

**A hierarchy of locations:
Evidence from the encoding of direction in adpositions and cases.¹**

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Abstract

The encoding of direction (place, goal, source, route) in systems of adpositions and local cases is not uniformly distributed over different locations (at, in, under), but can be shown to follow a hierarchical pattern. This pattern is compared with similar hierarchies proposed in the literature about the acquisition and typology of spatial language. Differences in semantic complexity and pragmatic salience between locations might explain why such a hierarchy exists.

Keywords: direction, space, adpositions, local case.

Languages make the basic spatial distinction between “position” and “destination” in a variety of ways. Even within the confines of the European continent we already find different ways of encoding the distinction between “being in” and “moving into”:

(1)	English:	<i>in the city</i>	<i>into the city</i>
	Norwegian:	<i>i byen</i> in city-DF	<i>inn i byen</i> into in city-DF
	Dutch:	<i>in de stad</i> in the city	<i>de stad in</i> the city in
	German:	<i>in der Stadt</i> in the.DAT city	<i>in die Stadt</i> in the.ACC city
	Greek:	<i>en tei polei</i> in the.DAT city.DAT	<i>ei ten polin</i> into the.ACC city.ACC
	Finnish:	<i>kaupungissa</i> city-INESSIVE	<i>kaupunkiin</i> city-ILLATIVE
	French:	<i>(rester) dans la ville</i> (stay) in the city	<i>(entrer) dans la ville</i> (enter) in the city

English extends the preposition *in* with *to* to derive the corresponding destination meaning, while Norwegian puts the directional adverb *inn* in front of the PP. In Dutch, changing the preposition *in* into a postposition changes the meaning from position to

destination. German uses the alternation between dative case (position) and accusative case (destination) on the noun phrase complement (here only visible on the determiner). Greek shows a similar case pattern, but in addition it changes the preposition itself, from *en* ‘in’ to *eis* ‘into’. Finnish, the only non-Indo-European language in this list, makes the distinction entirely through case marking on the noun, *kaupunki* ‘town’ with the inessive case suffix *-ssa* for ‘being in’ and the illative *-in* for ‘moving into’. French, finally, shows no distinction at all on the noun or in the preposition, but uses the same form *dans la ville*, leaving it to the verb to differentiate between position and destination.

The examples in (1) only show how directionality is encoded for one type of location: ‘in’. The question of this paper is what kind of patterns we see with other types of location, like ‘at’, ‘under’ or ‘between’. In other words, how are different types of formal encoding (additional adpositions, word order, case, ...) distributed over different locations? I will examine three types of data that suggest that encoding of direction follows a hierarchy of locations, going from locations that are more strongly marked for direction to locations that are more weakly marked for direction, with cut-off points that differ from language to language. The core of this hierarchy is shown in (2).

(2) AT < IN, ON < UNDER < BEHIND < FRONT

In Section 1 of this paper, I explain the necessary semantic background for making this inquiry. Then different encoding types are distinguished in Section 2. After that, we are ready to start to approach the hierarchy on the basis of English and Dutch (Section 3), governed case alternation in some Indo-European languages (Section 4), and local case systems (Section 5). Section 6 suggests one integral location hierarchy and Section 7 compares this hierarchy to similar locational hierarchies coming from acquisition research, grammaticalization studies, and typology.

1. The spatial structure of location and direction

It is common in analyses of both spatial adpositions and spatial cases to distinguish two dimensions or components that I call *location* and *direction* here.² The dimension of location (also called place, configuration, orientation, localiser) concerns the spatial relation between the Figure (moving or stationary) and the Ground, based on a variety

of geometrical and non-geometrical notions that are often represented with such primes as ON, UNDER, and BETWEEN. The dimension of direction (also called path, mode, modaliser) involves how the Figure moves with respect to the location, i.e. whether it starts or stops there, approaches it, passes through it, etcetera. Here we distinguish the three most important directions: SOURCE, GOAL and ROUTE (the term that I use for a path *via* a location).

Given these two dimensions we can analyze the English preposition *through* as a combination of the location IN and the direction ROUTE, indicating that *through* involves a path that has a point somewhere halfway intersecting with the interior of the Ground (see Zwarts 2005 for precise definitions). The preposition *into* is a combination of GOAL + IN, because the endpoint of the path is in the interior and the combination *from under* (in *from under the table*) is SOURCE + UNDER. The role of local cases can be analyzed in the same way. The Latin preposition *in* with the accusative (as *in civitatem* ‘into the city’) is GOAL + IN. When we turn to the Hungarian ablative suffix *-tól* (‘from’) we can analyze this as SOURCE + AT. The Avar subtranslative *-L’an* is ROUTE + UNDER (and perlocative cases in general involve the ROUTE direction).

We can see the two components in much of the nomenclature for local cases, where directional labels like ‘-directive’/‘-allative’ (GOAL) and ‘-relative’/‘-ablative’ (SOURCE) are combined with locational labels like ‘ad-’ (AT), ‘in-’ (IN), ‘super-’ (ON), ‘post-’ (BEHIND), etc. (Haspelmath 2006). In much work following Jackendoff (1983), these components are analyzed as functions in a semantic or logical representation, with directional (path) functions applying to the result of locational (place) functions. The + in such combinations as SOURCE + UNDER can then be understood as representing function composition from the mathematical point of view.

The existence of these two components leads to a spatial “matrix”, based on the cartesian product of a set of locations and a set of directions, shown in Table 1.

Table 1: Matrix of locations \times directions

	SOURCE	GOAL	ROUTE
AT	Hungarian ablative <i>-tól</i>
BEHIND
BETWEEN
IN	...	German <i>in</i> _{ACC}	English <i>through</i>
ON
UNDER	Avar subtranslative <i>-L'an</i>
...

Languages “fill in” this matrix (or at least part of it) in particular ways using adpositions and case markers, as well as adverbs, nouns and verbs. In this paper, I focus on the use of adpositions and case markers in a small set of languages and leave other grammatical categories out of consideration.

Before turning to that, some qualifications about the binary analysis in Table 1 are in order.

1) Location and direction are certainly not the only two dimensions that play a role in this spatial domain. Languages can incorporate many other additional distinctions in their system, like the deictic distinction between proximate/distal (in Tsez, Comrie and Polinsky 1998) or the aspectual dimension of bounded and unbounded paths (where the distinction between *to* and *towards* in English is made or between allative and versative, again in Tsez, Comrie and Polinsky 1998). Such distinctions are ignored here.

2) What we also leave out of consideration here are adpositions and case markers that can be called terminative or limitative and that involve the continuation of an activity or motion up to a certain point, as in English *until* and French *jusqu'à* (Beavers 2008, Beavers, Levin and Tham to appear). There are also adpositions and case markers based on a notion of approximation (‘towards’), like the versative case markers in Tsez (also called approximative, orientative, adversive, Haspelmath 2006).

3) Using ready-made locative notions like IN and UNDER for different languages has important limitations. As Levinson and Meira (2003) argue, languages don't simply map their adpositions (or other spatial markers) to a small set of universal primes like these. The cross-linguistic variation that we find between languages is too wide for such a simple view. However, as they point out, languages still seem to organize their locational concepts around certain areas in a multidimensional semantic space. So, with the appropriate care, we can still compare languages on the basis of locational notions like IN and UNDER.³

4) Notice that not every adposition can necessarily be decomposed along these two dimensions. The preposition *around*, for instance, but maybe also *across* and *along*, are not based on a simple intersection of a path with a particular location, but they involve properties of the whole path in relation to properties of the Ground (like shape, relative orientation and length of axes, etcetera, see Zwarts 2008a for discussion).

5) The decomposition assumed here is primarily semantic. In a lot of recent syntactic work (Koopman 2000; Van Riemsdijk and Huijbregts 2001; Den Dikken 2003; Svenonius 2004; Lestrade 2008b), direction and location are also separately represented in the syntactic structure, each with their own heads and projections. In such syntactic analyses, directional PPs have at least a Dir(ectional) and a Loc(ational) head, with Dir in a hierarchically higher position than Loc:

(3) [Dir [Loc DP]]

For the sake of concreteness, I also assume that there are two positions in the representation of directional phrases, Dir and Loc, but I do not wish to commit myself to the precise syntactic representation of those positions.

6) What kind of location is AT? AT should be taken as broader than the English preposition *at*. AT stands for general, unspecified location near, on, or in a reference object, in contrast to the more specific location that one finds with IN and ON, that necessarily refer to parts of the reference object (its "interior" or "surface"). So, AT is relevant with objects that have no interior or surface, or for which these spatial parts are not relevant. There can be special adpositions or case forms for AT location, but it is

important to realize that other adpositions and cases can also be used to express AT. Furthermore, I assume, following Levinson and Meira (2003) that when a language has forms for IN or ON in addition to AT, that the range of AT in that language gets restricted to what is not covered by IN or ON. So in principle AT can be taken as a universal category of general location, but in many languages this meaning will be partially blocked by more specific locations. See Levinson (2000) and Zwarts (2008b) for further elaboration of this idea.

7) Following Jackendoff (1983) and many other authors, I treat “stationary” locative phrases (like in *(be) under the table*) as having only a location component (UNDER in this case) and lacking a “static direction” component. This is not the only analytical option, and maybe ultimately not the most adequate one. Talmy (1985), for instance, treats stationary location as one of the values of his Path category and local case systems (but not adpositional systems) often shows synchronic or diachronic signs of this non-directional component (e.g. Finnish, see Note 4).

2. Encoding direction through adpositions and case markers

We now turn to the different ways in which the directional components, and more specifically the elements GOAL, SOURCE and ROUTE, are encoded in the form of adpositions or case markers for particular locations (like IN, UNDER, BETWEEN, ...). In order to get a clear perspective on this, we take the encoding of static position in a particular location LOC as a reference point and ask ourselves how GOAL + LOC, SOURCE + LOC and ROUTE + LOC are expressed in relation to position with LOC, where LOC = IN, UNDER, BETWEEN, etcetera. For example, what does the expression of GOAL + IN look like in relation to the expression of stationary IN or how is ROUTE + UNDER expressed in relation to position in the UNDER location?

Since the focus of this paper is on adpositions and case markers, one important locus for encoding spatial meaning is left out of the picture, namely through the verb or through particles or prefixes on the verb. How the verb complements what adpositions and cases do within or across languages is another big issue, which concerns Talmy’s well-known verb-framed/satellite-framed typology for directionality encoding (Talmy 1985, Beavers, Levin and Tham to appear, and many others).

In the domain of data that I am looking at in this paper, there seem to be at least six distinct ways in which direction can be encoded in the adposition/case domain: suppletion, marking, projection, government, reordering and identity.

Suppletion occurs when a particular direction is encoded by completely or partially replacing the encoding of the LOC form. In English (4a), the ROUTE counterpart of *in*, i.e. the encoding of ROUTE + IN, is *through*. In this case, the ROUTE direction requires replacement. This also happens in local case systems, like in Finnish (4b), where the locative inessive *-ssa* (IN) is replaced by the illative marker *-in* (GOAL + IN):⁴

(4)	a.	IN	ROUTE + IN
		<i>John is <u>in</u> the house.</i>	<i>John went <u>through</u> the house.</i>
	b.	IN	GOAL + IN
		<i>kaupungissa</i>	<i>kaupunkiin</i>
		city-INESSIVE	city-ILLATIVE
		‘in the city’	‘into the city’

The second way of encoding direction is through what I would like to call *marking*, which consists of the use of a directional morpheme tightly attached to the locative form, as an affix or a clitic. We have already seen the example of English *into*, where *to* is added to the locative preposition *in* to encode GOAL + IN. In Avar (Creissels 2009), different markers are added to the basic subessive case marker *-L'* for UNDER to express various directions:⁵

(5)	a.	<i>-L'</i>	UNDER, subessive
	b.	<i>-L'e</i>	GOAL + UNDER, sublative
	c.	<i>-L'a</i>	SOURCE + UNDER, subelative
	d.	<i>-L'an</i>	ROUTE + UNDER, subtranslative

Another example comes from Finnish, where many postpositions (as the Finnish grammars call them) are made up of a location part (often of nominal origin) and a part expressing direction through case markers. In (6) we find that the adessive marker of *alla* ‘at under’ is replaced by the ablative marker.

(6)	UNDER	SOURCE + UNDER
	<i>pöydän alla</i>	<i>pöydän alta</i>
	table-GEN under-ADESSIVE	table-GEN under-ABLATIVE
	‘under the table’	‘from under the table’

The encoding of direction can also be a separate word, as in the English and Dutch examples in (7).

(7)	UNDER	SOURCE + UNDER
a.	<i>under the sofa</i>	<i>from under the sofa</i>
b.	<i>onder de sofa</i>	<i>onder de sofa vandaan</i>
	under the sofa	under the sofa from-PRT
	‘under the sofa’	‘from under the sofa’

In (7a) the SOURCE direction is expressed through a separate prepositional projection. The same meaning in Dutch in (7b) is expressed by means of the postposition *vandaan*. I use the term *projection* for this third type of encoding. Another example is Norwegian *inn i byen* for ‘into the city’ with the adverb *inn* projecting GOAL.

Another type of directional encoding, through case *government*, is found in various Indo-European languages in the oblique - accusative opposition that we find on the noun inside a PP. Here is an example from German:

(8)	IN	GOAL + IN
	<i>in der Stadt</i>	<i>in die Stadt</i>
	in the.DAT city	in the.ACC city
	‘in the city’	‘into the city’

The dative and accusative cases in German are not local cases, but here they are used in a “local” way, to encode directionality. In Greek we see an example of two encoding mechanisms combined. GOAL+IN is encoded through government *and* suppletion:

(9)	IN	GOAL + IN
	<i>en tei polei</i>	<i>eis ten polin</i>
	in the.DAT city.DAT	into the.ACC city.ACC
	‘in the city’	‘into the city’

The fifth way of encoding direction distinguished here is through *reordering*, as in the Dutch examples in (10).

(10) a.	IN	GOAL + IN
	<i>in de stad</i>	<i>de stad in</i>
	in the city	the city in
	‘in the city’	‘into the city’
b.	IN	SOURCE + IN
	<i>in de stad</i>	<i>de stad uit</i>
	in the city	the city out
	‘in the city’	‘out of the city’

In (10a), the GOAL meaning of IN is encoded by changing the word order: a preposition becomes a postposition. Example (10b) shows a change in word order (preposition → postposition), accompanied by suppletion of the adposition (*in* → *uit*). The description of the encoding of the GOAL forms in these dynamic terms should not be taken literally. I don’t want to imply that the GOAL forms in (10) are somehow transformationally derived from the basic stationary forms by actually moving the preposition to a phrase-final position or changing *in* into *uit*. This is first of all a convenient way to describe the encoding of certain directions.

Finally, it is possible to leave the directionality unencoded, maintaining *identity* between the forms (adpositions or cases) for a location and a direction. Here is an example from English and one from Latin:⁶

(11) a.	UNDER	ROUTE + UNDER
	<i>(be) under the bridge</i>	<i>(pass) under the bridge</i>

b.	AT		SOURCE + AT
	<i>Athēnīs</i>	<i>(habitō)</i>	<i>Athēnīs</i> <i>(redēo)</i>
	Athens-ABL	live-1S.PRES	Athens-ABL return-1S.PRES
	'I live in Athens'		'I return from Athens'

Notice that in such cases the verb will typically carry the directional information. This is characteristic of verb-framed languages that have much of the direction (“path”) information in the verb, unlike satellite-framed languages that have such information in material outside the verb (Talmy 1985). English is categorized as a satellite-framed language, but, as (10a) shows, there are cases where the verb expresses the path.

Six general types of encoding can be distinguished then, with two poles: suppletion on one end and identity on the other end, with the four other encoding devices in the middle. A more systematic view of these encodings is possible when we assume that direction (Dir) and location (Loc) correspond to two abstract syntactic positions. The way these two positions are lexicalized in relation to each other is shown schematically in Table 2.

Table 2: Ways of encoding Dir + Loc

	<i>Dir</i>	<i>Loc</i>	<i>Example</i>	
Suppletion	=====		<i><u>through</u> the city</i>	
Marking	-----		<i><u>into</u> the city</i>	
Projection	==	==	<i><u>from</u> under the sofa</i>	
Government	. .	==	<i>in <u>die</u> Stadt</i>	(German)
Reordering	. .	==	<i>de stad <u>in</u></i>	(Dutch)
Identity		==	<i>(pass) under the bridge</i>	

In this table === refers to a single morpheme. With suppletion, Dir and Loc are lexicalized in one unanalyzable morpheme. In the case of marking we can discern two different morphemes, but these morphemes are closely tied together in one word. That is what the --- represent. When direction is projected there are definitely two separate words corresponding to Dir and Loc. Government and reordering are special cases. There is no separate morpheme for Dir, but still Dir is expressed in another morphosyntactic way, namely by special syntactic requirements on the noun phrase

complement of the preposition. The noun phrase either receives a particular case or it has to occupy a special position. That is what the dots . . stand for. Finally, identity is an encoding type that clearly leaves the Dir position unexpressed in the adposition/case domain.

What we see in Table 2 then, is a kind of partial scale of directional encoding mechanisms, ranging from suppletion on one end to identity on the other end. The hierarchy is a combination of two informal, related, properties: the “overtness” of *directionality* encoding and the “integration” of *location* encoding.

Expressing direction through explicit lexical material (*through, -to, from*) is more overt than expressing it through non-lexical grammatical means (case government, word order) and these grammatical means are more overt, of course, than complete absence of direction encoding (in the case of identity). This then motivates the following partial ordering of encoding types: { suppletion, marking, projection } > { government, ordering } > identity.

This criterion does not help us to order suppletion, marking and projection with respect to each other. When we look at what happens with Loc, we can say that in the case of suppletion (*through*) it is more integrated than with marking (*into*), which in turn is more integrated than projection or the other encoding types. This motivates the partial ordering: suppletion > marking > projection > { government, ordering, identity }.

I argue that these two factors combine to define a hierarchy of what I will informally refer to as the “strength” hierarchy of directionality encoding given in (12a), which is based on the definition in (12b). Note that the government and reordering encodings in (12a) are not ordered with respect to each other.⁷

- (12) a. Suppletion < Marking < Projection < { Government, Reordering } < Identity
 b. Definition: For two encoding types E and E', E precedes E' in the hierarchy if and only if the encoding of Dir in E is at least as overt as in E' and Loc in E is at least as integrated in Dir as in E'.

This is not a definition based on a formal analysis of the different encoding types for the Dir+Loc combination within some model of grammar. However, it does give an independent formulation of the idea that in this domain suppletion and identity are the extremes of a coherent hierarchy of “strength” of directionality encoding. The scale in (12) is partially reminiscent of the type of clines that are found in grammaticalization

studies, “a unidirectional progression in bondedness, that is in degree of cohesion of adjacent forms that goes from loosest (“periphrasis”) to tightest (“morphology”)” (Hopper and Traugott 2003:7). However, at the same time, it should be distinguished from the noun-to-affix cline that we also find in the grammaticalization literature (Hopper and Traugott 2003:110) and that, roughly speaking, goes from nouns, via adpositions, to case affixes (see Lestrade 2008b about the relevance of this grammaticalization cline for understanding the division of labor between adpositions and cases). The scale in (12) is category-neutral and generalizes over adpositions and case affixes.

The question of this paper is how the six encoding types that we presented in this section are distributed over the “space” of meanings that we discussed in Section 2. There are two aspects of this question, corresponding to the two dimensions of this space, direction and location, but I concentrate on the location side only.⁸ How do the different locations, like IN, UNDER, and BETWEEN, *align* with the directional encoding types in (12)? In other words, can we use (12) to induce an ordering on the locations? I will approach this question by deriving separate hierarchies for three different areas: adpositions in English and Dutch, case alternation in Indo-European PPs, and local case systems. After that I show that these different hierarchies converge, pointing to what might be one common pattern in the data.

3. Encoding direction in English and Dutch

Let us first take a closer look at the situation in English, to see how encoding types are distributed over the scale of locations there. My starting point here is the classical analysis of Bennett (1975), which is one of the most complete analyses of the English prepositional system (as far as the interplay between location and direction is concerned) and which has also been very influential for later work on prepositional semantics and syntax. On the basis of Bennett’s analysis, we can set up the partial overview of the English system shown in Table 3.

Table 3: English adpositional system

		SOURCE	GOAL	ROUTE
AT	<i>at</i>	<i>from</i>	<i>to</i>	<i>via</i>
IN	<i>in</i>	<i>out of</i>	<i>in(to)</i>	<i>through</i>
ON	<i>on</i>	<i>off</i>	<i>on(to)</i>	<i>over, across?</i>
NEAR	<i>by</i>	<i>from by</i>	<i>by</i>	<i>by, past</i>
OVER	<i>over</i>	<i>from over</i>	<i>over</i>	<i>over</i>
UNDER	<i>under</i>	<i>from under</i>	<i>under</i>	<i>under</i>
BEHIND	<i>behind</i>	<i>from behind</i>	<i>behind</i>	<i>behind</i>
FRONT	<i>in front</i>	<i>from in front</i>	<i>in front</i>	<i>in front</i>

For extensive argumentation of this table I have to refer to Bennett's book. Here I give examples for two rows (IN and UNDER) that illustrate how the four relevant meanings for a particular location relate to each other (examples adapted from Bennett 1975:19, 51):⁹

- (13) a. *Gwyneth is in the kitchen.* (IN)
 b. *Gwyneth walked out of the kitchen.* (SOURCE + IN)
 c. *Gwyneth walked into the kitchen.* (GOAL + IN)
 d. *Gwyneth walked through the kitchen to the hall.* (ROUTE + IN)
- (14) a. *The dog is under the table.* (UNDER)
 b. *The dog emerged from under the table.* (SOURCE + UNDER)
 c. *The dog ran under the table.* (GOAL + UNDER)
 d. *The dog ran under the table to the door.* (ROUTE + UNDER)

I am leaving out a few prepositions here discussed by Bennett (*above, below, inside, outside, in back of*) as well as some that Bennett does not discuss (e.g. *near, between, beside(s), against*). There is one slot for which Bennett did not find appropriate candidates: ROUTE + ON. *Over* and *across* (and maybe *along*) could be candidates here, although, as Bennett points out, these prepositions do not necessarily imply ON. For me the important point is that they *can* express the meaning ROUTE + ON, even though they also express other meanings. This phenomenon of *syncretism* of adpositional meanings cuts across the patterns of directional encoding that we are interested in here. Notice that I am treating *in/on* and *into/onto* as alternative encodings

for the same GOAL + IN/ON combination, which is not meant to imply that there are no real differences in their semantics and distribution that go beyond this simple binary decomposition (see for instance Gehrke 2008; Nikitina 2008)

The analysis of the AT row is too simple in at least one important respect. Other prepositions, notably *in* and *on*, and maybe *by*, can also be used for AT location, and as a result, alternate with *from*, *to*, and *via*. An example of this is found in the series *in New York, to New York, from New York, via New York*.¹⁰

Let us assume that Table 3 truthfully represents the most important part of the English system of prepositions. Now the question is how the directional prepositions encode their directionality relative to their locative base. Recall from Section 2 the encoding scale in (12):

(12) Suppletion < Marking < Projection < Government, Reordering < Identity

On the basis of this hierarchy, we can construct a hierarchy of locations that looks as follows:

(15) AT < IN, ON < NEAR < BEHIND, FRONT, OVER, UNDER

In the hierarchy in (15), if $X < Y$ and D is a direction, then the encoding of $D + X$ is at least as strong as the encoding of $D + Y$, given (12). For example, if SOURCE + NEAR is encoded through marking, then SOURCE + IN, SOURCE + ON, and SOURCE + AT must be encoded by marking or suppletion (stronger, or equally strong encodings), but not by projection, government, reordering or identity (weaker encodings). This is spelt out in Table 4 for the three directionalities (abbreviated as S, G, and R here).

Table 4: Hierarchy of locations in the English adpositions

	AT <	IN, ON <	NEAR <	BEHIND, FRONT, OVER, UNDER
S	Supp	Supp	Project	Project
G	Supp	Mark/Ident	Ident	Ident
R	Supp	Supp	Supp/Ident	Ident

The directional forms of AT are always encoded through suppletion (*from*, *to*, *via*). IN and ON use suppletion for SOURCE (*out of*, *off*) and ROUTE (*through*, *over*), but they

accomplish their GOAL encoding through marking (*into, onto*) as well as identity (*in, on*). At the bottom of the hierarchy is a group of four prepositions that project SOURCE, but leave GOAL and ROUTE unencoded. NEAR comes in between IN, ON and the bigger group to the left (because of the suppletive encoding of ROUTE, through *past*). Notice that in none of the three rows weaker encoding precedes stronger encoding, assuming the a priori order in (12). This is then the way in which the encoding of direction follows a hierarchy of locations, not for all directions taken together, but for a particular direction.¹¹

The adpositional system of Dutch is more complicated than that of English in a number of respects, but it seems to use the same hierarchy. There are special postpositions (like *vandaan* and *af*) and there are prepositions that also appear as postpositions (see Helmantel 2002 for an extensive overview). Furthermore, while Dutch lacks a counterpart of English *at*, it has two prepositions corresponding to ON: *op* and *aan*. Unfortunately, there is no semantic analysis of Dutch adpositions similar to that of Bennett (1975) for English, so what I am offering in Table 5 is my own tentative and partial overview of the situation, based on the existing literature.

Table 5: Dutch adpositional system

		<i>SOURCE</i>	<i>GOAL</i>	<i>ROUTE</i>
AT	<i>aan, in, op</i>	<i>van, uit</i>	<i>naar</i>	<i>via, langs</i>
IN	<i>in</i>	<i>uit_{pre/post}</i>	<i>in_{pre/post}</i>	<i>door_{pre/post}</i>
ON	<i>aan, op</i>	<i>van(af), af_{post}</i>	<i>aan,</i> <i>op_{pre/post}</i>	<i>over_{pre/post}</i>
NEAR	<i>bij</i>	<i>bij ... vandaan</i>	<i>bij</i>	<i>langs_{pre/post}</i>
OVER	<i>boven</i>	<i>van boven</i> <i>boven ... vandaan</i>	<i>boven</i>	<i>over_{pre/post}</i>
UNDER	<i>under</i>	<i>van onder</i> <i>onder ... vandaan</i>	<i>onder</i>	<i>onder ... door</i>
BEHIND	<i>achter</i>	<i>van achter</i> <i>achter ... vandaan</i>	<i>achter</i>	<i>achter ...</i> <i>langs</i>
FRONT	<i>voor</i>	<i>van voor</i> <i>voor ... vandaan</i>	<i>voor</i>	<i>voor ... langs</i>

For AT location, some of the other prepositions do double duty (*in, op, aan, bij*, another instance of syncretism along the vertical dimension). The two ON prepositions *aan* and *op* are not distinguished here; see Bowerman and Choi (2001) and especially Zwarts (2007) for more discussion. Furthermore, there is considerable dialectal and other variation which I had to ignore here. One observation that is worth mentioning here is that, according to Helmantel (2002:178), in southern Dutch and Flemish dialects *onder* ‘under’ is found postpositionally.

We see the same hierarchy of locations in (15) again in Dutch:

Table 6: Hierarchy of locations in the Dutch adpositions

	AT	< IN, ON	<	NEAR	<	BEHIND, FRONT, OVER, UNDER
S	Supp	Supp		Project		Project
G	Supp	Reord/Ident		Ident		Ident
R	Supp	Supp(+Reord)		Supp		Supp/Project

Notice, however, that although Dutch has the same hierarchy, it distributes its encodings in slightly different ways over this hierarchy. The clearest difference is that ROUTE is always explicitly encoded in Dutch (but never exclusively through identity). Like in English, NEAR in Dutch occupies a position between IN, ON and UNDER, BEHIND, FRONT, OVER: it shares the suppletive ROUTE encodings with the first group and the SOURCE and GOAL encodings with the second group.

Before we continue, it is interesting to briefly compare English and Dutch to two languages with much less marking. As is well known, in French, GOAL is left largely unencoded in the prepositional system (except for approximative *vers* and terminative *jusqu'à*, which I take to have a different status from the real GOAL prepositions). This means that encoding through identity ranges all the way across the hierarchy for GOAL. SOURCE and ROUTE, however, have their typical encodings in French, through suppletion (e.g. *par* for ROUTE + IN) and projection (e.g. *de derrière* for SOURCE + BEHIND and *par-derrière* for ROUTE + BEHIND). In many sub-Saharan languages, there is even less directionality encoded in the adpositional system. The postpositions in the Mande language Wan only express location, leaving the encoding of GOAL and SOURCE entirely to verb (Nikitina 2009). In this case, identity is the encoding type, all along the scale for these two directions and probably also for ROUTE (which Nikitina does not discuss).

4. Case government and GOAL encoding in Indo-European

We already mentioned the role of case marking in combination with prepositions. Instead of giving the table for one case-marking language now (say German), like I did for English and Dutch, I consider the way case government is used for encoding GOAL in a small sample of Indo-European languages. Among Indo-European languages case marking inside PPs is used to express directionality, especially through the alternation of accusative (for GOAL) with oblique cases (for static location). Such an alternation seems to be quite unique to Indo-European.¹² Recent discussions of this alternation, from various perspectives, can be found in Luraghi (2003), Den Dikken (2003), Van Riemsdijk (2007), Caha (2007), Asbury (2008), Gehrke (2008), and Lestrade (2008a). Lestrade, for instance, connects the accusative case to the higher transitivity (in the sense of Hopper and Thompson 1980) of goal and route adpositions in comparison to place and source adpositions. Whatever the historical origins and deeper explanations of the alternation might be, the question that I would like to ask here is what locations are involved in this alternation and also how this encoding strategy complements other encoding strategies. When we look at a small set of Indo-European languages then we can list the prepositions that show a meaningful alternation between an oblique case (dative, instrumental or locative) for static location and accusative for GOAL, as shown in Table 7. It turns out that the class of prepositions involved in this alternation varies considerably between languages, with German as an extremely rich language in this respect and Latvian as quite limited. In comparison with the Dutch and English situation of Section 3, BESIDE and BETWEEN enter the picture because of Polish and German, but NEAR disappears, because none of the languages included here shows the relevant case alternation with NEAR. I will come back to the status of AT towards the end of this section.

Table 7: Alternating case government in 6 Indo-European languages

	ON	IN	UNDER	OVER	BEHIND	FRONT	BETWEEN	BESIDE
Latvian	<i>uz</i>	<i>uz</i>						
Latin ¹³	<i>in</i>	<i>in</i>	<i>sub</i>	<i>(super)</i>				
Icelandic	<i>á</i>	<i>í</i>	<i>undir</i>	<i>yfir</i>				
Russian	<i>na</i>	<i>v</i>	<i>pod</i>		<i>za</i>			
Polish	<i>na</i>	<i>w</i>	<i>pod</i>	<i>nad</i>	<i>za</i>	<i>przed</i>	<i>między</i>	
German	<i>an</i> <i>auf</i>	<i>in</i>	<i>unter</i>	<i>über</i>	<i>hinter</i>	<i>vor</i>	<i>zwischen</i>	<i>neben</i>

From this set of data we can construe the implicational ordering in (16).

$$(16) \text{ IN, ON} < \text{ UNDER} < \begin{matrix} \text{BEHIND} \\ \text{OVER} \end{matrix} < \begin{matrix} \text{BETWEEN} \\ \text{FRONT} \end{matrix} < \text{ BESIDE}$$

If a language encodes GOAL + LOC_{*i*} through accusative case, then it also encodes GOAL + LOC_{*j*} in this way for every LOC_{*j*} that precedes LOC_{*i*} in the hierarchy (with LOC_{*i*} and LOC_{*j*} used as variables over ON, IN, UNDER, etc.). Since this pattern is based on a small set of data, we should not put too much weight on the details. We are interested here in exploring general patterns that emerge from converging data sets. One of the problematic aspects that deserves further study is the problematic status of OVER in Russian and its implications for the way this hierarchy is formulated.

However, a more general thing that is missing from (16) is AT, the location that came first in English and Dutch. Some languages might extend IN/ON prepositions to the AT location, but in general, there is a puzzling fact about the directional case alternation: it does not seem to involve specialized (GOAL +) AT prepositions. In German, for instance, the prepositions *zu* and *nach* (both meaning ‘to’) govern dative case and not accusative case, even though they are clearly GOAL prepositions. However, this puzzle becomes more natural as soon as we look at it from the perspective of the encoding scale in (12). With *zu* and *nach* in German, GOAL is not encoded through case government, but instead a *stronger* encoding is used, involving suppletion of the preposition itself. Coming from a different angle of argumentation, Noonan (2007) and Caha (2007) suggest that *zu* is the directional counterpart of *bei*, as shown in the examples like those in (17).

(17)	AT		GOAL + AT
	<i>Wir sind bei ihm</i>		<i>Wir gehen zu ihm</i>
	we are at him.DAT		we go to him.DAT
	‘We are at his place’		‘We go to his place’

The GOAL encoding of *bei* is not accomplished through accusative case government, but by replacing *bei* with *zu*, just like *to* in English replaces *at*. Something similar is seen in Slavic languages, where paths to and from a human being are expressed by specialized prepositions, i.e. by replacing the locative preposition and not by changing the case on the noun phrase (Clancy 2006), as shown in Table 8.

Table 8: Suppletive encoding patterns in Polish and Russian

	AT	SOURCE +AT	GOAL + AT
Polish	<i>u</i> _{GEN}	<i>od</i> _{GEN}	<i>do</i> _{GEN}
Russian	<i>u</i> _{GEN}	<i>ot</i> _{GEN}	<i>k</i> _{DAT}

Thus, in the GOAL encoding patterns of Indo-European languages we typically first find prepositional suppletion for AT, then case government for different portions of the hierarchy, and finally identity for the remaining locations, in a way that follows the hierarchy in (18):

(18)	AT	<	IN, ON	<	UNDER	<	BEHIND	<	BETWEEN	<	BESIDE
							ABOVE	<	FRONT		

An interesting additional aspect of the location hierarchy might be found in the distribution of oblique cases that languages use to express static location with prepositions, as suggested in Gehrke (2008:134) and by Pavel Caha (personal communication). In Czech, we find genitive case with AT prepositions (*u* and *při*), prepositional case with IN (*v*) and ON (*na*), and instrumental with the other locations. This suggests that the particular oblique, non-directional case that a preposition governs also follows the hierarchy, in the sense that there is an ordering of oblique cases (genitive < prepositional < instrumental) that aligns with the location hierarchy (see

Caha 2007 for an independently motivated hierarchy of cases that might shed light on this).

Although we have to leave the complicated case patterns of classical Greek for a later occasion (see Luraghi 2003), the Greek example in (9) deserves to be repeated here:

(9)	IN		GOAL + IN
	<i>en</i>	<i>tei</i>	<i>polei</i>
	<i>eis</i>	<i>ten</i>	<i>polin</i>
	in	the.DAT	city.DAT
			into the.ACC
			city.ACC
			‘into the city’
			‘in the city’

It illustrates that suppletion in GOAL encoding is not restricted to AT, but that it can extend further down the hierarchy too: GOAL + IN is encoded by replacing *en* by *eis*.¹⁴ This illustrates the need for a scale of locations over which languages distribute their encoding mechanisms in a gradual way. A rigid typology of locations (e.g. universally linking GOAL + AT with suppletion encoding and GOAL + IN/ON with weaker encodings) cannot account for the patterns that we find, given Greek *eis* and French *à*.

5. Local case systems

Across the world, languages also use case markers as independent expressions of spatial information, as so-called local cases. Some languages have only one series of basic locative cases (locative, ablative, allative, like Warlpiri or Basque), others have two or up to seven series, for different locations, like Uralic and Caucasian languages, leading to rich case systems. Such local case systems raise various questions for the typology and semantics of space. One important question, addressed in Lestrade (2008b) but not discussed here, concerns the division of labor between adpositions and cases in one language. He argues that adpositions mainly express configurational notions, while local cases are used for directionality. Coming from a different direction, for me the question is whether something like the location hierarchies that we already saw is also found in the locations (configurations) that appear in local case systems. The outcome, as we will see, converges with Lestrade’s proposal.

If we look at the inventory of local cases in a particular language, say Finnish, in Table 9 (from Comrie and Polinsky 1998), then the relevant question for us is what locations are involved in these cases.

Table 9: Finnish local case suffixes

inessive	-ssa
illative	-hVn
elative	-sta
adessive	-lla
allative	-lle
ablative	-lta

As Comrie and Polinsky and others have shown, these locative notions are IN (the underlying location for inessive, illative and elative) and ON (the underlying location for for adessive, allative and ablative). Languages with richer case inventories typically involve more locations, like Avar (Creissels 2009:617), in Table 10, which is based on ON, AT, UNDER and two varieties of IN (IN₁ is ‘in dense space’ and IN₂ is ‘in empty space’).

Table 10: Avar local case suffixes

	ON	AT	IN ₁	UNDER	IN ₂
location	-da (superessive)	-q (apudessive)	-t (interessive)	-L' (subessive)	- (inessive)
destination	-de (superlative)	-qe (apudlative)	-te (interlative)	-L'e (sublative)	--e (illative)
source	-dasa (superrelative)	-qa (apudelative)	-ta (interrelative)	-L'a (subrelative)	-sa (inelative)
path	-dasan (supertranslative)	-qan (apudtranslative)	-tan (intertranslative)	-L'an (subtranslative)	-san (intranslative)

We can then look at various local case systems and extract the locations for which these languages encode directions (especially GOAL and SOURCE) in distinction from static location. In the Tabasaran and Tsez lines, ON_H is location on a horizontal surface, ON_V on a vertical surface.¹⁵

Table 11: Locations with dedicated local case marking in 7 languages

Language	Locations
Basque	AT
Finnish	ON, IN
Hungarian	AT, ON, IN
Avar	AT, ON, IN ₁ , IN ₂ , UNDER
Lezgian	AT, ON, IN, UNDER, BEHIND
Tabasaran	AT, ON _H , ON _V , IN, UNDER, BEHIND, AMONG, NEAR/FRONT
Tsez	AT, ON _H , ON _V , IN, UNDER, AMONG, NEAR

In general, the location labels are taken over from the literature mentioned in Note 15. For Basque, I put AT as the underlying location, even though this location also covers ON and IN meanings, something which is probably also true for other languages with one series of local cases.¹⁶ Notice that Finnish only has specific local cases for ON and IN, but these also have AT uses. Labels like AT, ON and IN are directly taken over from the descriptive literature, but it is clear that a systematic semantic comparison would be needed to solidify the picture in Table 11.

What we see in Table 11 is that the availability of local cases for particular locations grows in languages along the implicational ordering in (19).

$$(19) \quad \text{AT} < \begin{matrix} \text{IN,} \\ \text{ON} \end{matrix} < \text{UNDER} < \begin{matrix} \text{BEHIND} \\ \text{AMONG} \end{matrix} < \begin{matrix} \text{NEAR,} \\ \text{FRONT} \end{matrix}$$

If a language encodes GOAL or SOURCE by local case for a particular location LOC_{*i*}, then it does so for every LOC_{*j*} earlier on the scale. Notice that this does not exclude syncretisms, like the Finnish “ad-” and “in-” series also being used for AT.

If a language uses local cases for encoding directionality over the first part of the scale, then it will use weaker forms of encoding for the other locations, typically series of denominal postpositions (representing the location) with case markers encoding the directionalities, as shown in (6) for Finnish with *al-* meaning ‘under’. What we see here confirms Lestrade’s (2008b) proposal that in languages with both local cases *and* adpositions, the local cases specify directionality, while the adpositions describe pure locations.

6. A hierarchy of locations

Let us take stock now of the three scales we have induced in the previous three sections:

(20) Adpositions in English and Dutch (various encodings)

AT < IN, ON < NEAR < BEHIND, FRONT, OVER, UNDER

(21) Oblique/accusative case (government encoding)

AT < IN, ON < UNDER < BEHIND < BETWEEN < BESIDE
OVER < FRONT

(22) Local case (suppletion encoding)

AT < IN, ON < UNDER < BEHIND < NEAR,
AMONG < FRONT

Each of these scales is derived by ordering the locations with respect to particular encoding types for directionality. In (20) the ordering is determined by strength of directional encoding, in (21) by the likelihood of case alternation for GOAL encoding, and in (22) by the likelihood of being encoded by a local case. These scales seem to converge on a basic pattern: common to all of them is the hierarchy AT < IN, ON < rest. Beyond that we can learn from case marking systems that UNDER has a special status in directionality encoding and that BEHIND has priority over FRONT in the encoding of directionality.

There are two ways to go from here. We could say that the data on directionality encoding give us slightly different hierarchies, probably based on differences between the way adpositions and cases work. In a sense, there is not one unique and “correct” location hierarchy, because these hierarchies are analytical tools for probing the data.¹⁷ Another option is to extract what seems to be common to the above hierarchies. If we ignore NEAR, BETWEEN/AMONG and OVER for the time being and take UNDER to have a special status, apart from the other projective locations, then the location hierarchy in (23) emerges:

(23) AT < IN, ON < UNDER < BEHIND < FRONT

However, the omission of NEAR and other locations from the hierarchy would require some motivation, based on a deeper analysis of locations such as NEAR. For the moment, we can conclude that there are different, conflicting hierarchies, sharing a common partial ordering of locations.

What would such a hierarchy (or a cluster of such hierarchies) mean? Like I already said, constructing a hierarchy is a way to explore a particular empirical domain and discover patterns in the data. The location hierarchy is not a theoretical construct intended to *explain* how languages organize their directionality encoding. It is a particular way of summarizing how languages tend to do it. One thing that becomes clearer in this way is that the encoding of directionality in adpositions and cases system is not consistent across all directions and locations. Every strategy for encoding directionality is always restricted, both with respect to locations and with respect to directions. In other words, it is not one general parameter that can be turned on and off for languages. On the other hand, the way directionality is encoded is subject to regularities and one of these regularities takes the form of a location hierarchy. The hierarchy shows the scalar way in which directionality is encoded. There are not two clearly separated blocks of locations with respect to directionality encoding, e.g. between the so-called topological locations AT, ON, IN and the so-called projective locations, such as UNDER, OVER, BEHIND.¹⁸ There is a cline, in which UNDER, for instance, is in between IN and ON on the one hand (topological) and BEHIND (projective) on the other hand, and in which AT is distinguished from IN and ON.

7. Comparison to other locative hierarchies

There are several other hierarchies and scales in the literature that involve locations and that can help us to put the location hierarchy in a broader perspective and that might point the way to potential explanations. I am going to look at four such hierarchies, the first two of which turn out to be less relevant, while the last two suggest a tentative explanation of the directionality encoding hierarchy.

The first hierarchy comes from the grammaticalization literature. Heine et al. (1991:130) present a hierarchy that looks as follows (in a slightly adapted form):

(24) UNDER < ON, IN < FRONT < BACK

This hierarchy expresses the idea that locations in the leftward direction tend to derive from landmarks (e.g. ‘earth’), while locations to the right from body parts (like ‘buttock’ or ‘face’). More precisely, if a location is derived from the body part model, then so is every location to the right of it. Again, we see the special status of UNDER, more closely related to ON and IN than to the projective locations, but on the whole the hierarchy is too different (and too restricted) to support the idea that the etymological source of a location might be responsible for the way it encodes its directional varieties. On the other hand, as I already mentioned in Section 2, the location hierarchy does have an important connection with grammaticalization in general. The higher part of the scale seems to be expressed by more grammaticalized forms than the lower part of the scale.

Bowerman and Choi (2001:485) present a non-directed scale of static topological location situations that goes from clear support (ON) on one side to clear containment (IN) on the other side, with situations of attachment and adhesion in between. In the languages they studied, a term was always used for a coherent part of the scale. This scale is not directly relevant for the domain of directionality encoding, but rather to the instances of syncretism that we saw throughout the paper. It is important to stress here that the location hierarchy does not describe patterns of syncretism or polyfunctionality, like the scale of Bowerman & Choi and other semantic maps (Haspelmath 2003), but implications about the use of encoding strategies.

The third hierarchy of location concepts that is relevant to the findings of this paper comes from the study of acquisition. In a classical study on the order in which locative prepositions are learned by children in four different languages (English, Italian, Serbo-Croatian and Turkish), Johnston and Slobin (1979), present the partial hierarchy of locative adpositions in (25), which is actually very similar to the directionality encoding hierarchy. What I have called BEHIND is called BACK here. In this hierarchy, a distinction is made between two different uses of the adpositions for FRONT and BACK: FRONT_f and BACK_f refer to intrinsic uses (based on intrinsic features of the reference object), FRONT and BACK without these subscripts refer to the relative use (based on a deictic perspective point).

(25) IN, ON, UNDER, BESIDE < BETWEEN, FRONT_f, BACK_f < FRONT, BACK

There are three blocks of adpositions, which are acquired in the order indicated in these languages, but within which languages show variation.

Johnston and Slobin hypothesize that two general factors are responsible for this universal order: increasing *cognitive complexity* of the underlying spatial concepts from left to right and decreasing *salience* down along the hierarchy. They assume (building on Piaget & Inhelder 1967, for instance) that topological notions (containment, support, occlusion) are acquired before projective notions (orientations, distances) because they are conceptually less complex. In this sense the hierarchy reflects conceptual growth. However, two locations can still be equally complex, but still be different in salience. BACK is taken to be more salient than FRONT, because it is more important to be able to ask and explain about objects that are not visible because they are behind something. The same, presumably, holds for UNDER in comparison to OVER. The earlier acquisition of BACK with respect to FRONT is actually confirmed in Abkarian (1983) and Johnston (1984) and much other work on the order in which children acquire adpositions. Even though the acquisition hierarchy is clearly different from the location hierarchy constructed in this paper, it is natural to assume that the same factors of cognitive complexity and communicative salience play a role in both domains.

Finally, another highly relevant locational hierarchy is presented by Levinson and Meira (2003:510):

(26) AT < IN < $\begin{matrix} \text{ON} \\ \text{UNDER} \end{matrix}$ < $\begin{matrix} \text{ON-} \\ \text{TOP} \end{matrix}$ < ATTACHED < INSIDE < $\begin{matrix} \text{SPIKED} \\ \text{HANGING} \\ \text{DISTRIBUTED} \\ \text{OVER} \end{matrix}$

This is first of all an implicational hierarchy about the inventory of adpositions in a sample of 9 languages. If a language has an ON-TOP adposition, then it also has an ON adposition, for instance. At the same time, as Levinson and Meira point out, the hierarchy orders the more grammatical (“less nominal”) adpositions at the beginning and the less grammatical (“more nominal”) adpositions further down the hierarchy. Adpositions are more nominal when they still show morphosyntactic traces of a nominal origin. Even though there are some “exotic locations” on this scale, we can see important similarities with the hierarchies derived in this paper.

Levinson and Meira work out the hierarchy in a “dynamic” way. A general location AT is successively “fractionated” into ever more specific locative categories in

the historical development of a language, based on universal prototypes. ON-TOP is then a refinement within the already existing ON category. In fact, this fractionation seems compatible with the factors of cognitive complexity and communicative salience that Johnston and Slobin proposed. More specific categories add cognitive complexity (because they draw on additional geometric or force-dynamic properties of a relation between two objects). The appearance of such a category at a particular point in the hierarchy is motivated by its greater communicative salience relative to categories later in the hierarchy.

This then leads to the following tentative explanation for the hierarchical structure that we see in directionality encoding. We found stronger encoding of direction for the location categories that in Johnston and Slobin and Levinson and Meira are developmentally and historically more basic and more salient or prototypical. The reason is that if a location is more salient and more basic relative to other locations, then this will also be true for directions to, from or via that location. Distinguishing GOAL, SOURCE and ROUTE will first of all be relevant for the most basic locations and require stronger encodings for those encodings.

8. Conclusion

We have seen that the encoding of directionality (goal, source and route) in a small set of adpositional and case systems is subject to a hierarchy of locations, ranging from more general or topological notions (with directions encoded in a “tighter”, more grammaticalized way) to more specific, complex, projective notions (with directions encoded in a “looser”, less grammaticalized way, or left unencoded). The study is based on a relatively small sample of data, the details of which are not always clear. Obviously, it is important to broaden and deepen the empirical basis of the hierarchy.

Similar hierarchies of locations are found in order of acquisition and in the structure of adpositional inventories. A hierarchy is a particular way of describing an empirical pattern, it is not a theoretical construct. As such it requires an explanation in terms of independent properties of locations. Two relevant properties emerge from the literature: (i) the cognitive complexity or relative specialization of a location, (ii) the salience or frequency of a location in communication. How exactly these two potential factors operate to shape systems of cases and adpositions, leading to the hierarchical structures that are found, is a question for future research, that would have to take into

account the way language systems are historically shaped through the interaction of communicative and cognitive factors.

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² See, for instance, Bennett (1975), Jackendoff (1983), Comrie and Polinsky (1998), Van Riemsdijk and Huijbregts (2001), Kracht (2002), Creissels (2006, 2009), Lestrade (2008b).

³ It is also possible to construct a spatial matrix of concrete and specific spatial situations (represented as pictures or movies) to elicit examples with adpositions and case markers that can then be compared along the lines suggested here. In other words, the use of locative primes like IN and UNDER or GOAL and SOURCE is not essential for this study.

⁴ The relation between *kaupungissa* and the elative *kaupungista* ‘from the city’ can be analyzed as exhibiting suppletion of a directional component (*-sa* → *-ta*). Historically, the Finnish inessive is *-s-sa* and the elative *-s-ta*, with *-s* corresponding to IN, *-sa* to static location, and *-ta* for SOURCE (see Kracht 2002 and Lestrade 2008b for relevant discussion).

⁵ The ROUTE cases seem to be derived by the addition of the morpheme *-n* to the encoding of GOAL, a interesting fact that I will have to ignore here.

⁶ The Latin example is taken from Blake (2004).

⁷ As an anonymous reviewer points out, the “strength” hierarchy might also correlate with the distinction between head marking (suppletion, marking, projection), dependent marking (government, reordering), and zero marking (identity).

⁸ For discussions of the directional dimensions, especially the differential encoding of location, goal, and source, see Creissels (2006), Nikitina (2009), Wälchli & Zuñiga (2006), Lestrade (2008a, 2008b), and Pantcheva (2008).

⁹ Bennett's analysis is based on the following locative primitives: interior (IN), surface (ON), posterior (BEHIND), anterior (FRONT), superior (OVER), inferior (UNDER) and proximity (NEAR). He analyses AT as an instance of general, unspecified location. It is important to note that Bennett gives the *unmarked* forms found in English. A reviewer pointed out that, although marked and subject to speaker variation, for him/her, forms like *to behind* (GOAL+BEHIND), *to in front* (GOAL+FRONT), *to near* (GOAL+NEAR) seem possible. The conditions under which *to* can be used to express GOAL with various prepositions clearly requires further study, but it is good to keep in mind that we might be dealing here with *to* in some sort of terminative or limitative use ('until').

¹⁰ One might wonder whether *towards* is not GOAL + NEAR instead of *by*. As I argued in Zwarts (2005) on the basis of its aspectual (atelic) properties, *towards* is not based on NEAR, but rather on the comparative NEARER: the endpoint of a *towards* path is nearer to the reference object than its starting point.

¹¹ Clearly, the hierarchy in its present form would have a problem if it would turn out that English expresses GOAL + NEAR and GOAL + BEHIND with *to near to* and *to behind* (see Note 11), because then a stronger encoding (projection) would be preceded on the hierarchy by a weaker encoding (identity, an option for GOAL + IN and GOAL + ON). This might suggest, following Malchukov (2005) that we need a weaker application of hierarchies (as pointed out to me by one of the reviewers). Instead of requiring that *all* instances of an earlier category must have stronger encodings, we require that at least *some* instances have stronger encodings. Whether such a weaker version is really needed depends on the closer analysis of further data from English and other languages, but also on the role of language-internal variation.

¹² This is not to say that case alternations in Indo-European and other languages cannot express other spatial contrasts. As one of the anonymous reviewers pointed out, in Japanese "road-ACC walk" means 'walk across the road' and "road-DAT walk" 'walk in the road'. See also Lestrade (2008a).

¹³ Latin *in* covers both IN and ON, e.g. *in monte* 'on the mountain', *in montem* 'up the mountain'. Grammars of Latin typically mention *in* and *sub*, but Luraghi (forthcoming) also mentions *super* 'over' as an alternating preposition.

¹⁴ Latin *ad* might present a problem for the hierarchy, because it seems to cover both locative and GOAL uses for what seems like the same 'AT' location: cf. *ad pedes* 'at

(his) feet’ and *ad me* ‘to me’ (Luraghi forthcoming:6). This requires further study. It could be that we are really dealing here with two different versions of *ad*, i.e. with different locations.

¹⁵ Basque based on Creissels (2006), Avar on Creissels (2009), Finnish, Hungarian, Tabasaran and Tsez based on Comrie and Polinsky (1998), Lezgian on Haspelmath (1993).

¹⁶ In general, AT has a broader range of uses when there are no specific IN or ON forms. When IN or ON exists, AT will be more specialized. See also the discussion in Section 7, following Levinson and Meira (2003).

¹⁷ Compare this what Levin and Rappaport Hovav (2005) say about the various thematic role hierarchies that have been proposed in the literature.

¹⁸ Topological locations are based on a basic topological relation of overlap between regions, while projective locations are based on axes (Herskovits 1986).

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