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

(14)



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.

[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.

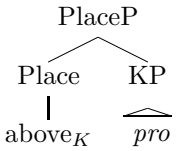
(15) a. As the group approached the final summit, Espen stayed **behind** (them).
b. There was a box on the table. **Inside** (it) was fine Swiss chocolate.
c. We stood on a bridge. **Below** (it) we could see barges laden with port wine.
d. Nils looked over the snowdrift. The frozen fjord **beyond** (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.

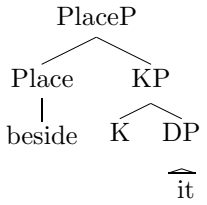
A different series of Place heads, not previously mentioned in this paper, disallows anaphoric identification of Ground.

(16) 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.

I return to these constructions in §3.5, where I discuss the fact that they are incompatible with measure expressions.

In the meantime I will simply assume that Place heads like *above* license a null KP, while heads like *beside* do not. This might be indicated by annotating the former as in the tree diagram here.

(17) a.


b.


For the time being, I leave the possibility of licensing null KP as a lexical stipulation. However, I return to this property in §3.5.

3.3. Locative Particles

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.

(18) 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.

3.4. Particles with Place

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

(19) 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:

(20) 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.

(21) 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.

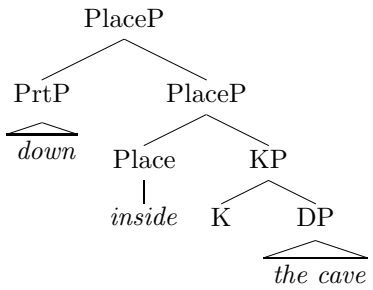
Particles which modify locative PPs do not generally restrict the vector space, which is calculated entirely by projecting vectors from the Ground, in a direction specified by the Place head. So-called 'projective' modifers (cf. Herskovits 1986) allow for a viewpoint perspective to determine the axes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

This suggests that Particles in examples like (22) do not take PlaceP as their complement, since the PlaceP does not express the Ground of the particle. Instead, I assume, the Particles have null complements and are attached as phrases, either in a specifier position, or adjoined as diagrammed here.

(22)



3.5. 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.

(23) 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.

(24) 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 (1997) 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.

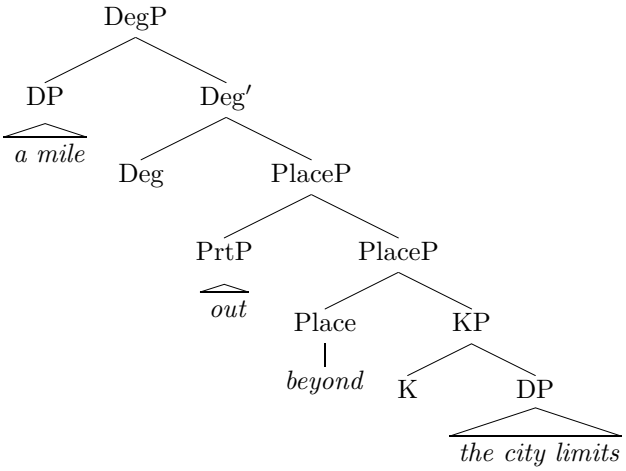
When degree expression and Particle cooccur within PlaceP, it must generally be in that order, as in (27); the reverse order, as in (28), is generally bad.

(25) 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

(26) 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.

(27)



This will be modified below. Note also that there may is 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]

(28) 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 (30a) 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*). However, this does not make immediately clear why exactly the same elements should resist null complementation.

There have been several proposals connecting nominal case to the aspectual interpretation of the verb phrase (as mentioned in §2). In the most explicit of these (e.g. Borer 2004), objects move to a specifier position in an aspectual phrase outside VP. This allows a straightforward connection between object case (e.g. partitive) and outer aspect (e.g. imperfective). I will suggest below that something similar is going on in the prepositional phrase, so that the 'perfectivity' of a PlaceP determines not only the case of the nominal complement but also whether it can be omitted.

3.6. Previous proposals

Den Dikken (2003), building on Koopman (1996), proposes the following structure for analogous constructions in Dutch:

(29) 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. In this case it is unclear whether *in front* is a specifier or a sequence of two heads. On Starke's analysis, there are null counterparts to *of* as well, so that even apparent prepositions like *between* and *behind* might actually be Place elements above a null P_{loc}.

Thus far, my analysis of English looks very much like den Dikken's and Koopman's proposals for Dutch, though some differences emerge for simple structures, since most of the prepositions that den Dikken assumes are in P_{loc} would not be K but Place, in my model, but with null K. However, it is not clear how much that represents an important difference as opposed to an accidental one.

If K includes *of* in *inside of*, but not, for example *above*, then the null complements in *he climbed above* and *she ran inside* are KP, anaphorically identified spaces. This, I think, favors placing *above* and other typical locative

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

prepositions in Place rather than K, which is more like a case marker on this story (cf. Yadroff 2000).

Other differences between my analysis and that of den Dikken will emerge in the next section.

4. Paths

4.1. *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*.[3]

(30) 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.

(31) 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.

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

Following much previous work (e.g. Jackendoff 1983), I will refer to expressions like these PPs with *to* as PathPs. They denote Paths of motion when they appear with motion verbs.

(33) 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 §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.

(34) 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

[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 the SpecPath.

g. The boat drifted six miles up the river

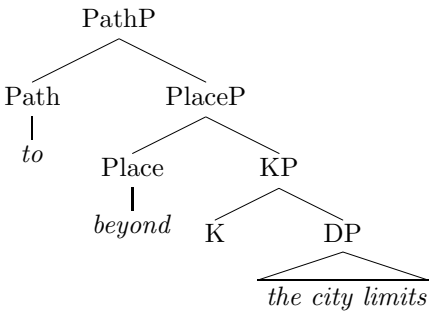
These would then be fully parallel to the examples in (10) in §3.1 above (repeated here as (37)).

(35) 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 Path heads in English which freely cooccur with Place heads: *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. It may be necessary to add 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.

(36)



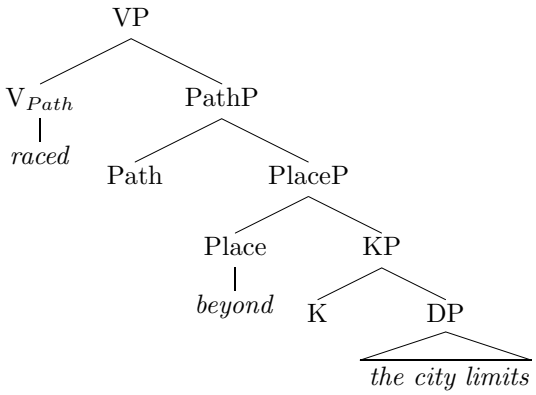
However, as has often been noted (e.g. Folli & Ramchand 2001), the directional meanings illustrated in (36) are only available in certain contexts, for example with verbs expressing some kind of motion. The examples in (39) can only be read as locative, but the examples in (40) also have a possible directional reading.

(37) a. The runners sweated behind the hill.
b. Miners coughed inside the mineshaft.
c. The truck smoked around the bend.

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

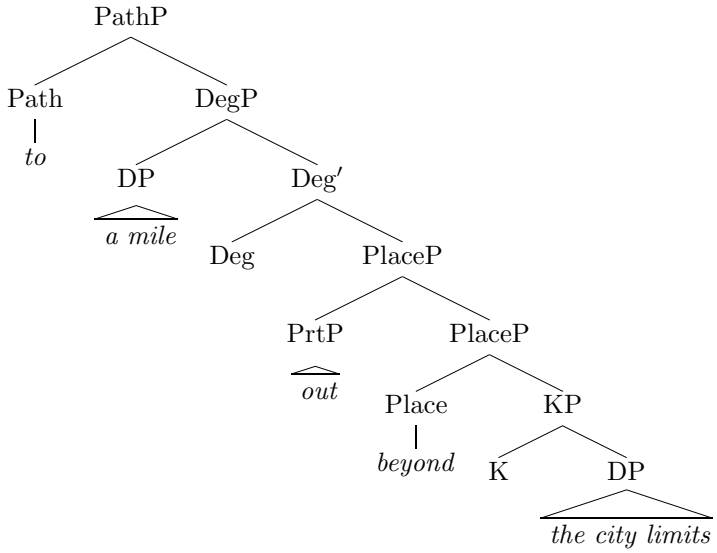
Using the notation adopted above for Place heads that license a null KP, we might annotate motion verbs with a subscript *Path* to indicate that they license a null Path head.

(39)



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

(40)



4.2. *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.'

(41) a. gmá
on
'onto' (directional)

b. má gmá
from on
'from on' (source)

c. a gmá
at on

'on' (locative)

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

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

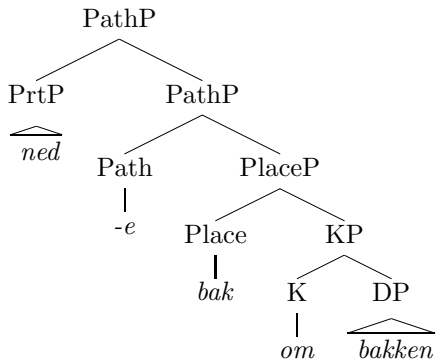
c. a mwá
at under
'under' (locative)

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]

Following Zwarts & Winter (2000), the semantics of a Path is a collection of vectors of differing lengths from the Ground to points between the Ground and the Goal or Source. The points are ordered, so that the beginning of the Path is distinct from its end. For example, a path *from the bridge* is an ordered sequence of vectors pointing from some reference point to contiguous points in space. Because the path is a *from* path, the beginning of the path is located at the Ground (*the bridge*). A *to* path would end at the bridge. Thus it is a simple matter to define an *at* path as one which is entirely located in the space defined by the Ground.

The Norwegian locative particles discussed in (23), 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').

(43)



The literal gloss for the various parts here would be something like 'down-AT back-of the.hill.' The particle is assumed to be adjoined to the PathP, here. A

[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 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 boađán áhku geahčen.
I come grandmother chez
'I'm coming from grandmother's'

variation on this analysis would be to take the particle as a head below Path, above Place, which moves to Path -*e* and attaches to it. This would be consistent with the orthography, which treats *nede* as a single word.

4.3. Richer Paths

I pointed out in §3 that examples with Place heads, like (9) (repeated here as (46)) are most naturally interpreted as locative even when appearing with motion verbs.

(44) 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.

(45) 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.

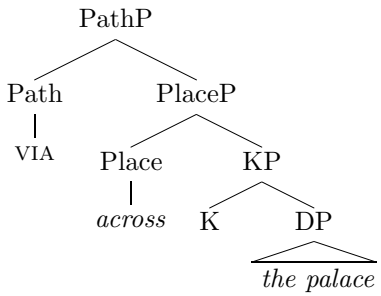
(46) a. The climb above the dam was arduous.
b. The climb over the dam was arduous.
c. A dive below the bridge would be refreshing.
d. A dive under the bridge would be refreshing.
e. Kari's flip in front of the mat brought applause.
f. Kari's flip across the mat brought applause.

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 Path heads (*over*, *under*, and *across*). These can be modeled as *climb* AT *above the dam* and *climb* VIA *over the dam*. If TO is optionally licensed by motion verbs in examples like those in (46), and if (non-path) nominals fail to license Path heads TO or VIA, then the directional interpretation in these examples seems to come from the prepositional element itself. Accordingly, many previous treatments have assumed that these elements are path-denoting.

However, I suggest that the only difference among these various heads (all of which I will continue to represent as belonging to a category Place) is the type of vector space they define. *Through* and *across* define spaces which make reference to the Ground in a way that *above* and *below* and so on do not; they 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. It is the nature of the space picked out which favors a

directional interpretation for *The revelers danced across the palace*, effected by the use of a null Path head, either TO or VIA.

(47)



For *under* and *over*, the effect is similar though the reason is slightly different. 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 is more natural to interpret motion verbs with *under* and *over* as combining with the null Path head VIA.

There are also locative expressions which are derived from Paths, following Cresswell (1978). Consider, for example the example in (50), from Cresswell.

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

On the simple Place interpretation of *across*, the band would have to be stretched out in a line from one end of the meadow to the other, certainly not the most salient reading. 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 (51).

(49) a. The post office is around the hill.
b. The post office is around the hill from the church.

Expressions like those in illustrate the difference between a simple AT interpretation of these complex Place expressions and the Cresswellian end-of-journey use.

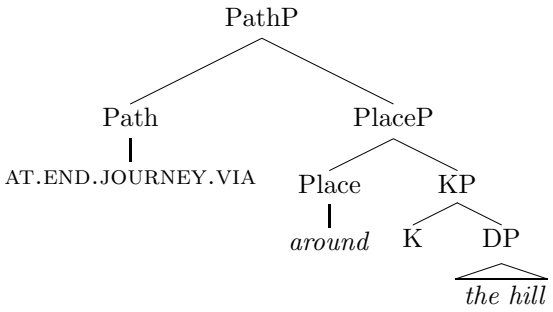
(50) a. The pencil is all the way through the cushion.
b. Bardu is right through those mountains.
c. The fence is around the house.
d. The post office is around the hill.

Treating *across* and so on as Place elements immediately explains why they do not cooccur with other Place elements (**across in front of, *through behind*, etc.). The path-denoting expressions in (58) do not easily cooccur with *to*, and several of them do not easily cooccur with *from*, either. Without claiming to fully understand the variation, I suggest that the good cases of cooccurrence involve Cresswellian derivation of Place from Path, i.e. *from under the bridge*

is derived from *from "at" the end of a journey "to" under the bridge.*

To distinguish the most natural readings of *through the cushion* versus *through those mountains*, a locative Path head distinct from AT might be postulated, meaning something like 'at the end of a journey via.'

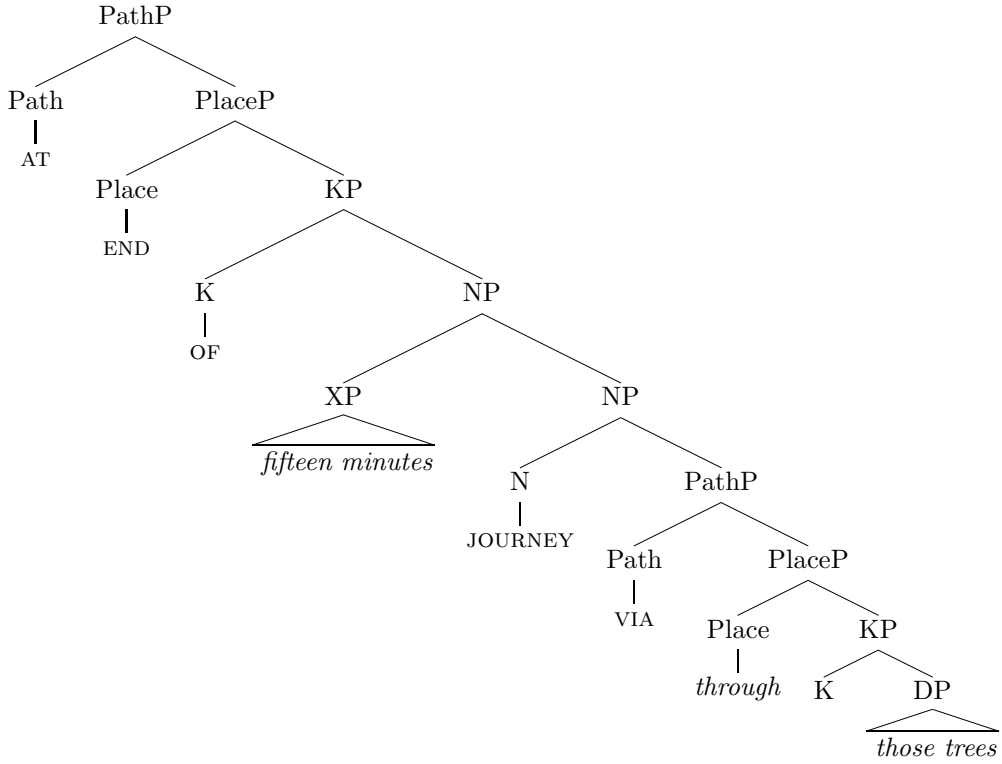
(51)



There may be reasons, however, to decompose this complex Path 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.

(52)



4.4. Path with Particles

The same Particles which combine with PlaceP (see §3.4) also combine with PathP composed of Place and *from* or null or overt *to*, as shown in (55), (56), and (57), respectively.[5]

(53) 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

(54) 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

(55) 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 Path heads of (58).

(56) 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.

(57) 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 *over behind the hill* is a path-denoting PathP, it can be turned into a Cresswellian

[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 (55) and (56).

location meaning 'at the end of a journey over behind the hill,' which by assumption involves a second PathP, which could then be selected by *from*, as above, or by a null TO, as below.[6]

(58) 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 PathP. What is at stake is whether the structure of a prepositional phrase is more like (61a), where subscripts are used to suggest that the two different Deg expressions are different, or like (61b), with recursion, where the subscripted numbers simply call attention to the different projections.

(59) a. [$_{\text{Deg}_{Path}\text{P}}$ right [$_{\text{PathP}}$ out [$_{\text{PathP}}$ from [$_{\text{Deg}_{Place}\text{P}}$ sixty meters [$_{\text{PlaceP}}$ over [$_{\text{PlaceP}}$ behind [$_{\text{KP}}$ [$_{\text{DP}}$ the hill]]]]]]]
b. [$_{\text{DegP}_2}$ right [$_{\text{PathP}_2}$ out [$_{\text{PathP}_2}$ from [$_{\text{DegP}_1}$ sixty meters [$_{\text{PathP}_1}$ over [$_{\text{PathP}_1}$ AT [$_{\text{PlaceP}}$ behind [$_{\text{KP}}$ [$_{\text{DP}}$ the hill]]]]]]]

Note, too, that with the structure in (61a) it is necessary to assume that Particles can adjoin either to Path or to Place projections, while in (61b) it is possible to assume that they adjoin only to PathP. I leave the matter open for now, turning to Particles in more detail in the next section.

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.

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

[6] I cannot rule out the possibility that the examples in (60) 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
d. **Down** from **up** above the dam came a boat
e. **Up** from **back** inside the cave came a boat

However, Particles quite freely express Path without any overt Path head, as already illustrated in (56) in the previous section, and in fact also freely express Path without any overt PlaceP.

(61) 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.

(62) 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.

(63) 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 locative expressions. Although locatives allow Particles as modifying elements (cf. §3.4), Particles cannot typically be the sole overt element in a locative PP (taking the complement of *from* in (66b) to be a locative PlaceP).[7]

(64) 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.

(65) a. She's off (*off shift*; or, *mistaken*)
b. He's up (*awake*)

[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.

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*)

(66) 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).

5.2. Degree with Particles

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

(67) 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.

(68) 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.

(69) 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.

(70) 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.

(71) 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 §3.5, between the omissibility of the Ground and the measurability of distance in PlaceP, as illustrated in (72) (repeated from (30) in §3.5).

(72) 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, 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.

I suggest that this pattern should be understood in comparison with the effects of various non-head elements on the telicity of the verb phrase.

(73) a. Silje ran.
b. Silje ran a race (in an hour).
c. Silje ran for fifteen minutes.

Standard telicity tests indicate that (75a) is atelic (**Silje ran in an hour*) while (75b) is telic (*Silje ran a race in an hour*). The example in (75c) also patterns as telic, though the *in an hour* test is inapplicable; no subpart of a running for fifteen minutes is also a running for fifteen minutes, so (75c) is heterogeneous in Krifka's sense, and therefore telic.

The parallel, then, is that just as adding either a (quantized) object or a time expression to an activity verb makes it telic, adding either a (possibly non-quantized) complement or a measure expression to a Particle makes it locative.

The connection to aspect recalls Higginbotham's (2001) distinction between accomplishment prepositions and achievement prepositions.

Borer (2004) formalizes the connection between quantization and telicity by postulating an aspectual head, Asp_Q, which licenses accusative case and bears an eventual variable $<e>$. A noun phrase in the specifier of Asp_Q has its accusative case checked and simultaneously (if it is quantized) binds the eventual variable, which fixes the aspectual interpretation. Non-quantized objects are compatible with a different aspectual head, corresponding to partitive case and imperfectivity.

If there is a similar case-licensing head in the prepositional phrase, then an overt noun phrase object might bind its eventual variable, fixing its 'aspect,' and a measure expression might similarly bind that variable.

Interestingly, many languages show a case distinction between locative and directional prepositions. For example,