

The distribution of labor between adpositions and case within complex spatial PPs

Abstract

This paper discusses a cross-linguistic sample of spatial PPs in languages that both have adpositions and case. It is shown that the distribution of labor within these potentially complex PPs follows from two general principles only. According to the principle of Grammaticalization, less frequent meaning elements should never be expressed by more grammatical means than more frequent ones. According to the principle of Compositionality, the syntactic construction should reflect the order of semantic function application. The only viable spatial PP constructions according to these principles are those constructions in which the P simultaneously expresses configuration and directionality, and constructions in which the P expresses configuration and the case marker on the P directionality.

1. Introduction

In this paper we will discuss a cross-linguistic study of spatial PPs in languages that both have adpositions and case. Consider the following example from Finnish:

Finnish (online CSC corpus¹)

- (1) *Keitä mausteliemi, tarkista maku ja kaada kuumana*
cook marinade, check taste and pour while.hot
sien-ten pää-lle.
mushroom-PL.GEN on-ALL
'Prepare the marinade, check the taste and pour it while still hot on the mushrooms.'

In (1), the adposition type *pää-* 'on', derived from the noun *pää* 'head' (cf. Hagège 2010), assigns genitive case to its complement. In addition, it is marked with allative

¹<https://hotpage.csc.fi>

case itself.

The goal of this paper is to study the way in which languages use these different formal parts to express the ingredients of spatial meaning. We will argue that the three elements, i.e. the adposition type and the two instances of case, each make an independent and predictable contribution to the interpretation of the PP. This contribution will be shown to be determined by the principles of Compositionality and Grammaticalization.

According to *Compositionality*, the interpretation of a phrase is a function of the meaning of its parts and the way they are syntactically combined. As is well-known, spatial meaning can be decomposed into at least two dimensions (cf. amongst many others Jackendoff, 1983). The *configuration* dimension specifies a location with respect to a ground; the *directionality* dimension concerns the change of location of the object that is being localized. In (1), the adposition type *pää-* expresses the configuration ‘on’ with respect to the ground *sien-* ‘mushroom’. The allative case on the adposition marks directionality, expressing that the marinade changes from ‘*not* being on the mushroom’ to ‘being on it’. The allative case contrasts here with, for example, the ablative case that would mark a change out of the specified configuration. Since directionality is a function that applies to a configuration function that, on its turn, takes a ground as its input, by Compositionality we therefore expect the configuration marker to be in between the marker of directionality and the ground, as we indeed observe in (1).

The principle of *Grammaticalization* determines the form with which a meaning is expressed in a language (cf., amongst many others, Hopper and Traugott 2003). Since more frequent meanings develop more economical forms over time, case, as a more economical way of expression, can be expected to express more frequent ingredients of spatial meaning, adpositions expressing the less frequent ones. As the distinctions of directionality constitute a much smaller set than those of the configuration dimension, directionality distinctions on average are used more often than configuration options. By Grammaticalization we expect directionality to be ex-

pressed by case forms and configuration distinctions by more lexical adpositions. In the example above this is again observed. Allative case expresses Goal directionality whereas the adposition *pää-* expresses the configuration distinction ‘on’.

This paper is organized as follows. In Section 2, we will decompose the meaning and form sides of spatial PPs. In Section 3, we show how meaning and form can be logically combined, and which combinations are actually crosslinguistically attested. Section 4 explains the difference between what is logically possible and empirically found by means of the principles of Compositionality and Grammaticalization introduced above.

2. Spatial Pps

In this section we will decompose the meaning and form sides of spatial Pps. In Section 2.1 we will decompose spatial *meaning* into three parts: a ground, a dimension of configuration and a dimension of directionality. In Section 2.2 we will make the *syntactic structure* of a complex spatial PP explicit. We will distinguish a DP complement, an adposition, and two types of case: a K_N that combines with the complement and a K_P that combines with the adposition.

2.1 Spatial Meaning

For our present purposes, we need to distinguish three basic ingredients of spatial meaning. Consider the following examples.

- (2a) *The ball is on the table*
- (b) *The ball is on the chair*
- (c) *The ball is under the table*
- (d) *The ball rolls from under the table*

The first ingredient of spatial meaning is the *ground* (term by Talmy, 2000), a reference object whose position is evident and therefore can be used to locate other objects or events. In (2-a), the ground is a table, in (2-b) it is a chair. Virtually any ob-

ject can be used as a ground.

Second, there is a *configuration* dimension, which concerns the location with respect to the ground. The configuration function takes the ground as its input and defines a place or region relative to it. In (2-a-c) the configurations ‘on’ and ‘under’ are contrasted. The number of distinctions that is made by the configuration function varies greatly between languages and the type of distinctions can become quite idiosyncratic (c.f. the discussion in Levinson & Wilkins, 2006a). On the basis of a cross-linguistic comparison, Levinson and Wilkins (2006b) even conclude that the configuration function is a complex, multidimensional semantic space for which there are no simple surface universals.

The third ingredient of spatial meaning is the *directionality* dimension. Directionality describes the change of location of a *locatum*, the object or event that is localized (the notion *locatum* is taken from Bateman, Hois, Ross, & Tenbrink, 2010, and is preferred above the term *figure* as it captures both objects and events, cf. also Zwarts 2005b). In (2-c) the ball is said not to change *location*, in (2-d), it changes from ‘being under’ to ‘not being under’ the table. Although accounts of spatial language differ on the type and number of directionality distinctions, the number of distinctions in any case is much more restricted, with a maximum proposal of five (see for example Jackendoff, 1983; Kracht, 2002, 2008; Zwarts, 2005b, 2008; Lestrade, 2010b, 2011). Note that we analyze the absence of a change of configuration as a directionality distinction proper here and not as the absence of the directionality dimension. In the English examples, this directionality option happens to be zero marked but we will see examples of languages that mark this option explicitly.

In sum, spatial meaning consists of a ground that serves as the input of a configuration function. The configuration function determines a region or place with respect to this ground. The configuration function itself serves as the input of the directionality function that is concerned with the development of configuration. The two functions differ in the number of distinctions they can make, which will become important in our discussion of the mapping of meaning to form below. First however,

we will decompose the form part of spatial meaning.

2.2 Spatial Form

Consider again the Finnish complex spatial PP in (1).

- (3) *sien-ten* *pää-lle*
 mushroom-PL.GEN on-ALL
 ‘on the mushrooms’

In this complex PP, we can readily identify a noun phrase (the adpositional complement) and the adposition *pää*-‘on’. We will call the case on the DP K_N and the case that the adposition itself bears K_P . Thus, in (3), genitive is the K_N , whereas allative is the K_P . The full syntactic structure of a (spatial) PP as we analyze it is given in Figure 1 (cf. e.g. den Dikken, 2006, for a more detailed analysis of the functional structure of spatial PP).

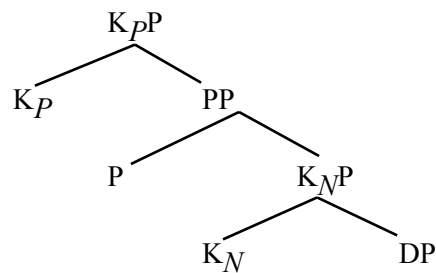


Figure 1: The syntactic structure of spatial PP

Note that we analyze case as a functional head of its own (cf. also Asbury, 2008, and the references cited therein). According to Asbury (2008, 23), the only real difference between cases and syntactically independent items like adpositions and nouns is in their phonological load. The former are phonologically dependent and therefore spelled out as affixes, the latter are independent. For us, this difference will be of crucial importance. It is caused by a difference in grammaticalization which

results from a difference in semantic specificity (cf. Section 4.2). Note furthermore that we use a right branching analysis here and in what follows. This is only to describe the mapping from semantic to syntactic structure most easily. However, nothing we say hinges on this analysis and the important point really is the relative order. That is, K_N case is in between the P and the P complement, K_P is on the outside.

Recapitulating, we assume the following semantic and syntactic structures of complex spatial PPs in our analysis:

- (4a) Semantic structure of spatial PP:
[*directionality* [*configuration* [*ground*]]]
(b) Syntactic structure of spatial PP:
[K_P [P [K_N [DP]]]]

Now we have established the groundwork, we can look at the way in which the form and meaning part of spatial constructions combine.

3. Mapping meaning to form

In this section we will study a cross-linguistic sample of complex spatial PPs with respect to the mapping of spatial meaning to form.

3.1 The PCaseBase

For our typological survey of spatial expressions we make use of the *PCaseBase*, which will be integrated into the Typological Database System project shortly.² The PCaseBase is a typological database of languages with both case and adpositions, consisting of 32 languages from 25 different language families. It is based on reference grammars and has been established by Kees de Schepper and Robbert van Sluijs for our present purposes, but also with a public use in mind. Big language families, that is, languages with many subfamilies, are represented by two languages from different subfamilies. The database contains 1355 entries on adpositional con-

²<http://language.link.let.uu.nl/tds/index.html>

structions plus an additional 548 entries for the functions of the cases when not governed by an adposition. The general goal of the database is to enable the comparison of the case and adposition inventories of different languages and the study of the interaction and differences between the two systems.

For our present purposes, we only consider the adposition inventory of the database, which consists of 400 spatial adposition types that make up 977 different spatial constructions (mostly combinations of adposition, K_N case and K_P). For example the Alambak adposition *bi-* ‘front’ is analyzed as one type, but its combinations with three different K_N s that can each assign two K_P s make up six constructions. An overview of the adpositional inventory sizes of the different languages is given in the Appendix of this paper.

Before we continue, it should be noted that there is one important drawback to our method of consulting reference grammars only. Although many grammars mention the option for adpositions to combine with different K_N s, they hardly ever mention a corresponding meaning difference. Similarly, grammars sometimes gloss over meaning contributions that may be made by K_P s. For example, Lestrade (2010a) argues that the alternation between partitive and genitive K_N in Finnish is meaningful in that the partitive construction expresses an unbounded or marked meaning alternative for the genitive construction. This is illustrated in (5), in which (5-a) can be said to express a bounded meaning whereas (5-b) expresses an unbounded one (cf. Kiparsky, 1998). Note that the two constructions differ not only in K_N , but also in word order. In Finnish, prepositional constructions generally have partitive K_N , whereas postpositional constructions have genitive K_N . The different dimensions of formal variation and their interactions may correspond to different meaning aspects (for more elaborate discussion, see Lestrade 2010a).

Finnish (Lestrade, 2010a, 604)

(5a) *Juoks-i-mme kaupungi-n ympäri.*
run-PAST-1PL city-GEN around
‘We ran around the city.’

- (b) *Juoks-i-mme ympäri kaupunki-a.*
 run-PAST-1PL around city-PART
 ‘We were running around in the city.’

In the same language, the adposition *pää-* marked with a K_P from the IN case series (inessive, elative, illative) means ‘at the end of’, whereas it means ‘on top of’ when marked with a case from the ON/AT series (adessive, ablative, allative). However, neither meaning contrast is mentioned in the consulted reference grammar (Sulkala & Karjalainen, 1992). In other words, not all correspondences between meaning and form will become manifest in our study.

3.2 Logical Possibilities of Mapping Spatial Meaning to Form

In the semantic representation of spatial meaning in the previous section we have proposed three basic meaning ingredients: a ground, a configuration function, and a directionality function. In Figure 1 we have identified four morphosyntactic parts of complex spatial expressions: a DP complement, a K_N and K_P case, and an adposition. We will assume that the ground obligatorily maps onto the DP complement. Although somewhat restricted by pragmatic principles that for example say that the ground should be bigger and less movable than the object it locates, the set of objects that can function as a ground is an open category. Obviously, such an open semantic set should map onto a syntactic class that is open too. In addition, we assume that the adposition is never meaningless, that is, it always expresses either configuration or directionality or both. Thus we are left with the five logical possibilities listed in Table 1 to combine the two remaining spatial meaning ingredients with the three remaining formal parts. Note that an empty cell in this table can either mean that the corresponding morphosyntactic part of the expression is lacking altogether from the spatial construction or that it expresses something else than configuration or directionality.

	K_P	P	K_N
1.	dir	config	
2.	config	dir	
3.		dir	config
4.		config	dir
5.		dir+config	

Table 1: Logically possible distributions of labor within the PP

In the next subsection, we will see how the two meaning parts of spatial expressions actually map onto each other in languages of the world. As it will turn out, the variation is rather limited. In Section 4, we explain how the two principles that were briefly discussed in the introduction account for this restriction.

3.3 Attested combinations of Spatial Meaning and Form

In this subsection we will go through the different possibilities spelled out in Table 1 and discuss their frequency of occurrence in our sample. It will be shown that of the five possible strategies only strategies 1, 4, and 5 are actually attested in our sample, of which strategy only strategy 1 and 5 occur with reasonable frequency.

To determine which meaning ingredient is expressed by which morphosyntactic part we have aligned the changes in meaning in our corpus with changes in form. Consider the example entries in Table 2 for illustration. Three different meanings are found within these six entries, the meaning changes from ‘other side’, to ‘behind’, to ‘to behind’. The meaning contrast between the configurations ‘other side’ and ‘behind’ aligns with a change in adposition type, the meaning contrast between the Place and Goal variants of the latter combination aligns with the change from adessive to allative K_P . The alternations between absolutive and referent K_N do not coincide with a change in meaning (at least not according to the reference grammar). Thus, for these entries, we can say that the adposition type expresses configuration,

K_P expresses directionality, and the meaning of K_N falls outside the boundaries of this analysis.

Type	Instance	K_P	K_N	Meaning
<i>mku</i>	<i>mku-oha</i>	path	abs	other side
<i>mku</i>	<i>mku-oha</i>	path	ref	other side
<i>mong</i>	<i>mong-kor</i>	ades	abs	other side
<i>mong</i>	<i>mong-kor</i>	ades	ref	behind
<i>mong</i>	<i>mong-ko</i>	all	abs	behind
<i>mong</i>	<i>mong-ko</i>	all	ref	behind

Table 2: PCaseBase: Example entries for Alambalak

If a meaning contrast does not straightforwardly align with a change in form, the meaning is attributed on the basis of analogy with other entries in the language. This is illustrated by the example entries from Evenki in Table 3. The adposition instance *oldon-du* corresponds to the adposition type *oldon* that is marked with dative K_P . In principle, the difference in meaning from ‘to the top of’ via ‘on’ to ‘across’ for the last three entries could be due to the change in adposition type, the K_P , the K_N or both, since all three differ for these entries. However, given that a change of the adposition type goes together with a change in configuration in Evenki in other entries (contrast *mur* ‘around’ with *ojo* ‘above’), that K_P marks directionality (as evidenced by the contrast between *ojo-du* ‘on’ with dative K_P and *ojo-duk* ‘from above’ with ablative K_P), and that K_N seems to be assigned idiosyncratically (there are no alternations of K_N within the entries of one type), we can attribute the meaning change over these entries to the adposition type.

Type	Instance	K_P	K_N	Meaning
<i>mur</i>	<i>mur-mnek</i>	dat	accd	around
<i>ojo</i>	<i>ojo-du</i>	dat	nom	above, on
<i>ojo</i>	<i>ojo-duk</i>	abl	nom	from above, on
<i>ojo</i>	<i>ojo-li</i>	prol	nom	above, on top of
<i>ojo</i>	<i>ojo-lo</i>	all	nom	above, (to) the top of
<i>oldon</i>	<i>oldon-du</i>	dat	nom	on
<i>pelpemnek</i>	<i>pelpemnek</i>		accd	across

Table 3: PCaseBase: Example entries for Evenki

In the discussion of the different strategies below, we have decomposed the meaning into a directionality (*Dir*) and configuration (*Config*) part for explicitness.

An impossible strategy

We will start our discussion with explaining away a pattern that should not exist according to our second assumption that says that P always expresses either configuration or directionality. There is one adposition in the database that could be analyzed as combining the configuration with K_N and directionality with K_P , viz. the Lezgian adposition *win* ‘up, above’. Its four entries are given in Table 4.

Type	Instance	K _P	K _N	Dir	Config
<i>win</i>	<i>win-iz</i>	dative	inelative	Via	Up
<i>win</i>	<i>win-elaj</i>	superrelative	genitive	Source	Above
<i>win</i>	<i>win-el</i>	superessive	genitive	Place	Above
<i>win</i>	<i>win-el</i>	superessive	inelative	Via	Above

Table 4: Lezgian *win-* ‘up, above’

Examples of its use are given in (6) (following the order of presentation in Table 4).

Lezgian (Adapted from Haspelmath, 1993, 214-215)

- (6a) *Zun taxta.di-n gurar-aj win-iz xkaž xa-na.*
 I.ABS plank-GEN stairs-INEL up-DAT raise ANTIC-AOR
 ‘I walked up the plank stairs.’
- (b) *I aslan čna či win-elaj alud-in.*
 This lion we.ERG we.GEN above-SUPEREL take.away-HORT
 ‘Let’s take this lion from above us.’ (i.e. ‘Let’s overthrow him.’)
- (c) *Č’ulaw cif-er.i xür.ü-n win-el mič’i q^hen*
 Black cloud-PL.(ERG) village-GEN above-SUPERES dark shadow
wehe-nwa-j.
 throw-PERF-PAST
 ‘Black clouds had cast a dark shadow over the village.’
- (d) *Sa dağwi žiğir.d-aj win-el jajlax.di-z*
 One mountaineer path-INEL above-SUPERES pasture-DAT
fi-zwa-j.
 go-IMPERF-PAST
 ‘A mountaineer was going to a pasture up a path.’

The uses in (6-a) and (6-d), with genitive K_N, can straightforwardly be analyzed. The adposition type *win-* expresses configuration and the K_P directionality. But in (6-b) and (6-c), the adposition does not seem to convey either directional or configurational meaning, which we assumed in Table 1, as these meaning aspects are already been taken care of by the inelative K_N: The inelative expresses the combination of configuration On and directionality Via, to which *win-* adds a difference in elevation between the location expressed by the PP and some reference location.

However, rather than analyzing these constructions as a complex spatial PP with a spatial K_N these constructions are probably better analyzed as the combination of a particle (or adverb) and a spatial case construction. The spatial case marked DP itself constitutes an independent spatial adverb, a locative case construction, which is modified by the particle *win* ‘up’. Indeed, this form has such adverbial uses, as illustrated in the following example sentences:

Lezgian (Adapted from Haspelmath, 1993, 205-206)

- (7a) *Ada-n če šme win-e dağ.d-a awa.*
 it-GEN source up-SUPERES mountain-INESS be.in
 ‘Its source is up on the mountain.’
- (b) *Baluğ-ar win-eldi gadar že-zwa.*
 fish-PL up-SUPERDIR throw ANTIC-IMPF
 ‘The fish are jumping upward.’
- (c) *Am aq^ha war-ar-aj qenez hax-na.*
 he.ABS open gate-PL-INEL inside enter-AOR
 ‘He went inside through the gate’

In (7-a-b), two different case forms of *win* ‘up’ are used as an adverb. In (7-a), the superessive form expresses ‘up’; in (7-b), the superdirective form expresses ‘upward’. At the same time, (7-a) shows the autonomous use of a spatial case to express a location (*dağ.d-a* ‘on the mountain’). Here, the modifying particle precedes the spatial case construction. In (7-c), it is illustrated how it may follow the spatial case construction too.

Example (7-c) is structurally equivalent to (6-a) and (6-d). Therefore, instead of analyzing these examples as complex spatial PPs in which the P expresses neither directionality nor configuration, we analyze them as spatial case constructions that involve modification instead of complementation.

Strategy 1: P/configuration, K_P /directionality

The first strategy that is actually attested in our sample is to map directionality onto

the KP and configuration onto the adposition. This option is very frequently attested and accounts for more than 50% of the PP constructions (521) in which 114 types from 13 languages are involved. As an example, consider the Evenki postposition type *xergi-* ‘under’. It can bear different cases that determine its directionality. It does not assign case to its complement. This is illustrated in Table 5.

Type	Instance	K_P	K_N	Dir	Config
<i>xergi</i>	<i>xergi-duk</i>	ablative		Source	Under
<i>xergi</i>	<i>xergi-le</i>	allative		Goal	Under
<i>xergi</i>	<i>xergi-du</i>	dative		Place	Under
<i>xergi</i>	<i>xergi-li</i>	prolative		Path	Under

Table 5: Evenki *xergi-* ‘under’

In (8) examples are given of Evenki *do:-* ‘in’.

Evenki (Nedjalkov, 1997, 172)

- (8a) *D'u do:-du-n teget-chere-n.*
house interior-DAT-3SG.POSS sit-PRES-3SG
‘He is sitting in(side) the house.’
- (b) *D'u do:-la-n ngene-re-n.*
house interior-ALL-3SG.POSS go-NONFUT-3SG
‘He went into the house.’
- (c) *D'u do:-duk-n ju-re-n.*
house interior-ABL-3SG.POSS go.out-PRES-3SG
‘He went out of the house.’

The basic meaning of the adposition type *do:* is the configuration ‘in’ (and as such, it contrasts with *xergi* ‘under’ in Table 5). Depending on its K_P , the instance can mean ‘inside’, ‘into’, or ‘out of’, and therefore K_P determines directionality. K_N does not seem to make a contribution to the meaning.

Other languages in our sample that make use of this strategy are Alambalak,

Basque, Burushaski, Finnish, Gamo, Ket, Kolyma Yukaghir, Lezgian, Malayalam, Marathi, Turkish, and Warao.

Strategy 3: P/directionality, K_N /configuration

Lezgian *t'uz* 'along' could be analyzed as the single exponent of the third strategy in which P expresses directionality and K_N configuration. The (putative) K_N in the combination with *t'uz* 'along' is an elative case of any configuration series. However, the analysis developed above for the "impossible strategy" can also be applied to this instance. Consider the following examples:

Lezgian (Haspelmath, 1993, 228)

- (9a) *küče.d-aj t'uz fi-zwa-j dišehli.*
 street-INEL along go-IMPERF-PTP woman
 'a woman who is walking along the street'
- (b) *Araba-jar qwan-er awa-j kakur req'-äj*
 cart-PL stone-PL be.in-PTP curved road-INEL
t'uz fe-na.
 along go-AOR
 'The carts went along a stony curved road.'
- (c) *čaqal čil.e-laj t'uz jarği xa-na.*
 jackal ground-SUPEREL along long become-AOR
 'The jackal stretched out on the ground.'

If analyzed as a spatial P, *t'uz* would express directionality (VIA), the K_N configuration (inelative expressing IN, superrelative expressing ON). However, superrelative case independently may have path meaning as the following example shows:

Lezgian (Haspelmath, 1993, 100)

- (10) *Mirg.i-waj ülen.di-laj xkadai-z xa-na-č.*
 Dear-ADEL swamp-SUPEREL jump-INF can-AOR-NEG
 'The deer could not jump across the swamp.'

And the same holds for inelative case:

Lezgian (Haspelmath, 1993, 100)

- (11) *čun k'wač.i-n žiğir.d-aj fi-da.*
we.ABS foot-GEN path-INEL go-FUT
'We'll go along a footpath.'

By analyzing the constructions in (9) in terms of a combination of a spatial case construction with a modifying particle, as we did with the previous Lezgian adposition, we get rid of this idiosyncratic strategy with one representative type only. The relative spatial case constructions express a path meaning that can be strengthened with the particle *t'uz* 'along'.

Strategy 4: K_N /directionality, P/configuration

There is only one language in our sample, viz. Polish, in which the fourth strategy, combining directionality with the KN and configuration with the adposition, is used. Nine Polish adpositions display this strategy. An example is given in (12).

Polish (Bielec, 1999, 224)

- (12a) *Pracuję na poczcie.*
work.1sg at postoffice.LOC
'I work at the post office.'
- (b) *Idę na pocztę.*
go.1sg at postoffice.ACC
'I am going to the post office.'

The adposition type *na* expresses the configuration 'at', depending on the KN, the complex PP expresses Place for Goal directionality. The KN of the former distinction can be either instrumental or locative case, Goal directionality is expressed with accusative case.

Although this strategy is fairly typical for Indo-European languages (see Lestrade, 2008), its cross-linguistic infrequency can be explained by its apparent violation of the principle of Compositionality, as will be discussed below.

Strategy 5: P/directionality+configuration

The fifth strategy to have both the directionality and configuration expressed by the P is the second-most frequent option in our sample in terms of instances (432, almost 45%), and the most frequent one in terms of number of P types (299, more than 75%) and number of languages (with the exception of Alambak, all languages incidentally make use of this strategy, 14 use it even exclusively). Adpositional constructions that make use of this strategy do not use K_N or K_P to express meaning distinctions although they could, as their language does have morphological case.

An example from Warao is given in (13). Warao (Romero-Figeroa, 1997, 75)

- (13a) *Wanu inabe ata ha.*
John dense.forest in COP
'John is deep in the forest.'
- (b) *Naba-era eku-ya wayo obo-te.*
river-AUGM inside-ALL Wayo flow.into-NONPAST
'Wayo (the name of a caño) flows into the big river.'

In (13-a), neither K_N nor K_P is used in the PP *inabe ata* '(deep) in the forest'. Other adpositions in Warao sometimes do make use of case however, as the allative case on *wayo* 'inside' in (13-b) shows.

3.4 Conclusion

In conclusion, out of the five logical possibilities, there are only two that are used abundantly, viz. strategies 1 and 5. The fourth strategy to express configuration with the adposition and to have the K_N specified directionality is restricted to one language in our sample, although it is known to be used more often in Indo-European. Putative examples of the third and an "impossible" strategy, both from Lezgian, were analyzed as combinations of spatial case constructions and particles. Strategy 2 is not attested in our sample.

A summary of the data is given in Table 6. Notice that the number of languages do not add up. That is, the table suggests a total of 44 languages, whereas we have

only 32 languages in our sample. The solution is simple, as the example in (13) already shows, languages can make use of the latter strategy for a subset of their adpositions only whereas they make use of different K_N s and K_P s for others. The same holds for the number of types; only the Instances column adds up to a total of 100%.

	K_P	P	K_N	Languages	Types	Instances
1.	Dir	Config		13 (41%)	114 (29%)	521 (53%)
2.	Config	Dir		-	-	-
3.		Dir	Config	-	-	-
4.		Config	Dir	1 (3%)	7 (2%)	15 (2%)
5.		Dir+Config		31 (97%)	299 (76%)	432 (45%)

Table 6: Attested distributions of labor within the PP

4. Explaining the data

In this section, we will explain the cross-linguistic patterns as described in the previous section and summarized in Table 6. We propose that the possibilities are limited by the two spatial principles briefly discussed in the introduction of this paper: Grammaticalization and Compositionality.

4.1 The principle of Compositionality

The principle of *Compositionality* states that the interpretation of a construction is a function of the meanings of its ingredients and the way in which they are combined. In its strongest form this principle interprets every syntactic combination as a semantic function application. Syntactic heads are interpreted as functions that apply to their complement.

- (14) Compositionality: the interpretation of a phrase is a function of the meaning of its parts and the way they are syntactically combined (i.e. the expression of directionality should not intervene between the expression of configura-

tion and the ground).

The principle of compositionality should not be confused with the second type of iconicity that Haiman (1980) distinguishes, *viz.* that of *iconicity of sequence*. Compositionality, is an important, probably universal structural and hierarchical constraint on interpretation, which is non-defeasible. Iconicity of sequence is a much weaker constraint that is easily overruled and concerns surface word order only. For example, it would ask for source expressions to precede goal directions in an utterance to reflect the natural order of events. As Haiman notes, iconicity of sequence even seems to inversely relate to the explicit marking of relations, which is the realm of compositionality. Nevertheless, the two could be thought to be related in some way as compositionality too can be said to be an (abstract) instance of iconicity.

The principle of Compositionality is applied to the spatial domain by Zwarts (2005a). Recall from Section 2.1 that spatial meaning consists of a configuration function that defines a region with respect to a ground. The directionality function subsequently maps this region to a locatum. In other words, the ground is the input of configuration, and the configuration function in turn is the input of directionality. By Compositionality, we expect the syntactic expression to match this semantic order of function application. That is, we expect the marker of configuration to be put on the ground and the marker of directionality to be put on the marker of configuration (cf. Figure 1). We do *not* expect the marker of directionality to intervene between the ground and the configuration marker.²

Thus, a syntactic form is a function of the meaning that it expresses. In languages

² An exception to this may be non-configurational languages, with free word order at the phrase level, as Thomas Stolz (p.c.) points out. As the following example from Classical Aztec shows (*Codex Florentinus*, Book III, provided by Thomas Stolz), the expression for directionality *-pa* may appear in between that of configuration, the relational noun *tēm-* (from *tēn-tli* ‘lip’), and the ground.

- (i) *t̄-tēn-co* *in* *cuahui-tl ti-hui-^*
POR.3SG-lip-LOC DET tree-ABS 1PL-go-PL
‘We walk along the wood(s).’

that map the different parts of spatial meaning to different parts of a spatial construction, the order of function application is expected to be presented in the syntactic expression. Since directionality is a function on a configuration function that, on its turn, takes a ground as its input, by Compositionality we expect the configuration marker to be in between the marker of directionality and the ground. Generally, languages in our sample are faithful to this principle.

However, Zwarts (2005a) observes that sometimes prepositions and cases do not compose in the way elements of a combinatorial system are expected to compose. Consider again the examples from Polish, repeated here for convenience:

Polish (Bielec, 1999, 224)

- (15a) *Pracuję na poczcie.*
 work.1sg at postoffice.LOC
 ‘I work at the post office.’
- (b) *Pracuję na poczcie.*
 go.1sg at postoffice.ACC
 ‘I am going to the post office.’

As the contrast between (15-a) and (15-b) shows, the preposition *na* ‘at’ expresses configuration and the locative and accusative K_N s directionality. Locative case is used for Place, accusative for Goal directionality. But this means that Polish violates the principle of Compositionality: The syntactic order of function markers in the PP does not reflect the semantic order.

Zwarts (2005a) is reluctant to accept a violation of Compositionality and proposes that in such cases the preposition and the K_N are co-interpreted. They are two syntactic heads with one interpretation, a discontinuous expression of one meaning. Thus, the Polish data could be said to become a subtype of Strategy 5. This state of affairs is caused by the diachronic development in Indo-European of a new system of adpositions that is built on top of an older system of spatial cases (cf. also Vincent 1999). The motivation for keeping Compositionality as an inviolable constraint would be that it is very hard to understand how interpretation of a sentence would be

constrained by syntactic structure in a systematic way.

As an alternative to this proposal, we could say that Compositionality is a very strong principle indeed, but is violable nevertheless. Languages are almost always faithful to it and it is only in highly exceptional cases, for example by historical accident, that languages come to violate it. This account would accept the incidental occurrence of strategy 4 and at the same time explain its rareness.

In any event, by the principle of Compositionality we can explain the fact that the directionality part of the meaning is hardly ever (if at all) expressed in between the expression of configuration and the ground, that is, by K_N . The principle of Compositionality excludes strategies 2 and 4. Now, we still need to account for the non-occurrence of strategy 3. For this, we need the principle of Grammaticalization.

4.2 The principle of Grammaticalization

Speakers preferably put as little effort as possible into achieving their communicative goals (cf. for example Zipf, 1965; Haspelmath, 2007). The obvious way to do so is by using as short utterances as possible. This general idea can easily be illustrated by counting the number of words used to refer to an object in a discourse situation. If there is only one mug present, the speaker can simply use *Give me the mug* to have the hearer understand about which object she is talking and give her the mug. Only if there are more cups, she will use a more elaborate construction to single out a specific one, e.g. *Give me the big/red/old mug*. The preference to use economical ways of expression is known as the principle of Economy. An expression can be said to be economical in comparison with another expression if it is shorter (fewer words, fewer syllables, fewer segments) or otherwise requires less articulatory effort (Haspelmath, 2008; Kiparsky, 2004).

More interestingly for our present purposes, the length of lexical items themselves differs according to the economy principle. The synchronic desire of the speaker to use as little articulatory effort as possible results in the diachronic development of more economical forms, a process called *grammaticalization*. Frequency is

a very important factor in this process. Since the mean length of an utterance is most significantly determined by the length of its most frequent elements, utterances are on average maximally economical if the most frequently used words are made shortest. That is, it can be expected that grammaticalization mostly applies to frequently used words. Indeed, it is a well-known fact that highly frequent words are on average shorter than less frequent words (Zipf, 1965).

The positive effect of grammaticalization on production effort can easily be illustrated. A long word such as *grammaticalization* is used much less often in this text than the maximally short word *a* (27 vs. 152 times). The combined production effort of these two words to this paper in terms of button presses is $(27 * 18 + 152 * 1 =) 638$. If these numbers were the other way around, however, this would have resulted in a total of $(152 * 18 + 27 * 1 =) 2763$ button presses, i.e., causing an effort that is more than four times as big.

The difference in frequency between words is mostly due to a difference in generality in meaning. More general words can be used more often than more specific ones, since the former apply more often. Thus, words with general meanings are more frequently used than words with more specific meanings and therefore develop more economical forms in a grammaticalization process (see Haspelmath, 2008; Lestrade, 2010b). Both case and adpositions are the product of grammaticalization. They have a very general meaning, are highly frequently used, and are very economical in their use. Between the two categories, case forms are more general in meaning and used more often, and therefore further grammaticalized (cf. Lestrade, 2010b, 17).

What we will call here the principle of *Grammaticalization* determines the form with which a meaning is expressed in a language. Since more frequent meanings develop more economical forms over time, case can be expected to express the more frequent ingredients of spatial meaning, adpositions expressing the less frequent ones. We do *not* expect configuration to be expressed by further grammaticalized means than directionality.

- (16) Grammaticalization: more frequent meanings are expressed by further grammaticalized forms (i.e. directionality should be expressed by case if configuration is too).

Now how does this principle apply to the variation of our present concern? Recall from Section 2.1 that the distinctions of configuration constitute a much bigger set than those of directionality. For example, in our present sample, we have identified only four directionality distinctions (Goal, Place, Source, Via) but more than 20 distinctions of configurations. As a result of this difference, the distinctions of directionality are on average much more frequently used than the distinctions of configuration (simplifying a bit: $1/4$ vs. $1/20$). From (16) it follows that if either directionality or configuration is to be expressed by a case form, it should be the former.

By the principle of Grammaticalization we can explain the fact that the directionality part of the meaning is never expressed by less grammaticalized forms of expression than the configuration part (excluding strategies 2 and 3).

5. Conclusion

With the principles of Compositionality and Grammaticalization, we can explain the cross-linguistic patterns identified in Section 3.3. In Table 7 a violation of the principles is marked with an asterisk. As can be seen, strategies 1 and 5 (boldfaced) are the only strategies that satisfy both principles. A comparison with Table 6, summarized in the final column, shows that these are indeed the predominant strategies in our sample.

	K_N	P	K_P	Comp	Gram	Attested
1.		config	dir			yes
2.		dir	config	*	*	no
3.	config	dir			*	no
4.	dir	config		*		marginally
5.		dir+config				yes

Table 7: Predicted distributions of labor within the PP

Strategy 1 satisfies Compositionality by having K_P express directionality and P configuration, and satisfies Grammaticalization by having directionality expressed by a further grammaticalized form than configuration. Strategy 5 vacuously satisfies the first principle: If there is only one marker, Compositionality does not apply. Also Grammaticalization is satisfied, as it is only concerned with the relative degree of grammaticalization. If the adposition is the most grammaticalized form in the spatial construction, there is no better form of expression for directionality. Configuration is not expressed with a more grammatical expression than directionality.

Strategy 2 violates both principles and therefore is not attested in our sample. It has the directionality marker in between that of configuration and the ground and expresses configuration with more grammatical means than directionality. Strategy 3 satisfies Compositionality as the directionality marker does not intervene between configuration and the ground, but violates Grammaticalization by expressing directionality with a less grammatical form than configuration. Because of this violation, it does not occur in our sample. Strategy 4 shows the opposite pattern. It violates Compositionality by having the expression of directionality in between configuration and the ground, but does satisfy Grammaticalization, as configuration is expressed with less grammatical means. Depending on the analysis of the Polish data,

strategy 4 does not occur or is exceptional.

In conclusion, we have accounted for the cross-linguistically attested distribution of labor within complex spatial PPs. We have shown how the expression of configuration and directionality by adpositions and case markers in our sample follows from two general principles: Grammaticalization and Compositionality. According to Grammaticalization, configuration should never be expressed by more grammatical means than directionality. According to Compositionality, the marker of directionality should not be in between that of configuration and the ground. The only viable spatial PP constructions according to these principles are those constructions in which the P simultaneously expresses configuration and directionality, and constructions in which the P expresses configuration and its case form, the K_P , directionality.

Abbreviations

ABL ablative, ABS absolutive, ACC accusative, ACCD definite accusative, ALL allative, ANTIC anticausative, AOR aorist, AUGM augmentative, COMP Compositionality, CONFIG configuration, COP copular, DAT dative, IR directionality, ERG ergative, FUT futur, GEN genitive, GRAM Grammaticalization, HORT hortative, IMPF imperfective, INEL inelative, LOC locative, NOM nominative, NON non-, P adposition, PERF perfective, PL plural, POR ..., POSS possessive, POST postpositional, PP adpositional phrase, PRES present, PTP participle, REF referent case, SG singular, SUPERDIR superdirective, SUPEREL superrelative, SUPERES superessive.

Acknowledgments

We thank Robbert van Sluijs for his help in establishing the PCaseBase, Vlad Oberchuk for his editorial help, and Paula Wolski for the translation of the Finnish corpus example. Furthermore, we would like to thank Aina Urdze, Susanne Hackmack, Thomas Stolz, and the audiences of the *PIONIER workshop on locative case* (Nijmegen, August 25–26, 2008) and the workshop *Case in and across languages* (Helsinki, August 27–29, 2009) for valuable comments that helped us improve this paper.

Appendix

Language (WALS classification; reference grammar)	types	instances
Alamblak (Sepik-Ramu; Bruce, 1984)	22	138

Basque (Basque; Hualde & Ortiz de Urbina, 2003)	11	43
Brahui (Dravidian; Bray, 1986)	6	8
Burushaski (Burushaski; Lorimer, 1935)	11	24
Cahuilla (Uto-Aztecan; Seiler, 1977)	5	6
Evenki (Altaic; Nedjalkov, 1997)	17	58
Finnish (Uralic; Sulkala & Karjalainen, 1992)	27	157
Gamo (Afro-Asiatic; 'Eva, 1990)	8	10
Georgian (Kartvelian; Hewitt, 1995)	21	36
Harar Oromo (Afro-Asiatic; Owens, 1985)	10	30
Ika (Chibchan; Frank, 1985)	5	6
Jaqaru (Aymaran; Hardman, 2000)	5	5
Kabardian (North Caucasian; Colarusso, 1989)	7	10
Ket (Yeniseian; Vajda, 2004)	13	46
Kolyma Yukaghir (Yukaghir; Maslova, 2003)	11	34
Korana (Khoisan; Meinhof, 1930)	8	8
Lezgian (North Caucasian; Haspelmath, 1993)	19	43
Macushi (Carib; Abbott, 1991; Williams, 1932)	12	29
Malayalam (Dravidian; Asher & Kumari, 1997)	20	27
Mapudungun (Araucanian; Z'úñiga, 2000)	6	6
Marathi (Indo-European; Pandharipande, 1997)	11	14
Meitei (Sino-Tibetan; Bhat & Ningomba, 1997)	15	17
Mochica (Mochica; Hovdhaugen, 2004)	11	15
Newar (Sino-Tibetan; Hale & Shrestha, 2006)	10	11
Paumari (Aruan; Chapman & Derbyshire, 1991)	11	11
Polish (Indo-European; Bielec, 1999)	32	41
Puelche (Puelche; Barbar'a, 1944)	13	18
SE Pomo (Hokan; Moshinsky, 1974)	18	20
Tlingit (Na-Dene; Leer, 1991)	1	1
Turkish (Altaic; Kornfilt, 1997)	22	77
Warao (Warao; Romero-Figeroa, 1997)	10	26

Table 8: Spatial adposition inventory size per language

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