

**The case of prepositions:
Government and compositionality in German PPs¹**

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One of the things to memorize when learning German, is how prepositions go with particular cases, which is typically done with such lists as in (1) (my Dutch highschool lists):

- | | | |
|-----|-------------------|---|
| (1) | DATIVE | mit, nach, bei, seit, von, zu, außer, aus, gegenüber, gemäß |
| | ACCUSATIVE | bis, durch, für, gegen, ohne, um, entlang |
| | DATIVE/ACCUSATIVE | an, auf, hinter, neben, in, über, unter, vor, zwischen |

There are prepositions that only go with the DATIVE, others that go with the ACCUSATIVE, and there are two-way prepositions that go with both (*Wechselpräpositionen* as they are called in German, with *Doppelrektion*):

- | | | | | |
|-----|----|------------------------------|------------|--------|
| (2) | a. | Anna stand | in dem | Zimmer |
| | | Anna stood | in the.DAT | room |
| | | ‘Anna stood in the room’ | | |
| | b. | Otto trat | in das | Zimmer |
| | | Otto stepped | in the.ACC | room |
| | | ‘Otto stepped into the room’ | | |

Roughly speaking, with these two-way prepositions the DATIVE is used for static situations of location and the ACCUSATIVE for dynamic situations of directed motion. There is a host of other prepositions, that are much less common and that mostly take the GENITIVE case, like *trotz* ‘despite’, *unterhalb* ‘underneath’, *während* ‘during’ (see the Appendix of this paper).

Focussing on the pattern shown in (1) and the alternation in (2), this paper addresses the following question:

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What is the relation between prepositions and the cases they govern?

When we take the semantic observations that have been made in the literature about prepositional government in German and make these more precise in the context of a formal and compositional semantics, we will see that there is something problematic about the way prepositions and cases team up to express spatial meanings. Prepositions and cases do not compose in the way we expect elements of a combinatorial system to compose. Case is in the wrong syntactic position to combine with the preposition and the spatial information that it provides is often redundant or vacuous. There are ways to fit this finding into existing grammatical models, but we also have to explain why the problem exists in the first place. The explanation is historical: German has a newer set of prepositions built on top of an older case system that has preserved spatial distinctions of the richer Indo-European case system. It is this non-combinatorial ‘stacking’ of two systems, originating in different phases of grammaticalization, that creates non-compositionality, redundancy and vacuity. This shows that the grammar of a language is not one homogeneous combinatorial structure in which everything fits perfectly, but a conglomerate of possibly overlapping and incongruous components, a situation typical of complex systems that grow and wear off over time.

In order to develop my line of argumentation I will have to ask the reader to put familiar theoretical conceptions about the case of prepositions between brackets, for the time being. Case may be a marker on the dependent noun that is being subcategorized, assigned or checked by another element or it may be a morphological spell-out or realization of a ‘deeper’ level of structural, thematic or functional relations (see Nichols 1986, Chomsky 1986, Blake 1994, Beard 1995, de Hoop 1999, Vincent 1999, for instance). But knowing this so well, might obscure our view on the special nature of prepositional government. My strategy here is to treat cases in PPs as ordinary meaningful morphemes. This will fail, but it will be an instructive failure, I hope, that allows us to explain why prepositions in a language like German govern different cases in the first place.

1 Prepositions and cases

German has a large class of prepositions, each of which assigns one or more different cases to its noun phrase complement. The Appendix of this paper lists the prepositions that are described in one grammar of German, Helbig & Buscha (1991). However, within this set, I

will only consider the *spatial* prepositions that primarily govern DATIVE or ACCUSATIVE, because it is the spatial contribution of these two cases that is being investigated here.² With these two criteria, this is the set that we get, in three groups according to their government properties:

A1	DATIVE	ACCUSATIVE	DATIVE & ACCUSATIVE
	aus ‘out of’	durch ‘through’	an ‘on’
	außer ‘outside’	entlang ‘along’	auf ‘on’
	bei ‘near’	gegen ‘against’	hinter ‘behind’
	entgegen ‘against’	um ‘around’	in ‘in’
	gegenüber ‘opposite’		neben ‘next to’
	nach ‘to’		über ‘over’
	von ‘from’		unter ‘under’
	zu ‘at, to’		vor ‘in front of’
			zwischen ‘between’

The term *preposition* should be understood in the traditional, broad sense here, as including also *postpositions*. A few of the prepositions in **A1** (the complex forms *entgegen*, *entlang* and *gegenüber*) can be used postpositionally with spatial meaning:

- (3) a. dem Feind entgegen
the.DAT enemy against
‘against the enemy’
- b. den Fluß entlang
the.ACC river along
‘along the river’
- c. der Kirche gegenüber
the.DAT church opposite
‘opposite the church’

² For a couple of reasons I have kept *ab* ‘from’ and *bis* ‘up to’ aside. Because of their restricted distribution (mainly place names) it is hard to determine which case they govern. They also seem to have a durative element in their interpretation (‘since’, ‘until’) that makes them different from the other, purely spatial prepositions.

The two prepositions in our selection that show case variation (*außer* and *entlang*) are listed under their most common case. *Entlang* ‘along’ is listed under ACCUSATIVE, but is also quite common with the DATIVE, in a way that interacts with its placement and interpretation (Durrell 1993).

The prepositions in **A1** are more or less the so-called *primary* prepositions, as opposed to the *secondary* ones (for this distinction see Diewald 1997, Fleischer 2002, Hopper & Traugott 2004, Zwarts 1997b, among others). The primary prepositions are the older, shorter and more basic prepositions of the language, not borrowed from another language (like Latin *per*) or transparently built up from other materials within the language (like the PP *anstatt* ‘instead of’). The secondary prepositions are newer, derived from nouns or verbs or prepositional constructions and play a less central role in the language. Many syntactic processes are restricted to primary prepositions, like preposition stranding (e.g. *zu das* to that > *dazu* there-to) and contraction of preposition and article (e.g. *zu dem* to the.DAT > *zum* to.DAT).

I said that the prepositions in **A1** are ‘more or less’ the primary prepositions. The set is ‘less’ than primary because some non-spatial primary prepositions are not included (like *mit* ‘with’ and *ohne* ‘without’) and it is ‘more’ than primary because it includes prepositions with internal structure (*entgegen*, *entlang* and *gegenüber*). But still, in general, we can see within the class of German prepositions a correlation between these three properties: primary character, spatial meaning, and DATIVE or ACCUSATIVE case assignment.

A1 is the first, descriptive answer to our central question how prepositions relate to cases. Even though we have a fairly small set of prepositions now (21 elements), we can make some generalizations about the spatial role of the case marking, as I will show in the next section.

2 Locations and sources, routes and goals

The basic split in the set of prepositions in **A1** is between *locative* prepositions and *directional* prepositions.³ In its primary use, a locative preposition helps to answer the question where something or somebody is located, by referring to a *place*. The typical configuration to see this use is in a static predication, with a copula:

³ The literature about this distinction and its relevance for the semantics and syntax of PPs is large. Some relevant references in this respect are Bennett (1975), Jackendoff (1983), Bierwisch (1988), Wunderlich & Herweg (1991), Fong (1997), Riemsdijk & Huijbregts (2001), Kracht (2002), Helmantel (2002), den Dikken (2003).

- (4) a. Das Auto ist bei der Schule
 The car is near the.DAT school
 ‘The car is near the school’
- b. Die Katze ist unter dem Schrank
 The cat is underthe.DAT cupboard
 ‘The cat is under the cupboard’

The locative prepositions are *außer* ‘outside’, *bei* ‘near’, *gegenüber* ‘opposite’ and the two-way prepositions, in their locative use. Notice that all these locative prepositions govern the DATIVE.

A directional preposition is used to answer where or how something is going, by referring to a *path*, typically in combination with a motion verb. There are three types of directional prepositions:

- (5) a. Prepositions that specify the *source*, ‘from where’ the path is going: *aus* ‘out of’ and *von* ‘from’
- b. Prepositions that specify the *goal*, ‘to where’ the path is going: *entgegen*, *gegen*, *nach*, *zu* and the two-way prepositions
- c. Prepositions that specify the *route*, ‘via where’ the path is going: *durch* ‘through’, *entlang* ‘along’, *über* ‘over’, *um* ‘around’

Here are some examples of directional prepositions illustrating this three-way distinction:

- (6) a. Er rannte aus dem Park (Source)
 He ran out the.DAT park
 ‘He ran out of the park’
- b. Er rannte zum Park (Goal)
 He ran to-the.DAT Park
 ‘He ran to the park’
- b’. Er rannte in den Park (Goal)
 He ran in the.ACC park
 ‘He ran into the park’

- d. Er rannte um den Park (Route)
 He ran around the.ACC park
 ‘He ran around the park’

Notice that *zum* in (6b) is the contraction of *zu* with *dem*.

How does the source/goal/route division relate to case marking in PPs? The two source prepositions *aus* ‘out of’ and *von* ‘from’ always take the DATIVE, the three route prepositions *durch* ‘through’, *über* ‘over’ and *um* ‘around’ always take the ACCUSATIVE, but *entlang* ‘along’ can also govern the DATIVE. The situation with the goal prepositions is mixed: the two-way prepositions govern ACCUSATIVE case in their goal meaning, but the two basic goal prepositions *nach* and *zu* ‘to’ govern DATIVE case as well as *entgegen* ‘against’. The complete situation with our 21 prepositions is summarized in Table 1 below.

		DATIVE	ACCUSATIVE
<i>Locative prepositions</i>		an 'on (hanging)' auf 'on (standing)' bei 'near' gegenüber 'opposite' hinter 'behind' in 'in' mit 'with' neben 'beside' über 'over, above' unter 'under' vor 'in front of' zwischen 'between'	-
<i>Directional prepositions</i>	<i>Source</i>	aus 'out of' von 'from'	-
	<i>Route</i>	(entlang 'along')	durch 'through' entlang 'along' über 'over' um 'around'
	<i>Goal</i>	entgegen 'against' nach 'to' zu 'to'	an 'onto' auf 'onto' gegen 'against' hinter '(to) behind' in 'into' neben '(to) beside' über 'over' unter '(to) under' vor '(to) in front of' zwischen '(to) between'

Table 1: The spatial relation between preposition and cases

Notice that *über* occurs in this overview in three places, because it can be used as a place preposition, as a route preposition and as a goal preposition:

- (7) a. Die Lampe hing über dem Tisch (Place)
the lamp hung over the.DAT table
'The lamp hung above the table'
- b. über die Brücke fahren (Route)
over the.ACC bridge drive
'drive over the bridge'

- c. Er hängte die Lampe über den Tisch (Goal)
 he hung the lamp above the.ACC table
 ‘He hung the lamp over the table’

How should we interpret the pattern in Table 1? In line with earlier investigations in this area (for example, Bierwisch 1988, Leys 1989,1993,1995, Smith 1992,1995) and taking the two-way prepositions as decisive, I conclude that there is a spatial aspect to the relation between (primary) prepositions and cases:

- A2** DATIVE case goes with locative or source prepositions.
 ACCUSATIVE case goes with route or goal prepositions.

In this view *nach* and *zu* ‘to’ and *entgegen* ‘against’ and *entlang* ‘along’ are the exceptions. I will briefly come back to these in section 9.

There are some phenomena that might obscure the generalization in **A2** if we don’t set them apart:

- (8) a. Der Haupteingang ist um die Ecke
 The main-entrance is around the.ACC corner
 ‘The main entrance is around the corner’
 b. Die Stühle standen um den Tisch
 The chairs stood around the.ACC table
 ‘The chairs stood around the table’

Here we have two well-known cases of location that are derived from a more basic reference to a path. In (8a) we locate one object at the end of a path that goes around the corner. In (8b) we locate several objects along a path that goes around the table. It is generally assumed in the literature about directional PPs that such locative uses are based on a more basic directional use (e.g. Cresswell 1978, Jackendoff 1983, Lakoff 1987). Case assignment in German PPs does not reflect these special locative uses, but only the more basic directional meaning that underlies them.

We should also realize that locative PPs can be embedded into syntactic contexts in which they get a directional interpretation:

- (9) a. Zwei Schwäne schwimmen unter der Brücke hindurch
 Two swans swim underthe.DAT bridge PRT-through
 ‘Two swans swim under the bridge (to the other side)’
- b. Er parkt das Auto vor dem Haus
 He parks the car in.front.of the.DAT house
 ‘He parks the car in front of the house’

However, in these examples it is the directional adverb (*hindurch* ‘through’) or directional verb (*parken* ‘to park’) that should be held responsible for this, not the preposition itself. The adverb *hindurch* takes a *non-directional* PP and turns it into a directional PP. In the same way the verb *parken*, although itself a verb of directed motion, selects a locative PP to determine the goal of its motion. This doesn’t make the PP *vor dem Haus* ‘in front of the house’ a directional goal PP. We should always carefully distinguish between the meaning that a PP has in virtue of its internal morphosyntactic properties and the role that it fulfills in a particular position.

This remark is related to a fundamental assumption that I am making. Contrary to Abraham (2001,2003) I don’t want to assume that adverbs and verbs can directly determine or select a particular case *inside* a PP *across* the preposition involved. What adverbs and verbs do is select either a locative or a directional PP and the case marking inside the PP follows from this selection. This does not mean that the selection is always unambiguous or easily predictable. The sentence in (9a) is also marginally possible with ACCUSATIVE case in the PP (Den Dikken 2003) and the boundary between verbs that select locations (like *parken* in (9b)) and those that select paths (like *stellen* ‘to put’) is difficult to pin down. There might of course be (ad)verbs that select idiosyncratically for a particular preposition or even for a particular preposition+case combination, like *glauben* ‘believe’, that takes *an* with ACCUSATIVE while *interessieren* ‘be interested’ takes *an* with DATIVE. For further discussion of such issues of selection see Jackendoff (1983), Riemsdijk & Huijbregts (2001) and Kracht (2002,2003).

3 Place functions and path functions

We now want go one step further beyond answer A2 of the preceding section and bring in an important insight from the literature on prepositions (see Jackendoff 1983, Wunderlich & Herweg 1991, Zwarts and Winter 2000, Van Riemsdijk & Huijbregts 2001, Kracht 2002 and many others). There is not just a distinction between places and paths, between locative and

directional prepositions, as we saw in the previous section, but this distinction corresponds to *two levels* in the semantics of spatial expressions, a *lower* level of places and a *higher* level of paths. Irrespective of whether our theoretical spatial framework is decompositional semantics (Bennett 1975, Jackendoff 1983), formal semantics (Zwarts and Winter 2000, Kracht 2002), or generative syntax (Van Riemsdijk & Huijbregts 2001, Den Dikken 2003), we can distinguish between a relatively bigger set of locative place functions and a much smaller group of directional path functions.

The place functions always apply directly to the reference object and define a place or region relative to this object, and they corresponds to such notions as interior (IN function), inferior (UNDER), proximal (NEAR), and are based on topological, projective and force-dynamic notions. It is this level that Zwarts (1997a) and Zwarts and Winter (2000) capture in terms of vectors, which is a mathematical formalization of the notion of relative position. In addition to these place functions, there is a small class of path functions that map objects and places to paths. The major ones are FROM (for source), TO (for goal), VIA (for route) (borrowing Jackendoff's 1983 terms here). The system underlying these path functions is based on whether the beginning, end or middle of a path intersects with a specified place (Jackendoff 1991, Kracht 2002, Zwarts 2005, among others).⁴ There are only these two levels, place and path, necessarily ordered with paths on top of places, and a small number of ways to map from places to paths. There is probably only one function that maps paths to places, the function that Jackendoff (1983) calls ON and Lakoff (1987) *end-point focus*. It maps a path to its endpoint, and it is relevant for locative readings of route prepositions (like in (8a) above). Interestingly, this function is never overtly expressed in languages, as far as I know, unlike the path functions.

As Bennett (1975), Jackendoff (1983) and many others have shown, most prepositions can be analyzed in terms of combinations of place and path functions. The following examples show this for a number of German prepositions:

⁴ I am ignoring here the much less important 'progressive' path functions TOWARDS and AWAY FROM and the finer details of the VIA function, which has an 'existential' version (where *one* intermediary point of the path has a particular position) and a 'universal' version (with *all* points of the path intersecting with a location). The PP *durch das Haus* can refer to a path that starts and ends outside the house, but also to a path that is inside the house all the time. See Zwarts (2005) for a treatment of this distinction in English and its aspectual effects.

(10)	<i>Path function</i>	<i>Place function</i>	<i>Case</i>	<i>Example</i>
a.		IN	DATIVE	in dem Haus 'in the house'
b.	FROM	UNDER	DATIVE	von unter dem Haus 'from under the house'
c.	FROM	IN	DATIVE	aus dem Haus 'out of the house'
d.		TO IN	ACCUSATIVE	in das Haus 'into the house'
e.	VIA	IN	ACCUSATIVE	durch das Haus 'through the house'

Spatial meanings can be analyzed as *compositions* of path and place functions. Some of these function compositions correspond directly to single words, like *aus* in (10c), that is FROM ° IN, the path function FROM applied to the place result of IN. Others make the semantic composition explicit in their syntactic structure, like *von unter* in (10b), which is FROM ° UNDER. Not only can we show the relation between the two instances of a two-way preposition like *in* (locative *in* = IN versus goal *in* = TO ° IN) but also the directional opposition between *in* (TO ° IN) and *aus* (FROM ° IN) and their relation to *durch* 'through' (VIA ° IN).⁵

What interests us here, of course, is how this helps us answer the central question of this paper. If we look at how the cases in (10) are distributed relative to the path functions, we can refine answer **A2** from the previous section in the following way:

A3 DATIVE case corresponds to the FROM function or to the absence of a path function.

ACCUSATIVE case corresponds to the TO and VIA functions.

This seems a reasonable way to associate case assignment of prepositions to the system of path functions of prepositional semantics. Notice that the locative use of the DATIVE does not correspond to a particular path function, but to the absence of that function, as shown in (10a).

⁵ One preposition for which such a decomposition is less straightforward is *um* 'around'. The corresponding semantic function does not separate the place and the path function, but maps directly from an object to a path that encloses it. See Zwarts (2004) for a detailed study of the semantics of English *around*.

A preposition is locative when its meaning does not involve a path function. We can also say that DATIVE case corresponds to an identity function ID that maps each place to itself.⁶

4 Syntactic projection and semantic interpretation

Now that we have a sharper idea of the semantic contribution that DATIVE and ACCUSATIVE case make to prepositional phrases in German, our next step is to work out *how* they make this contribution, i.e. how the meaning of prepositions and cases combine to form the interpretation of a full prepositional phrase. We need to make two natural assumptions to work this out, one about the syntax, and one about how the syntax relates to the semantics.

In order to be maximally explicit, I will take case to be a functional head of its own, K(ase), between P and the DP (Lamontagne & Travis 1987, Bittner & Hale 1996, Bayer, Bader & Meng 2001). The structure of the PP *in das Haus* ‘into the house’ is as follows under this assumption:

- (11) [PP P [KP K [DP D [NP N]]]]
in ACC das Haus

What this structure represents is that case is a grammatical category between the preposition and the noun phrase, i.e. lower than the preposition, but taking the noun phrase (the DP) into its scope. Of course, morphologically, the K, with its feature ACC(USATIVE) will not be realized as a separate word, but as a particular morphological form of the pronoun, determiner, adjective and (minimally in German) of the noun. What kind of mechanism takes care of this realization is not the concern of this paper, because it falls in the domain of morphology.

The semantic interpretation process takes a syntactic structure and maps it to a representation of the meaning, according to the well-known principle of compositionality:

(12) COMPOSITIONALITY

The interpretation of a phrase is a function of its parts and the way they are syntactically combined.

⁶ The view of path functions assumed here is based on Jackendoff (1983). In the alternative of Kracht (2002), which is based on a more temporal view of path functions, there is a function that maps places to static locations, parallel to the dynamic path functions.

In its strongest form this principle interprets every syntactic combination as semantic function application. For the structure in (11) this means that the syntactic heads are interpreted as functions that apply to their complements:

$$(13) \llbracket \text{in ACC das Haus} \rrbracket = \llbracket \text{in} \rrbracket (\llbracket \text{ACC} \rrbracket (\llbracket \text{das} \rrbracket (\llbracket \text{Haus} \rrbracket)))$$

In (13), $\llbracket \alpha \rrbracket$ is the standard notation for the interpretation of α .

If we combine the insights of the previous sections with the two assumptions (11) and (12) of this section then it seems natural to conclude that cases in PPs are interpreted in the following way:

$$\begin{aligned} \mathbf{A4} \quad \llbracket \text{DAT} \rrbracket &= \text{ID} \text{ and } \llbracket \text{DAT}' \rrbracket = \text{FROM} \\ \llbracket \text{ACC} \rrbracket &= \text{TO} \text{ and } \llbracket \text{ACC}' \rrbracket = \text{VIA} \end{aligned}$$

The prime ' is used to keep semantically distinct instances of a case apart, which is necessary because interpretation is a mathematical function. For the locative DATIVE function we use the semantically empty ID function that maps every place to itself. DATIVE and ACCUSATIVE are interpreted as path functions that apply to a DP denotation and yield something to which the preposition can apply again to yield the full PP interpretation.

5 Crossing, redundancy and vacuity

What does this give us? Actually, it is not difficult to demonstrate that what the three ingredients give (the individual interpretations in **A4**, the syntax in (11) and the compositionality requirement in (12)), is not what we want. The first and most obvious problem is an *ordering* problem. Let's take a look at the phrase *in das Haus* again:

- (14) a. in das Haus
 'into the house'
 b. $\llbracket \text{PP in} \llbracket \text{KP ACC} \llbracket \text{DP das Haus} \rrbracket \rrbracket \rrbracket$
 c. TO (IN (THE-HOUSE))
 d. *IN (TO (THE-HOUSE))

The syntactic structure of (14a) is given in (14b). What we want is the interpretation in (14c), but what the compositional interpretation of (14b) gives us is (14d), which is not what we want, because IN and TO are in the wrong order to compose. (The * here means that the final function application does not give a result.) So, it seems that case is syntactically in the wrong position to compose with the preposition. It should have been ‘outside’ the preposition and not ‘inside’ it. This ordering problem does not only affect this specific example, but all the prepositions under consideration here.

This is not the only problem. Consider the phrase *durch das Fenster* ‘through the window’, with the route preposition *durch*. We have to assume that, apart from any consideration of case marking, *durch* is analyzable as VIA ° IN, because that is the meaning that it also has in non-prepositional uses:

- (15) a. Durchweg
 through-way
 ‘passage’
 b. durchscheinen
 through-shine
 ‘to shine through’
 c. hindurch sehen
 PRT-through see
 ‘to see through’

In these combinations with nouns, verbs or with the directional particle *hin*, *durch* still has the VIA ° IN meaning that it also has in its prepositional use. However, we also concluded that ACCUSATIVE case is interpreted as VIA, because of the pattern we saw in Table 1. This means that the compositional interpretation of the structure in (16b) will not give us (16c), with one VIA, but (16d), with two VIA’s, one from *durch* and one from ACC:

- (16) a. durch das Fenster
 ‘through the window’
 b. [_{PP} durch [_{KP} ACC [_{DP} das Fenster]]]
 c. VIA (IN (THE-WINDOW))
 d. *VIA (IN (VIA (THE-WINDOW)))

Case is semantically redundant here: it contributes something that is already part of the meaning of the preposition. The same kind of redundancy, but with a different case, is shown in the following example:

- (17) a. aus dem Haus
 ‘out of the house’
 b. [PP aus [KP DAT [DP dem Haus]]]
 c. FROM (IN (THE-HOUSE))
 d. *FROM (IN (FROM (THE-HOUSE)))

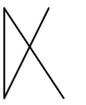
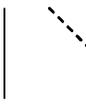
Both *aus* and DAT contribute the path function FROM, so the structure that we get compositionally, by taking together the contributions of the four heads is (17d). The FROM function of the DATIVE case is not only in the wrong place, it is also redundant.

A third problem is seen in a locative phrase like *in dem Haus* ‘in the house’:

- (18) a. in dem Haus
 ‘in the house’
 b. [PP in [KP DAT [DP dem Haus]]]
 c. IN (THE-HOUSE)
 d. IN (ID (THE-HOUSE))

Since there is no path function for locative phrases, we have a DATIVE case here that does not really have a meaning. What we would like to get is the simple semantic structure in (18c), but the syntax gives us this DATIVE case that we have to interpret in a semantically empty way, namely as an identity function ID, as in (18d).

The combination of prepositions and cases creates three types of mismatches between form and meaning:

(19)	<i>Crossing</i>	<i>Redundancy</i>	<i>Vacuity</i>
<i>Form</i>	P [K ...	P [K ...	P [K ...
			
<i>Meaning</i>	Dir [Loc	Dir [Loc	Loc
	in das Haus	durch das Haus	in dem Haus
	‘into the house’	‘through the house’	‘in the house’

The lines indicate how the two elements of the form, prepositions (P) and case (K) relate to the two levels of meaning in the PP, Dir(ection) and Loc(ation). We must conclude the following about the relation between prepositions and cases:

A5 The relation between prepositions and cases is characterized by the kind of crossing, redundancy and vacuity that is illustrated in (19).

Our set of assumptions, developed in section 1 to 4, does not give us the meanings that we want for German spatial PPs. There are two conclusions that we can draw from this. The first conclusion, of course, is that we made a wrong turn somewhere in our argumentation and in setting up our system of assumptions about the cases of prepositions, and we need to go back and find where we went wrong. But the fact that we went wrong shows that there is something special about the relation between prepositions and cases, that makes it different from the way morphemes usually combine with each other.

6 Underspecification and λ -abstraction

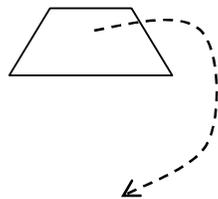
Where did we go wrong? Maybe our idea of what ACC means in a phrase like *in das Haus* (namely TO) is really too limited, as are the other case interpretations in **A4**. How can I be so sure that there are no semantic functions IN* and TO* that can compose as in (20c) below?

- (20) a. in das Haus
 ‘into the house’
 b. [PP in [KP ACC [DP das Haus]]]
 c. IN* (TO* (THE-HOUSE))

Suppose that instead of TO we define a path function TO* that captures a more general notion of goal. When it applies to the reference object THE-HOUSE it gives us an underspecified notion of goal, encompassing paths that lead into the house, towards the house, to the house, under the house. What the preposition *in* should do then, is make this endpoint more precise. Under this view, *in* does not correspond to a function from objects to places, but to a function IN* from less specific to more specific paths. It is like a specifier or modifier that adds localizing information about the *endpoint* of the path to the goal expression TO*(THE-HOUSE). If we can reformulate all the path and place functions in this way, then there is really no mismatch between syntax and semantics in this respect, because we can compositionally interpret (20b) as (20c). Nigel (1999) suggests that a language like Latin has gone through a stage in which *sub* ‘under’ was not yet a preposition governing the ABLATIVE or ACCUSATIVE case, but a specifier of the case (the KP in our terms), modifying either a locative case (ABLATIVE) or a directional case (ACCUSATIVE).

But is this really possible? For this approach to work, there must be *one* function TO* that can provide a set of paths for all two-way prepositions to apply to, not only *in*, but also, for example, *unter*. The following situation shows that this is impossible:

(21) unter den Tisch ‘under the table’



We have a path here that does not in any sense take the reference object, the table, as a goal, because it moves away from it and so it can not be TO*. Nevertheless, we have no difficulty describing this situation as *unter den Tisch* ‘(to) under the table’. The heart of the problem is that we can never decide whether a path goes ‘(to) under the table’ without first having a region where the path should end, defined by a place function. The general function TO* (or similar path functions VIA* and FROM*) to which place functions like IN* and UNDER*

could apply, cannot exist.⁷ The ordering of path and place functions is an irreducible semantic fact and we can therefore conclude:

A6 There is no semantic function that can serve as the independent interpretation of a case when a preposition has to apply to the result.

The assumption that we have to retract is **A4**, where we directly assigned functional meanings to cases. Such meanings simply do not exist.

But we have to be careful here, because with the more powerful notion of function that the λ -calculus gives us, we can define the following meaning for ACCUSATIVE case:

$$(22) \llbracket \text{ACC} \rrbracket = \lambda x \lambda F [\text{TO}(F (x))]$$

This makes the ACCUSATIVE case head a relation between objects and place functions. Or, in other words, it is a function that, when applied to the reference object THE-HOUSE, yields this function:

$$(23) \llbracket \text{ACC das Haus} \rrbracket = \lambda F [\text{TO}(F (\text{THE-HOUSE}))]$$

By abstracting over place functions, we can interpret the ACCUSATIVE KP as a function that compositionally combines with the meaning of the preposition (the place function IN) and gives us the expression we want, namely TO(IN(THE-HOUSE)). However, we have to pay a price for this solution. We must drop the idea that it is the preposition that takes the KP as its argument (see (13) above) and instead allow a complement to apply to its head, which is unusual. So, the conclusion in **A6** still stands.

7 Dependency and marking

We have seen that prepositions and the cases they govern don't 'fit' if we try to interpret them in the ordinary compositional way. But, suppose now that we take an alternative (and, in fact, more common) perspective in which a case morpheme is not like a word, with an independent

⁷ There are also problems in defining extended place functions like IN* and UNDER*. For *unter den Tisch* the UNDER* specifies the TO* path as ending under the table, which involves non-compositional access to the reference object *den Tisch*.

meaning, but rather a *marker* of a *relationship*. As Blake writes in his textbook about case: “Case is a system of marking dependent nouns for the type of relationship they bear to their heads.” (Blake 1994:1). What a case does is mark how a noun relates to another noun, to a verb, adjective or preposition, without being itself part of that relational structure itself. The case assigned by a preposition to its object is what is called a *lexical* or *inherent* case: it signals the thematic relation between preposition and noun. Does the problematic relation between prepositions and cases disappear when we start viewing it as a marking relation?

When the dependent noun of a preposition is marked by *DATIVE*, then this marks that noun as being the location of the preposition or the source of that preposition (or more precisely, the location or source of the spatial configuration expressed by the preposition). With an *ACCUSATIVE*, a preposition marks its object as having the relation of goal or route to it. Take the following examples:

- | | | |
|---------|--|--|
| (24) a. | in dem _{DAT} Haus
‘in the house’ | the house is the location of <i>in</i> |
| b. | aus dem _{DAT} Haus
‘out of the house’ | the house is the source of <i>aus</i> |
| c. | in das _{ACC} Haus
‘into the house’ | the house is the goal of <i>in</i> |
| d. | durch das _{ACC} Haus
‘through the house’ | the house is the route of <i>durch</i> |

The cases in (24) mark the different relations that one and the same DP *der Haus* ‘the house’ has to different prepositions. In (24a) the *DATIVE* marks that this DP is the location of *in*, in (24b) that it is the source of *aus*. The same DP is the goal of *in* in (24c), and therefore *ACCUSATIVE* marked, and the *ACCUSATIVE* marked route of *durch* in (24d). In this way the cases of the prepositions are associated to particular thematic roles that the noun phrase can play in the spatial configuration described by the PP.

At first sight, then, this line of thinking about the case of prepositions, seems perfectly straightforward. We capture the semantic content of these cases, but without giving them an independent compositional semantics. But now consider the following examples:

- | | |
|---------|--|
| (25) a. | unter dem _{DAT} Haus
‘under the house’ |
|---------|--|

- b. unter das_{ACC} Haus
‘(to) under the house’
- c. um das_{ACC} Haus
‘around the house’

If we extend the marking idea of (24) to these examples, we have to say that in (25a) the house carries the location role, in (25b) it is the goal and in (25c) the route, because these thematic roles determine the case marking. But when we take a closer look to these examples, we realize that they are different from the ones in (24). The house in (25a) is really not the location of the PP. We may call it the *reference object* (or *ground*, or *landmark*) of *unter*, but not the location, because for all intents and purposes the location is the *region* under the house. In (25b) it is not the house that fulfills the role of goal, but again the region under the house, because that is where the path that this PP defines, has its endpoint. The route in (25c) is not the house, but the path that encloses the house. So, in all of these examples we must make a distinction between the role of the reference object and the role of the place of path that is defined with respect to this object. With *in*, *aus* and *durch* in (24) it may be hard to see the difference, because the house and its internal place occupy more or less the same space, but with *unter* things are different. The route of *durch* might be the house, but the routes of *um*, *entlang* or *über* are definitely not the house, but spatial trajectories *outside* the house.

This shows that the marking approach seriously underestimates the way prepositions thematically relate to their objects. From the point of view of spatial semantics, the objects in *unter dem Haus* ‘(at) under the house’ and *unter das Haus* ‘(to) under house’ fulfill the same thematic role, that of the reference object (ground, landmark) that determines the inferior region of the house. If cases in German would directly mark thematic relations, then we expect the same case to figure in these two PPs, but this is not what we see. What the cases mark instead are complex thematic relations, roughly along the following lines:

- (26) a. A preposition assigns DATIVE case to the reference object of its *location*.
- b. A preposition assigns ACCUSATIVE case to the reference object of the location of its *goal*.

Unless we are willing to call the ‘reference object of the location of a goal’ a thematic role, we must draw the following conclusion:

A7 The case of a preposition does not mark the thematic role of its noun phrase object.

It makes sense to call the case of a preposition an inherent or lexical case, as a descriptive term, to indicate that the choice of case lexically depends on the head, but there is no direct link between the case and the thematic content of this dependency, contrary to what is often implicitly assumed about dependency marking or lexical/inherent case.

8 Combinatorics and cooccurrence

The case of a preposition can not have an independent meaning, that's the bottom line of the preceding discussion. The preposition and the case that it assigns are therefore not two semantically independent elements, as in (27):

(27) *in das Haus* 'into the house'

[PP in [KP ACC [DP das [NP Haus]]]]
[[in]] ([[ACC]]([[das]]([[Haus]]))
IN TO THE HOUSE

Instead, we must say that *in* and the ACCUSATIVE case are 'co-interpreted'. They are two syntactic heads with one interpretation, TO ° IN:

(28) *in das Haus* 'into the house'

[PP in [KP ACC [DP das [NP Haus]]]]
[[in ACC]] ([[das]]([[Haus]]))
TO ° IN THE HOUSE

Because the directional PP *in das Haus* contrasts with the locative PP *in dem Haus* 'in the house' we can still see that ACC corresponds to the path function TO and *in* to the place function IN, but these correspondences no longer result from a combinatorial system that constructs the TO ° IN meaning from contributions of two separate heads. Instead of saying that the preposition and the case *combine* as part of a recursive and compositional system, we can only say that they *cooccur* and that their cooccurrence has a particular meaning. The crossing problem disappears in this way: because *in* and ACC are taken together by the

interpretation process, their syntactic ordering has become irrelevant. In the same way the other cooccurrences of prepositions and cases are taken together by the interpretation function:

- (29) a. $[[\text{in DAT}]] = \text{IN}$
 b. $[[\text{aus DAT}]] = \text{FROM} \circ \text{IN}$
 c. $[[\text{durch ACC}]] = \text{VIA} \circ \text{IN}$

Under this analysis, the horizontal syntactic relation (of asymmetric c-command) maps into an unordered interlocking of two expressive systems, that both give access to one semantic level:

(30)	in	in	aus	durch
			/ \	/ \
	TO ° IN	IN	FROM ° IN	VIA ° IN
	ACC	DAT	DAT	ACC
	(28)	(29a)	(29b)	(29c)

The top level is the level of prepositions, the lower level the system of cases, dissociated from their syntactic positions, and because of this interpretive simultaneity of prepositions and cases, the vacuity of the locative DATIVE and the redundancy of the route ACCUSATIVE do not affect the semantic output. The crossing, redundancy and vacuity of section 4 are still there, but no longer in a way that disturbs the compositional recursion of the German grammatical system. We can formulate our conclusion as follows:

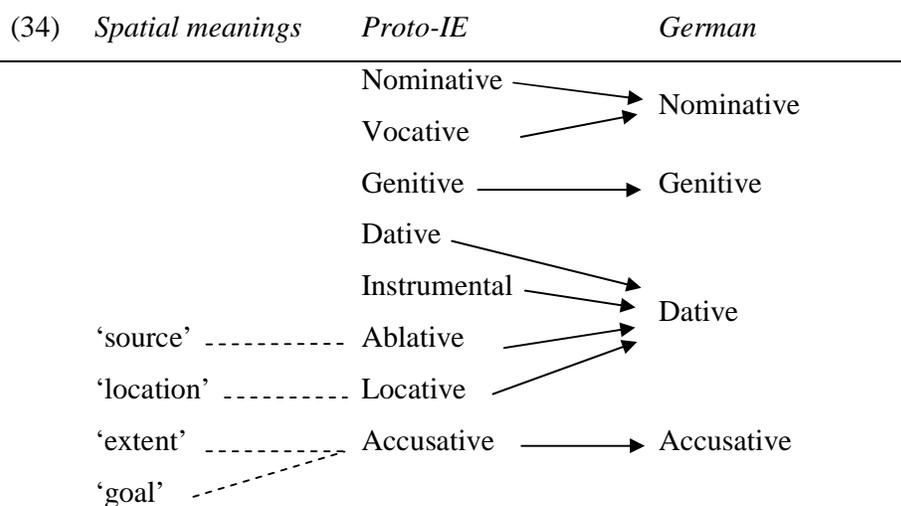
A8 The case of a preposition does not have an interpretation apart from the preposition, but preposition and case are interpreted together.

There are different ways to implement this conclusion, depending on one's model of grammar. In a construction-based approach (Fillmore, Kay & O'Connor 1988, Goldberg & Jackendoff 2004) the cooccurrence of preposition and case is a semantically non-transparent construction, an idiom, with a slot for a DP:

the right questions. Why should German have prepositions with cases in a way that requires these special devices in (31), (32) and (33)? This is where we have to consider the historical dimension.

9 Old things and new things

A careful historical study of the development of German cases and prepositions is beyond the scope of this paper, but we can draw on the insights of other diachronic studies (of German and Indo-European at large) to point us the way. The first thing to note is that the German case system is a reduced remnant of a richer Proto-Indo-European case system, that has partially been reconstructed from the case systems of various Indo-European languages (see Fox 1995 and Beekes 1995 for general overviews). In particular, PIE was richer than most of its daughter languages in cases with a clear spatial use. There was a LOCATIVE for location, an ABLATIVE for source and the ACCUSATIVE was used for goal and route (or ‘extension’ as it is sometimes called). Like Latin and Greek, German lost some of these cases through syncretisms. The DATIVE case, originally more limited in its spatial uses, took over the locative meaning from the LOCATIVE and the source meaning from the ABLATIVE:



So, the distribution of meanings that we see now in the German cases governed by prepositions is an inheritance from Indo-European times. Moreover, this association between cases and meanings has its basis in a system that could work independently from prepositions. We can observe in other languages what has become impossible in modern German, namely

that the cases in (34) are used spatially without the support of a preposition. Here are two Latin examples:

- | | | | |
|---------|-----------|----|-----------------|
| (35) a. | Romam | b. | Carthagine |
| | Rome-ACC | | Carthago-ABL |
| | ‘to Rome’ | | ‘from Carthago’ |

So, cases inside German PPs, with the semantic properties observed here, are in essence the remnants of this older spatial system, which has now become syntactically encapsulated by the prepositional phrase.

As for the prepositions of German (and other Indo-European languages), it is generally assumed that these are a later development, out of PIE adverbs (e.g. Dal 1966 for German, Vincent 1999 for Latin, Luraghi 2003 for Greek, Beekes 1995 for Indo-European in general). The cases were there first, as an older and rudimentary spatial system, and later a variety of adverbs, with richer spatial meanings, came to accompany these cases and grammaticalized into prepositions. The time scales involved are not so relevant here. What is important is that the newer system of prepositions was put on top of an older system of case forms. We see a typical clustering of differences in grammaticalization between cases and prepositions (as observed in the grammaticalization literature, e.g. Hopper & Traugott 2004). The prepositions are the free-standing elements, while the cases are inflectional; the prepositions are phonologically ‘bigger’ than the case forms; the set of prepositions is larger and their semantics more elaborate (less ‘bleached’) than that of the cases.

Instead of the grammaticalization cline or cycle in (36):

- (36) ... > Adverb > Preposition > Case > Zero > Adverb > ...

what we really see in German is more like a *spiral* in which different grammaticalization stages occur simultaneously, one on top of the other, like strata (Hopper & Traugott 2004). We could represent this as in the following figure:

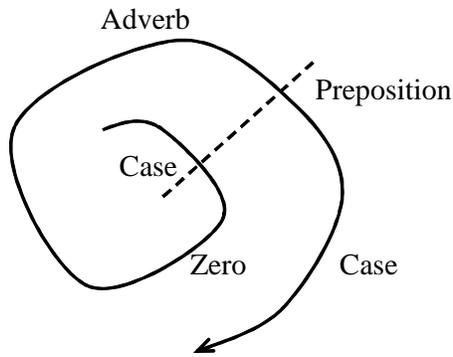


Figure 1: Grammaticalization spiral

The dashed line shows the present state of German in this grammaticalization spiral, which combines older case forms with newer prepositions, as a newer stratum of soil or buildings on top of an older one. Our conclusion for this section is:

A9 The government relation between prepositions and cases reflects the relation between a newer system of spatial forms built on top of an older system.

In this way we can understand why we find crossing, redundancy and vacuity in the relation between prepositions and cases. They were not ‘meant’ to cooperate in a compositional way, but they ended up together through the historical development of the language, presumably because the case system was deteriorated to such an extent that it needed help from the adverbs to remain expressive enough. Redundancy was inevitable, because certain distinctions in the old system are repeated in the new system: the FROM meaning that the DATIVE case acquired as it syncretized with PIE ABLATIVE, is repeated in the lexical meaning of the adverb/preposition *aus* ‘out of’ (FROM ° IN) that was added to it. The locative DATIVE became vacuous because its general locative meaning was superseded by the specific locative meanings of the prepositions that came to accompany it. Crossing resulted from adding an adverb with locative content to a case marker that gives directional information, to form one new complex expression that is no longer a compositional function of the parts.

Of course, this is far from the complete historical story about the case of prepositions. Although the spatial case system became encapsulated in the prepositional system, it was not completely fossilized, as Dal (1966) shows. There were prepositions that started out with one case (often the DATIVE) and later became two-way prepositions by also starting to govern the ACCUSATIVE. Sometimes this might have been a result of analogy with already existing two-

way prepositions. *Neben* ‘next to’ started out as a complex preposition *in eban* ‘in even’ in Old High German, at first governing the DATIVE, later also ACCUSATIVE. In other instances, the change in government resulted from a merger of two different prepositions: *über* (once only ACCUSATIVE) came to govern the DATIVE because it merged with the now obsolete locative preposition *ob(er)* ‘above’. *Bei* ‘near’ went the other direction, from two-way to exclusively DATIVE. *Gegen* started out with DATIVE and went through a two-way state before becoming ACCUSATIVE only. So, the pattern of government that arose from the combination of prepositions and cases was not inert to further change by analogy and other paradigmatic reorganizations, but it is unclear how various diachronic factors interacted to give this effect.

As we saw, there are also some goal or route prepositions that take a DATIVE case, where we would expect ACCUSATIVE, because of a goal or route meaning: *nach* and *zu* ‘to’, *entgegen* ‘against’ and *entlang* ‘along’. Whatever the precise explanation may be for these exceptions, we can observe that two of these prepositions entered the language at a later stage (the complex formations *ent-gegen* and *ent-lang*) and that *nach* was originally an adjective ‘near’ governing DATIVE, which acquired its directional meaning only later. This leaves *zu* as the unsolved mystery. But even with these exceptions and the historical vacillating of prepositional government, the point of this section stands: the cases buried inside PPs in German conserved the PIE spatial properties.

10 Conclusions and further questions

We will end this paper with the question that started it:

What is the relation between prepositions and the cases they govern?

The first conclusion that we must draw is that government in German PPs is not a fundamental grammatical relation. It is descriptively helpful to be able to say that *bei* governs DATIVE case, but we can never make this to mean more than: *bei* cooccurs with or is used with DATIVE case. There is no grammatical *system* behind it in the way in which there is a system behind the way NOMINATIVE and ACCUSATIVE are assigned to subject and object, respectively. The assignment of cases inside PPs is not based on structural or thematic factors, as it may be elsewhere, neither does the case assignment *follow* from the properties of a preposition according to fundamental principles. Prepositions came to accompany cases at some point in the development from Proto-Indo-European through Germanic to modern German and the

went on together in a non-compositional way, but with the semantic convergences that we saw at the beginning of this paper in Table 1.

The second conclusion is related to this last point. A system of complex forms can be meaningful without being compositional. The correspondence between cases and notions like location, source, route and goal is not explicit and completely transparent, but it resides in the system of primary prepositions of German in an implicit way, and it influenced the way German government patterns kept developing.

The third conclusion links the case of prepositions to a recent discussion in Pinker & Jackendoff (2005) about the architecture of the language faculty. They argue, in response to claims associated with Chomsky's Minimalist Program, that language is not a 'perfect', 'optimal' or non-redundant system, but that it is "a complex adaptation for communication which evolved piecemeal". Without recapitulating this discussion here, we can note that the German case system presents a nice example of the kind of 'imperfections' and redundancies that naturally arise in the historical development of language. There is not one homogeneous combinatorial system, which isomorphically maps between forms and meanings, but there are at least two different systems (in this narrow domain of PPs) that don't fit. There must be a limit to imperfection, though. Even though a language grows imperfect combinations of systems, it still tries to find optimal solutions for the conflicts that this complexity creates. The overall compositional recursion of language as a combinatorial system needs to be maintained, by making minimal adjustments. The adjustment that German made was that it reanalyzed prepositions and cases as one semantic unit, thereby sacrificing the independent interpretation of the case markers. In a sense, we see a kind of Optimality Theoretic conflict resolution here that balances general constraints on the mapping between different levels (Prince & Smolensky 1997, Hendriks & de Hoop 2001).

There are many old questions that remain and new questions that come up. The proposal of this paper seems a good starting point for exploring other aspects of the case of prepositions, using compositionality as the 'gold standard' of language, not only in German (where we still have the many secondary prepositions with their GENITIVE and DATIVE cases and rich patterns of dialectal and historical variation), but also outside German, in the Indo-European language family and beyond. There are many connections with typology, grammaticalization and issues in the syntax and semantics of prepositions that make this a promising avenue of research.

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Appendix: German prepositions and their cases

This list is not in any way intended as a complete or reliable overview. Quite a few less frequent or archaic prepositions are missing, the English glosses are very rough and only capture one prominent sense, and there are no examples illustrating the word order and case assignment properties. The list is only intended to show on what kind of selection of prepositions (from this list) this paper is based, namely on the spatial prepositions that primarily govern the DATIVE or ACCUSATIVE case. For authoritative overviews of German prepositions I have to refer to the many grammars, monographs and specific studies devoted to this class of items.

<i>Preposition</i>	<i>Gloss</i>	<i>Case(s)</i>	<i>Position</i>	<i>Spatial?</i>
à	'at the rate of'	ACC	pre	
ab	'from'	DAT (ACC)	pre	yes
an	'on'	DAT/ACC	pre	yes
(an)statt	'instead of'	GEN (DAT)	pre	
auf	'on'	DAT/ACC	pre	yes
aus	'out of'	DAT	pre	yes
außer	'outside, without'	DAT (ACC, GEN)	pre	yes
außerhalb	'outside'	GEN	pre	yes
bei	'near'	DAT	pre	yes
binnen	'within'	DAT (GEN)	pre	
bis	'up to, until'	ACC	pre	yes
dank	'thanks to'	DAT (GEN)	pre	
diesseits	'on this side of'	GEN	pre	yes
durch	'through'	ACC	pre	yes
entgegen	'against'	DAT	pre + post	yes
entlang	'along'	ACC (DAT, GEN)	pre + post	yes
für	'for'	ACC	pre	
gegen	'against'	ACC	pre	yes
gegenüber	'opposite to'	DAT	pre + post	yes
gemäß	'according to'	DAT	pre + post	
halber	'on account of'	GEN	post	
hinter	'behind'	DAT/ACC	pre	yes
in	'in'	DAT/ACC	pre	yes
infolge	'as a result of'	GEN	pre	
inmitten	'amidst'	GEN	pre	yes
innerhalb	'inside'	GEN (DAT)	pre	yes
je	'per'	ACC	pre	

jenseits	'beyond'	GEN	pre	yes
kraft	'in virtue of'	GEN	pre	
längs	'along'	GEN (DAT)	pre	yes
laut	'according to'	GEN (DAT)	pre	
mit	'with'	DAT	pre	
(mit)samt	'together with'	DAT	pre	
mittels	'by means of'	GEN (DAT)	pre	
nach	'after, to'	DAT	pre + post	yes
neben	'next to'	DAT/ACC	pre	yes
oberhalb	'above'	GEN	pre	yes
ohne	'without'	ACC	pre	
per	'per'	ACC	pre	
pro	'per'	ACC	pre	
seit	'since'	DAT	pre	
seitens	'on behalf of'	GEN	pre	
trotz	'despite'	GEN (DAT)	pre	
über	'over'	DAT/ACC	pre	yes
um	'around'	ACC	pre	yes
um ... willen	'for the sake of'	GEN	pre	
unfern	'not far from'	GEN	pre	yes
ungeachtet	'irrespective of'	GEN	pre + post	
unter	'under'	DAT/ACC	pre	yes
unterhalb	'underneath'	GEN	pre	yes
unweit	'not far from'	GEN	pre	yes
von	'from'	DAT	pre	yes
vor	'in front of'	DAT/ACC	pre	yes
während	'during'	GEN (DAT)	pre	
wegen	'due to'	GEN (DAT)	pre + post	
wider	'against'	ACC	pre	
zu	'at, to'	DAT	pre	yes
zufolge	'according to'	DAT (GEN)	pre + post	
zugunsten	'in favour of'	GEN (DAT)	pre	
zuliebe	'for the sake of'	DAT	post	
zwischen	'between'	DAT/ACC	pre	yes

Conflicts in Interpretation
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