EXTENDING THE SEMANTIC CARTOGRAPHY HYPOTHESIS BEYOND FRENCH SPATIAL PREPOSITIONS

Francesco-Alessio URSINI
Keith TSE
Tong WU

Introduction

The literature on French spatial prepositions has offered thorough analyses of their grammatical properties (e.g., Borillo, 2000). Though details vary across proposals, an influential view on their taxonomy can be synthesised as follows. *Simple* prepositions act as heads directly governing the NP that introduces the landmark object, or *ground* (e.g., *à*, *devant*: Talmy, 2000: ch. 1). *Complex* prepositions may include *Internal Location Nouns* (ILN's). These nouns specify which location the located entity or *figure* occupies, given a ground (e.g., *l'intérieur* in *à l'intérieur de*: Borillo, 1988; Aurnague, 1998). These two morphological types act as poles in a cline of increasing complexity. While *à* and *devant* can govern a ground NP, *devant* is a bi-syllabic preposition that originated in the conflation of *de* and *avant* (e.g., Fagard & Sarda, 2009). Prepositions such as *près de* and *à l'intérieur de* include two, and four morphemes, and may qualify as (increasingly) complex prepositions.

Recent semantic works have capitalised on this rich morpho-syntactic research and proposed the *Semantic Cartography hypothesis* (Aurnague & Vieu, 2013, 2015). This hypothesis suggests that a cluster of morphologically simple prepositions (e.g., *à*) cover functional relations among figure and ground. Increasingly complex prepositions can instead introduce reference to *internal* and *external regions*, mostly via ILN's (e.g., *à l'intérieur de* vs. *à l'extérieur de*). The relation(s) between figure and ground is thus mediated via a third entity: a region that the figure can occupy. The Semantic Cartography hypothesis thus suggests that morphological and semantic types are related, though not necessarily in an isomorphic manner.

The generative syntax-based Ursini & Tse (2021) builds on previous formal proposals (e.g., Zwarts & Winter 2000), and introduces a fourth semantic type, *projective* prepositions, to this Cartography. The argument hinges on contrasts such as those in (1)-(2):

(1)	#*Mario*	*est*	*un*	*mètre*	*jusqu'à*	*la*	*voiture.*
	Mario	is	one	metre	next.at	the	car
	#Mario is one metre next to the car.						
(2)	*Mario*	*est*	*dix*	*mètres*	*devant*	*la*	*voiture.*
	Mario	is	ten	metres	in.front.of	the	car
	Mario is ten metres in front of the car.						

As (1) shows, a sentence including a PP headed by *jusqu'à* can become *uninterpretable* if the *Measure Phrase* (MP, henceforth) *un mètre* is also present (viz. the symbol "#"). A PP headed by *devant* distributes with MPs seamlessly, as (2) shows. Ursini & Tse (2021) suggests that the ILN *jusqu(e))* in (1) carries abstract features establishing that this item denotes an undirected region, adjacent to the ground. The MP *un mètre* carries opposite features: it denotes a directed distance of one metre from the ground. The feature mismatch leads to an uninterpretable sentence. Conversely, *devant* carries features matching those of the MP *dix mètres*, whence the interpretable sentence. According to this Extended Semantic Cartography hypothesis, morphological complexity can act as a cue for prepositions' semantic type.

Crucially, this work does not offer a semantic account of the hypothesis. Therefore, it does not investigate *whether* and *how* semantic types may be compositionally associated to morphological structure(s), and thus to the distinct categories/parts forming prepositions. As observed in Aurnague & Vieu (2015), furthermore, the hypothesis seems to carry cross-linguistic import. The distinction between functional, region and projective sense types for prepositions seems attested in other languages (e.g., Mandarin; Zhang, 2017). However, this claim can be accepted insofar as one can individuate preposition types in a language, or categories approximating them. Therefore, a cross-linguistic extension of this hypothesis requires an analysis of a language's spatial categories.

The goal of this chapter is to confirm the Extended Semantic Cartography (henceforth: ESC) hypothesis for Italian, Chinese and Korean. We choose these languages because they include different sets of categories related to prepositions and ILN's (cf. Hagège, 2010). We show that the ESC hypothesis can be derived from a compositional analysis of the senses assigned to spatial categories and their constituting parts. To reach this goal, we first discuss previous research and extant analyses on French prepositions (Section 1). We then present our methodology and results (Sections 2-3), before offering a discussion and conclusions.

1. Previous Literature: The view from French

French reference grammars and most linguistic works usually distinguish between simple and complex prepositions (e.g., *en* vs *autour de*: Melis, 2003; Price, 2008: 520-545; Fagard, 2010). Several works also offer evidence for another class of prepositions, *locutions prépositionnelles* ("locutional prepositions" or "prepositional locutions": e.g., *au bord de*; Borillo, 2000, 2001; Melis, 2003; Fagard, 2012; Stosic, this volume). This type always includes a simple preposition acting as a "marker" of an ILN and another preposition following the ILN. Markers are usually inflected (e.g., *au bord de* "at the edge of"); connecting prepositions mostly include *à* or *de* (e.g., *face*

à "against", *dos à* "at the back of"). ILN's diachronically originate in the nominal, adjectival and adverbial domains, and tend to lose any inflecting morphology (Fagard, 2010, 2012; Fagard & De Mulder, 2007; Fagard & Sarda, 2009). Syntactically, locutional prepositions can head PPs in sentences like their simple and complex counterparts (cf. (3), Melis, 2003: 95-104):

(3) *Ils se sont assis a-u bord de la route.*
They self are sat at-the edge of the road
"They are sitting at the edge of the road."

Fagard, Pinto de Lima, Stosic & Smirnova (2020) develops a tighter connection between morphological structure and syntactic distribution in prepositions across Romance languages (cf. also Fagard, 2010, this volume; Ganfi & Piunno, this volume). For French, it proposes that simple prepositions introduce a relation between a constituent and a sentence or higher constituent (cf. the template in (4a)). Complex prepositions involve a lexical nucleus, and a case marker introducing this nucleus (cf. (5a)). One can find adjectives, adverbs instead of nouns/ILN's as lexical nuclei (e.g., *à côté de* "next to" in (5b)), but also lexicalised forms of markers and ILN's (e.g., *autour de*). For locutional prepositions, one can find definite articles fusing with markers (e.g., *au* in *au bord*). Locutional prepositions may involve an explicit determiner preceding an ILN (cf. *l'intérieur* in (6b)). Thus, marker-based simple prepositions also acting as markers form the list in (7); multi-morphemic or "lexicalised" simple prepositions involving the lexicalisation/univerbation of nuclei, cf. the list in (8). We offer non-exhaustive lists of complex and locutional prepositions in (9)-(10):

(4) a. $Prep_{1=2} + \emptyset_{Det} + \emptyset_{N} + Prep_{2=1}$
b. *à*, *en*

(5) a. $Prep_1 + \emptyset_{Det} + N + Prep_2$
b. *à côté de*

(6) a. $Prep_1 + Det + N + Prep_2$
(*$Prep_2$=connects preposition with higher constituent; $Prep_1$=acts as case marker introducing constituent, N=ILN, Det=Determiner*)
b. *à l'intérieur de*

(7) **Marker-based Simple Prepositions** = {*à* "at, to", *de* "of, from", *dans* "in, from", *en* "in"}

(8) **Lexicalised Simple Prepositions** = {*chez* "with", *entre* "within", *par* "for", *pour* "via", *parmi* "between", *sur* "on", *sous* "down", *devant* "in front of", *derrière* "behind", etc.}

(9) **Complex Prepositions** = {*autour de* "around", *loin de* "away from", *hors de* "out of", *derrière* "behind", *jusqu'à* "until, up to", etc.}

(10) **Locutional Prepositions** = {*au bord de* "at the edge of"*, au fond de* "at the bottom of", *à côté de* "beside, next to"*, à l'intérieur de* "at the interior of", *à l'extérieur de* "at the exterior of", *en face de* "against"*, au sommet de* "on the top of", etc.}

A similar point is made in Ursini & Tse (2021). This work differs from previous generative works (e.g., Roy, 2006) in treating ILN's and other lexical nuclei as arguments of $Prep_1$, thus forming a PP that in turn becomes an argument of $Prep_2$. However, the account does not offer a full-fledged semantic analysis. Luckily, the semantic properties of French prepositions have been investigated in cognitive semantics works (e.g., Vandeloise, 1986, 2003, 2017). These works offer evidence that simple prepositions are amply polysemous (e.g., *à*), whereas complex prepositions usually have more restricted sense ranges (e.g., *au bord de*). Works focusing on the diachronic evolution of prepositions show that items can develop different senses over time (e.g., Aurnague & Stosic, 2002; Fagard & De Mulder, 2007; Stosic 2007). These works suggest that complex and locutional prepositions may develop the ability to refer to locations defined via specific parts of the ground (e.g., *bord* to extremities). This fact entails that the semantic properties of ILN's may be transferred to the prepositions lexicalising them and may have affected prepositions' polysemy.

Several works have also explored French prepositions from a model-theoretic perspective, though capitalising on cognitive linguistics insights (e.g., Aurnague & Vieu, 1993; Aurnague, Vieu & Borillo, 1997; Aurnague, 1998, 2004; Aurnague et coll. 2007). Two of their core proposals can be summarised as follows. First, spatial prepositions find their denotations in an ontology of five spatial categories: space portions, locations, objects, mixed entities, and substances. Examples of terms denoting these types are respectively *l'intérieur*, *Paris, la voiture*, *la maison*, and *le vin*. ILN's usually denote spatial portions by referring to positions defined via objects. Place names and ground NPs usually denote locations as parts of space stably occupied by an object over time. Second, complex prepositions may denote mereological relations between a "whole" ground and "parts" defined via the objects occupying these parts, or the corresponding spatial portions.

Furthermore, Aurnague et coll. (2001) studies the distribution of PPs and notes that some complex prepositions can also distribute with MPs (e.g., *dix mètres derrière la voiture*). However, this work does not fully explore this pattern. Aurnague & Vieu (2015) introduces the Semantic Cartography Hypothesis and a tri-partite semantic classification. Simple prepositions tend to denote functional, not entirely spatial relations among entities (e.g., *à*, *sur*). Complex prepositions tend to locate figures in regions (i.e., space portions), either "internal" (e.g., *à l'intérieur de*), or "external" regions (e.g., *derrière*). The cross-linguistic import of this classification is mentioned in passing, though left to explore for future research. As mentioned in the

introduction, Ursini & Tse (2021) proposes to introduce a fourth type, that of projective prepositions, by offering data involving the distribution of MPs with this category. However, the work ends its analysis without fully addressing the ESC hypothesis and its possible extensions.

Overall, previous works on French prepositions suggest that they can display different morphological and semantic types, though their syntactic distribution is mostly homogeneous. Most works do not attempt to directly connect these results to the ESC hypothesis, since this hypothesis is a recent development in research on French prepositions. Therefore, the questions of whether and how semantic types compositionally emerge from morphological types, in French and in other languages, are overall still open. We address these questions and their cross-linguistic support of the ESC hypothesis in the next sections.

2. Methodology

The data we present in this chapter originate in works that share with Ursini & Tse (2021) a common methodology for the analysis of prepositions' types. For this reason, we present this methodology in this section, and summarise the key data in the next section. The data were collected via off-line elicitation tasks involving native speakers of each language. We present the two reasons for which this task was used in tandem with the task's description.

First, the task involved the testing of sentences describing scenarios involving different configurations between figure and ground. Participants read descriptions of these scenarios, then evaluated whether a target sentence described the matching scenario. Therefore, the task allowed the experimenters to test large sets of target items, while controlling their use in context. Second, participants could choose one value from a 5-point Likert scale ("1"=unacceptable, "5"=perfect), and could add comments below each sentence. We follow recent studies on grammaticality (de Clerq & Haegeman, 2018) by offering average scores and specific values below each sentence. Thus, the notation "Average score: 4.80, answers: 1^0 2^0 3^0 4^2 5^8" means that 2 participants answered "4", 8 participants answered "5", and the average was "4.80". Therefore, our studies could detect intra-speaker variation in how participants could assign senses to each item.

3. The Data

The data we present for French originate in the Ursini & Tse (2021)'s study (N=30), though these examples differ from those reported in that article (Section 3.1). For Italian, Mandarin and Korean, we first offer a compact overview of the key categories corresponding to spatial prepositions. We then offer an overview of the results from each language-specific study (Sections 3.2-3.4).

3.1. French

According to Ursini & Tse (2021) and references therein, case marker prepositions tend to denote functional relations and, when heading PPs, they do not distribute with MPs (e.g., *à*, cf. (11)). Lexicalised simple prepositions may belong to the functional (e.g., *sur*, *sous*), region (e.g., *parmi*) or projective types (e.g., *devant*). Complex and locutional prepositions denote relations involving regions (e.g., *l'intérieur*) or projections (e.g., *loin*), via lexical nuclei (e.g., ILN's). Except for projective prepositions (e.g., *derrière* in (14)-(15)), all other preposition types head PPs resisting combination with MPs (cf. (12)-(13)). The sense of a verb can determine whether a preposition denotes a static relation (cf. (14)) or a dynamic relation (cf. (15)). This sense dimension is orthogonal to the other sense types in French. It however plays a role in Mandarin and Korean, whence its mention:

(11) #*Mario* *est* *dix mètres* *à* *la voiture.*
Mario is ten metres at the car
"#Mario is ten metres at the car."
(Average score: 1.33; answers: 1^{20} 2^{10} 3^{0} 4^{0} 5^{0})

(12) #*Mario* *est* *un mètre* *à* *l'intérieur* *de* *la voiture.*
Mario is one metre at the.interior of the car
"#Mario is one metre in the interior of the car."
(Average score: 2.16; answers: 1^{18} 2^{2} 3^{1} 4^{2} 5^{7})

(13) #*Mario* *est* *un mètre* *à* *l'extérieur* *de* *la voiture.*
Mario is one metre at the.exterior of the car
"#Mario is one metre in the interior of the car."
(Average score: 1.9; answers: 1^{19} 2^{3} 3^{2} 4^{2} 5^{4})

(14) *Mario* *est* *dix mètres* *derrière* *la voiture.*
Mario is ten metres behind the car
"Mario is ten metres behind the car."
(Average score: 4.33; answers: 1^{2} 2^{0} 3^{4} 4^{4} 5^{20})

(15) *Mario* *va* *dix mètres* *derrière* *la voiture.*
Mario goes ten metres behind the car
"Mario is ten metres behind the car."
(Average score: 4.53; answers: 1^{2} 2^{0} 3^{2} 4^{2} 5^{24})

In agreement with Aurnague & Vieu (2015), we here propose that the external or internal region type is assigned via the content of ILN's, though both types block MPs. We also suggest that the region/projective divide is not necessarily clear-cut. For items such as *à l'intérieur de*, some participants accepted their distribution with MPs (N=7, cf. (12)). This form of intra-speaker variation notwithstanding, the data support the classification defined via lists (16)-(19):

(16) **Functional Prepositions** = {*à*, *de, dans, en*, *sur*, *chez*, etc.}

(17) **External Region Prepositions** = {*à côté de*, *par*, *près de*, *à l'intérieur de*, *à l'extérieur de*, *sur le sommet de*, etc.}

(18) **Internal Region Prepositions** = {*entre***,** *parmi***,** *au fond de*, *à l'intérieur de*, *au milieu de*, etc.}

(19) **Projective Prepositions** = {*dans*, *autour de*, *derrière*/*devant*, *à gauche de*, *à droit de*, *au nord de*, *au sud de*, *à l'ouest de*, *à l'est de*, etc.}

Overall, semantic and morphological types do not stand into isomorphic correspondence. For instance, projective prepositions include simple (e.g., *dans*), complex (e.g., *autour de*) and locutional (e.g., *au nord de*) types. What the lists also suggest is that simple prepositions doubling as case markers correlate to functional senses, whereas locutional prepositions correlate to region types, internal and external. Thus, the ESC hypothesis seems confirmed in French via nuanced data patterns.

3.2. Italian

Italian includes a clear-cut set of simple prepositions (Bottari, 1985; Rizzi, 1991; Ganfi & Piunno, 2017, 2022). Complex prepositions usually include a possibly optional "connecting" preposition (*a* or *di*), and a case marker preceding an ILN (e.g., *a destra*: Ursini, 2015; Franco, Savoia & Manzini, 2020). Some Italian ILN's have de-verbal or adjectival origins (e.g., *presso* from Latin *pressus*) or have undergone univerbation with prepositions (e.g., *in-torno*: Casadei, 2011; Franco, 2016). Locutional Italian prepositions include a definite article invariably conflating with the case marker preceding the ILN (e.g., *alla destra di*: Franco, 2016). Like French, Italian includes a perhaps smaller set of lexicalised simple prepositions. Non-exhaustive lists are in (20)-(23):

(20) **Simple Case Marker Prepositions** = {*a* "at, to", *da* "from, to, at", *di* "of, from", *in* "in"}

(21) **Simple Lexicalised Prepositions** = {*per* "through, across", *tra*/*fra* "between", *su* "on, to", *giù* "down"}

(22) **Complex Prepositions** = {*accanto a* "beside", *addosso a* "against", *davanti a* "in front of", *intorno a* "around", *lungo (a)* "along", *sopra (a)* "above", *sotto (a)* "below", *presso (a)* "next to", *dietro (a)* "behind", *verso* "towards"}

(23) **Locutional Prepositions** = {*di fronte a* "in front of", *a sinistra di* "to the left of", *a destra di* "to the right of", *in cima a* "on top of", *nei pressi di* "in the proximities of", *al centro di* "at the centre of", *ai piedi di* "at the feet of", etc.}

Semantic types can be defined as follows (cf. Ursini & Wu, 2021; N=50). Simple prepositions coincide with functional prepositions, and thus cannot

distribute with MPs (cf. (24)). Complex and locutional prepositions can denote any other type, but locutional prepositions mostly carry region sense types and cannot combine with MPs (cf. (25)-(26)). Projective prepositions include lexicalised simple prepositions (e.g., *per*, cf. (27)), and most complex prepositions (*dietro a*, cf. (28)). Verbs denoting a dynamic relation do not overall affect this distribution, as in French (cf. (27)-(28)). Some degree of intra-speaker variation is also attested. Some speakers (N=5) would consider *all'esterno* "in the exterior" a projective preposition (cf. (26)). The data nevertheless lead to the classification proposed in (29)-(32):

(24) #*Mario è dieci metri a-lla macchina.*
Mario is ten metres at-the car
"#Mario is ten metres at the car."
(Average score: 1.2; answers: 1^{40} 2^{10} 3^{0} 4^{0} 5^{0})

(25) #*Mario è un metro a-ll'interno de-lla macchina.*
Mario is one metre at-the.interior of-the car
"#Mario is one metre in the interior of the car."
(Average score: 1.66; answers: 1^{35} 2^{6} 3^{4} 4^{1} 5^{4})

(26) #*Mario è un metro a-ll'externo de-lla macchina.*
Mario is one metre at-the.exterior of-the car
"#Mario is one metre in the exterior of the car."
(Average score: 1.88; answers: 1^{29} 2^{7} 3^{6} 4^{3} 5^{5})

(27) *Mario va un chilometro per i campi.*
Mario goes one kilometre for the fields
"Mario goes one kilometre across the fields."
(Average score: 4.26; answers: 1^{4} 2^{2} 3^{2} 4^{11} 5^{31})

(28) *Mario si trova dieci metri dietro a-lla macchina.*
Mario SELF finds ten metres behind at-the car
"Mario is located ten meters behind the car."
(Average score: 4.8; answers: 1^{2} 2^{0} 3^{0} 4^{7} 5^{41})

(29) **Functional Prepositions** = {*a*, *da*, *di, in*}

(30) **External Region Prepositions** = {*su (di), giú (di), accanto a*, *addosso a*, *dirimpetto a*, *incontro a, davanti a*, *sulla cima di*, *nei pressi di*, *all'esterno di*, etc.}

(31) **Internal Region Prepositions** = {*in mezzo a*, *in fondo a*, *al centro di, al cuore di*, *all'interno di*, *dentro a*, etc.}

(32) **Projective Prepositions** = {*per*, *verso (di)*, *tra/fra (di), intorno a*, *vicino a*, *attraverso (a)*, *dentro (a)*, *dietro (a)*, *di fronte a*, *a sinistra/destra di*, *a nord/sud di*, *ai piedi di*, etc.}

Overall, the four semantic types predicted by the ESC hypothesis are clearly attested. ILN's and other lexical categories seem also to strongly correlate to

sense types, though intra-speaker variation paints a nuanced picture also in Italian.

3.3. Mandarin

Mandarin includes prepositions also distributing as co-verbs. Prepositions can take figure and ground NPs as arguments, in the absence of a lexical verb (Sun, 2006: ch. 30; Huang, Li & Li, 2009: ch. 6). Mandarin also includes *fangweici* "localisers", a category of nominal modifiers following ground NPs (Peyraube, 2003; Huang, 2009). It is usually assumed that the combination of prepositions and localisers, along with ground NPs, forms a discontinuous PP, and a language-specific counterpart to complex and locutional prepositions (Djamouri et coll., 2013, Zhang, 2017). Localisers come in two forms: *simple* localisers (e.g., *qian* "front", *hou* "behind"), and *compound* localisers (e.g., *qian-mian* lit. "front-side", *qian-fang* lit. "front-axis"). Simple localisers act as clitic-like elements attaching to ground NPs, though they share with compound localisers their ability to refer to regions or projections (Liu, 1998; Zhang, 2017). Compound localisers are mostly introduced via the relational head *de*, which takes these and ground NPs as their arguments (e.g., Peyraube, 2003; Djamouri et coll., 2013). The lists of in (33)-(35) offer an overview of these three categories:

(33) **Prepositions** = {*zai* "at", *dao* "to", *cong* "from", *dui* "in the opposite direction of", *li* "away", *wang* "in the direction of", *xiang* "in the direction of"}

(34) **Simple localisers** = {*li* "in", *wai* "out", *shang* "on", *xia* "down", *qian* "front", *hou* "back, behind", *zuo* "left", *you* "right", *bei* "North", *xi* "West", *dong* "East", *nan* "South", etc.}

(35) **Compound localisers** = {*li-mian* "in-side", *qian-bian* "front-part", *hou-bian* "back-part", *qian-tou* "front-head", *bei-fang* "north-axis", *xia-fang* "down-axis", etc.}

For Mandarin, Ursini, Long & Zhang (2020) offers the following picture (with N=31). Simple prepositions carry functional senses and block MPs when they distribute without localisers (e.g., when the ground is a place name, cf. *Beijing* in (36): Sun, 2006: 428-430). Simple localisers can add either region or projective senses to PPs, as their distribution with MPs shows (cf. (36)-(38)). Compound localisers based on the *-tou* suffix (lit. "edge") restrict localisers' senses to regions internal to the ground (e.g., *qian-tou* "front edge" (39)). Instead, *-mian* and *-bian* do not affect a sense type (cf. *qian-mian* in (40)). The *-fang* series restricts the localisers' senses to projective types: this suffix refers to an "axis" of the ground (cf. *qian-fang* in (41)). Furthermore, some prepositions can capture dynamic relations *qua* co-verbs, but can also co-occur with projective PPs and MPs (e.g., *dao*, in (42)). The lists in (43)-(46) offer the classification emerging from these data:

(36) *#Zhangsan* *zai* *Beijing* *yi gong-li.*
Zhangsan be-at Beijing one kilometre
"#Zhangsan is one kilometre at Beijing."
(Average score: 2.06; answers: 1^{11} 2^{11} 3^{6} 4^{2} 5^{1})

(37) *#Zhangsan* *zai* *shandong* *li* *yi mi.*
Zhangsan be-at cave in one metre
"Zhangsan is one metre in the cave."
(Average score: 2.16; answers: 1^{9} 2^{11} 3^{6} 4^{2} 5^{3})

(38) *Zhangsan* *zai* *fangzi* *wai* *yi mi.*
Zhangsan be-at room out one metre
"Zhangsan is one metre outside the room."
(Average score: 3.74; answers: 1^{3} 2^{3} 3^{4} 4^{10} 5^{11})

(39) *#Zhangsan* *zai* *che* *de* *qian-tou* *yi mi.*
Zhangsan is-at car DE front-edge one metre
"#Zhangsan is one metre in the front of the car."
(Average score: 2.06; answers: 1^{12} 2^{10} 3^{5} 4^{3} 5^{1})

(40) *Zhangsan* *zai* *che* *de* *qian-mian* *shi mi.*
Zhangsan be-at car DE front-side ten metre
"Zhangsan is ten metres in front of the car."
(Average score: 3.83; answers: 1^{0} 2^{3} 3^{9} 4^{9} 5^{10})

(41) *Zhangsan* *zai* *che* *(de)* *qian-fang* *shi mi.*
Zhangsan be-at car (DE) front-axis ten metre
"Zhangsan is ten metres in front of the car."
(Average score: 4.06; answers: 1^{2} 2^{3} 3^{2} 4^{8} 5^{16})

(42) *Zhangsan* *dao* *le* *shandong* *li-mian* *shi mi.*
Zhangsan go-to PF cave in-face ten metre
"Zhangsan has gone ten metres inside the cave."
(Average score: 4.06; answers: 1^{0} 2^{3} 3^{4} 4^{10} 5^{14})

(43) **Functional Prepositions** = {*zai*, *cong*, *dui*, *li*, *wang*, *ziang*}

(44) **External Region Localiser** = {*wai*, *shang*, *xia*,*pang*, *bei*, *xi*, *dong*, *non*, etc.}

(45) **Internal Region Localiser** = {*li*, *zhong*, *li-tou*, *wai-tou*, *shang-tou*, *qian-tou*, etc.}

(46) **Projective Localiser** = {*qian*, *qian-mian, hou*, *hou-bian, qian-fang*, *hou-fang*, *shang-mian*, *xia-bian*, *bei-fang*, *xia-fang*, *wai-fang*, etc.}

Overall, the ESC hypothesis is also confirmed for Mandarin. Furthermore, Mandarin supports the distinction between external and internal location types, as suffixes *-tou* and *-fang* respectively do. Thus, a sense type emerges via the piece-meal, compositional contribution of prepositions, localisers and possibly suffixes. Interestingly, speakers generally preferred dynamic *dao* as a preposition heading projective PPs, other prepositions are also acceptable: thus, intra-speaker variation was again at work.

3.4. Korean

The picture that Korean offers is considerably different from the other three languages. First, Korean includes spatial particles attaching to ground NPs (Chang, 1996: ch. 3; Kim, 2016: ch. 32). It also includes spatial nouns following particles and ground NPs (Choi-Jonin, 2008; Ko, 2008; Bayk, 2019). Works on Korean usually suggest that spatial particles act as approximate counterparts of prepositions. Spatial nouns seem a category slowly evolving into postpositions via grammaticalization (e.g., "postpositionoids" in Rhee, 2004, 2008). In modern Korean, they realise ILN's; combinations of particles and spatial nouns thus approximate complex prepositions (cf. Rhee, 2008). A clear counterpart of locutional prepositions seems not attested, though certain spatial nouns involve classifier-like suffixes (e.g., *alun-ccok* lit. "right-side"). We offer non-exhaustive lists of spatial particles in (47), and of spatial nouns in (48):

(47) **Spatial Particles** = {*-ey* "at, to", *-eyse* "at, in, from", *-(u)lopwuthe* "to, toward", *-eykey* "to, animate ground", *-kkey* "to, animate ground, honorific", *-kkaci* "up to", etc.}

(48) **Spatial Nouns** = {*an* "the inside", *sok* "the inside", *pakk* "the outside", *wi* "the top", *alay* "the below", *aph* "the front", *twi* "the rear", *olun-ccok* "right side", *oyn-ccok* "left side", etc.}

The existence of the four hypothesised semantic types is tested in Ursini & Baik (2021) (N=75). This study shows that spatial particles and nouns may form PPs carrying different senses. These PPs may include a genitive particle/marker *-uy* mediating between ground NP and spatial noun in written contexts (cf. *cha-ey* "car" and *pakk* "out" in (49)). A spatial particle can affix to the resulting complex NP (e.g., *-ey* "-loc" in (49)). Spatial and ground NPs can also form compound-like phrases affixed via particles, thus forming complex PPs (cf. *cha-an-ey* "car-in-loc" in (50), *cha-an-eyse* "car-in-abl" in (51)). Thus, the genitive construction patterns suggest that spatial nouns are actually NPs introducing reference to specific locations. Spatial particles seem instead to determine sense type. Locative *-ey* introduces reference to locations: external ones with *pakk*, internal ones with *an*. Ablative *-eyse* instead, favours projective senses, especially with dynamic verbs (cf. *enn-ta* "come-dec" in (51)).

The presence of MPs and thus of projective senses can be confirmed via two different constructions. In the first construction, an ablative particle affixes to the ground NP (e.g., *-eyse* and *-lopwuthe* in (52)). An MP (e.g., *il mithe* "one metre") follows the affixed ground NP and precedes a spatial NP marked via locative *-ey* (e.g., *aph-ey* "front-loc" in (52)). In the second construction, ground and spatial NPs form complex NPs affixed via an ablative particle (e.g., *cha-aph-ulopwuthe* "car-front-abl" in (53)). The MP is affixed via the

case particle *-ey* and follows this complex NP (e.g., *il mithe-ey* "one metre-loc" in (53)). Locative *-ey* and other non-ablative cases block MPs, when affixed to complex NPs (cf. (54)). We summarise the results emerging from the study via the lists in (55)-(58):

(49) *Ku sonyen-un cengwen(-uy-)pakk-ey iss-ta.*
The boy-TOP garden-GEN-the.out.side-LOC be-DEC
"The boy is outside the garden."
(Average score: 4.13; answers: 1^{0} 2^{6} 3^{15} 4^{31} 5^{23})

(50) *Ku sonyen-un cha-an-ey iss-ta.*
The boy-TOP car-in-LOC be-DEC
"The boy is in the car."
(Average score: 4.42; answers: 1^{0} 2^{0} 3^{9} 4^{25} 5^{41})

(51) *Ku sonyen-un cha-an-eyse enn-ta.*
The boy-TOP car-in-ABL come-DEC
"The boy comes from inside the car."
(Average score: 4.2; answers: 1^{2} 2^{4} 3^{9} 4^{22} 5^{38})

(52) *Ku sonyen-un cha-lopwuthe/eyse il mite aph-ey iss-ta.*
The boy-TOP car-ABL/ABL one metre front-LOC be-DEC
"The boy is one metre in front of the car."
(Average score: 4.24; answers: 1^{1} 2^{5} 3^{7} 4^{24} 5^{38})

(53) *Ku sonyen-un cha-aph-ulo-pwuthe il mite-ey iss-ta.*
The boy-TOP car-front ABL one metre-LOC be-DEC
"The boy is one metre in front of the car."
(Average score: 3.41; answers: 1^{7} 2^{11} 3^{17} 4^{24} 5^{16})

(54) *#Ku sonyen-un cha-ey il mite-ey iss-ta.*
The boy-TOP car-LOC one metre-LOC be-DEC
"#The boy is in/at one metre in the car."
(Average score: 2.21; answers: 1^{29} 2^{22} 3^{12} 4^{3} 5^{9})

(55) **Functional Particles** = {*-uy*, *-ey*, *-eyse*, *-ulopwuthe*, etc.}

(56) **External Region Particles snd Nouns** = {*pakk-ey*, *wi-ey*, *aph-ey*, *twi-ey*, *ypeh-ey*, *kuwsek-ey*, *kagancali-ey*, *tong-ey*, etc.}

(57) **Internal Region Particles snd Nouns** = {*alay-ey*, *mith-ey*, *kawuntey-ey*, *kwusek-ey*, etc.}

(58) **Projective Particles snd Nouns** = {*pakk-eyse*, *wi-eyse*, *aph-ulopwuthe*, *twi-lopwuthe*, *ypeh-eyse*, *kuwsek-eyse*, *tong-ulopwuthe*, *alay-eyse*, *mith-eyse*, etc.}

Overall, these data confirm the ESC hypothesis: all four semantic types are attested in Korean. They also show that such senses seem to emerge in a compositional manner. Spatial particles may carry functional senses without spatial NPs (e.g., locative *-ey*), but change to region senses with these NPs.

Projective senses depend on the combination of ablative particles and spatial NPs, instead. Crucially, participants' answers show that the first type of construction that can include MPs (cf. (52), average score 3.41) is generally preferred over the second type of construction (cf. (53), average score 4.24). Most participants nevertheless accepted both constructions as possible ways to describe a figure at a certain distance from a ground, and thus potentially carrying projective sense types. Overall, we have reached our goal: confirm the ESC hypothesis for each of the four languages by analysing the relation between semantic and morphological types. We can offer a discussion and conclusions.

Discussion & Conclusions

We believe that three key results emerge from our analysis.

First, the morphological side of our analysis is consistent with previous proposals introducing different morphological types for spatial prepositions and related categories (e.g., Borillo, 1988; Melis, 2003; Aurnague, 2004; Fagard, 2012; Stosic, this volume). The analysis shows that four languages under discussion seems to have morphological types that approximate simple, lexicalised, complex and locutional prepositions. Second, the analysis can capture the semantic types present in French, Italian, Mandarin and Korean, via a careful discussion of the interplay between MPs and spatial categories. Third, our account also shows that intra-speaker variation can be aptly modelled, in each attested language. We achieve this result by explicitly representing speaker-specific variation in the examples. We therefore suggest that speakers may entertain different representations for each vocabulary item, but that this bi-modal type of distribution is not problematic for the hypothesis. This is the case because all speakers can access the four proposed semantic types for spatial categories, with divergences usually emerging when complex and locutional morphological types are involved.

Let us move to the conclusions. Our chapter has offered an extension of the ESC hypothesis that finds confirmation of its predictions in French, Italian, Mandarin and Korean. The predictions of this extended hypothesis involve the existence of four semantic types: functional, internal, and external region, and projective types. The chapter offers evidence that there is a correlation between morphological complexity and semantic type. Locutional prepositions, and categories corresponding to these preposition types (e.g., Korean spatial nouns and particles) tend to denote region types. Simple prepositions and particles tend to denote functional types, and intermediate types (lexicalised or complex prepositions) often denote projective types. Our chapter has then shown that it is possible to derive these semantic types from the combination of prepositions, markers and lexical nuclei forming each vocabulary item. For further applications, however, we must wait future research.

References

Adger, D. (2010). A minimalist theory of feature structures. Dans Kibort, A. & CCorbett, G. (dir.), *Features: Perspectives on a Key Notion in Linguistics* (p. 185-218). Oxford: Oxford University Press.

Asher, N. & Pustejovsky, J. (2013). A Type Composition Logic for Generative Lexicon. Dans Pustejovsky, J.Bouillon, P., Isahara, H., Kanzaki, K. & Lee, C. (dir.), *Advances in Generative Lexicon Theory* (p. 39-68). Dordrecht: Springer.

Aurnague, M. (1998). Basque genitives and part-whole relations: Typical configurations and dependences. *Carnets de grammaire*, 1, 1-62.

Aurnague, M. (2004). *Les structures de l'espace linguistique : Regards croisés sur quelques constructions spatiales du basque et du français*. Leuven/Paris : Peeters.

Aurnague, M. & Stosic, D. (2002). La préposition *par* et l'expression du déplacement : Vers une caractérisation sémantique et cognitive de la notion de « trajet ». *Cahiers de Lexicologie*, 81(1), 113-139.

Aurnague, M. & Vieu, L. (1993). A three-level approach to the semantics of space. Dans Zelinsky-Wibbelt, C. (dir.), *The Semantics of Prepositions: From Mental Processing to Natural Language Processing* (p. 395-439). Berlin: Mouton de Gruyter.

Aurnague, M. & Vieu, L. (2013). Retour aux arguments : Pour un traitement relationnel des prépositions spatiales. *Faits de Langues*, 42(1), 17-38.

Aurnague, M. & Vieu, L. (2015). Function versus regions in spatial language: A fundamental distinction. Dans Astésano, C. & Jucla, M. (dir.), *Neuropsycholinguistic perspectives on language cognition: Essays in honour of Jean-Luc Nespoulous* (p. 31-45). New York: Psychology Press.

Aurnague, M., Vieu, L. & Borillo, A. (1997). Représentation formelle des concepts spatiaux dans la langue. In Denis, M. (dir.), *Langage et Cognition Spatiale* (p. 69-102). Paris : Masson.

Aurnague, M., Bras, M., Vieu, L. & Asher, N. (2001). The syntax and semantics of locating adverbials. *Cahiers de Grammaire*, 26(1), 11-35.

Baik, J. (2019). A Corpus-Based Analysis of the Functional Split of the Lexical Item the *ground* in Korean. *The Journal of Linguistics Science*, 88, 227-250.

Borillo, A. (1988). Le lexique de l'espace : Les noms et les adjectifs de localisation interne. *Cahiers de Grammaire*, 13(1), 1-22.

Borillo, A. (2000). Degrés de grammaticalisation : des noms de parties aux prépositions spatiales. *Travaux Linguistiques du Cerlico*, 13(2), 257-274.

Borillo, A. (2001). Il y a prépositions et prépositions. *Travaux de linguistique*, 42-43(1), 141-155.

Bottari, P. (1985). Sintagmi locuzionali preposizionali. *Rivista di Grammatica Generativa*, 9-10. 141-214.

Casadei, F. (2001). Le locuzioni preposizionali. Struttura lessicale e gradi di lessicalizzazione. *Lingua e Stile*, 36(1), 43-80.

Chang, S.-J. (1996). *Korean*. Philadelphia: John Benjamins.

Choi-Jonin, I. (2008). Particles and postpositions in Korean. Dans Kurzon, D. & Adler, S. (dir.), *Adpositions: Pragmatic, semantic and syntactic perspectives* (Typological Studies in Language 74) (p. 133-170). Amsterdam: John Benjamins.

Clercq K. de & Haegeman, L. (2018). The typology of V2 and the distribution of pleonastic DIE in the Ghent dialect. *Frontiers in Psychology* 9, 1342. DOI:10.3389/fpsyg.2018.01342

Djamouri, R., Waltraud, P. & Whitman, J. W. (2013). Postpositions *vs*. prepositions in Mandarin Chinese: The articulation of disharmony. Dans Biberauer, T. & Sheehan, M. (dir.), *Theoretical Approaches to Disharmonic Word Order* (p. 69-101). Oxford: Oxford University Press.

Fagard, B. (2010). *Espace et grammaticalisation – L'évolution sémantique des prépositions dans les langues romanes*. Paris : Éditions Universitaires Européennes.

Fagard, B. 2012. Prépositions et locutions prépositionnelles : La question du renouvellement grammatical. *Travaux de linguistique*, 64(1), 161-189.

Fagard, B. & Sarda, L. (2009). Étude diachronique de la préposition *dans*. Dans François, J., Gilbert, É., Guimier, C. & Krause, (dir.) *Autour de la Préposition* (p. 225-236). Caen : Presses Universitaires de Caen.

Fagard, B. & De Mulder, W. (2007). La formation des prépositions complexes : grammaticalisation ou lexicalisation ? *Langue française*, 156(1), 9-29.

Fagard, B., Pinto de Lima, J., Stosic, D. & Smirnova, E. (dir.) (2020), *Complex adpositions in European Languages.* Berlin: De Gruyter.

Franco, L. (2016). Axial parts, phi-features and degrammaticalization: The case of Italian presso/pressi in diachrony. *Transactions of the Philological Society*, 114(2), 149-170.

Franco, S. & Manzini, M.R. (2020). Locative Ps as general relators: Location, direction, DOM in Romance. *Linguistic Variation*, 21(1), 1-39.

Ganfi, V. & Piunno, V. (2017). Preposizioni complesse in italiano antico e contemporaneo. Grammaticalizzazione, schematismo e produttività. *Archivio Glottologico Italiano*, CII(2), 184-204.

Hagège, C. (2010). *Adpositions*. Oxford: Oxford University Press.

Huang, J., Li, A. & Li, Y. (2009). *The Syntax of Chinese*, Cambridge: Cambridge Univ. Press.

Huang, J. (2009). Lexical decomposition, silent categories, and the localizer phrase. *Yuyanxue Luncong,* 39(1), 86-122.

Kim, J.-B. (2016). *The Syntactic Structures of Korean*. Cambridge: Cambridge Univ. Press.

Ko, K. S. (2008). Korean Postpositions as Weak Syntactic Heads. Dans Müller, S. (dir.) *Proceedings of the 15th International Conference on Head-Driven Phrase Structure Grammar* (p. 131-151). Stanford, CA: CSLI Publications.

Melis, L. (2003). *La préposition en français*. Paris : Ophrys.

Peyraube, A. (2003). On the history of place words and localizers in Chinese: a cognitive approach. Dans Li, A. & Simpson, A. (dir.), *Functional Structure(s), Form and Interpretation* (p. 180-198). London: Routledge-Curzon.

Price, G. (2008). *A Comprehensive French Grammar*, 6th ed. London: Blackwell.

Rhee, S. (2004). A comparative analysis of grammaticalization of English and Korean Adpositions. *Studies in Modern Grammar*, 40(2), 209-233.

Rhee, S. (2008). On the rise and fall of Korean nominalizers. Dans López-Couso M.J. & Seoane E, (dir.), *Rethinking grammaticalization: New perspectives* (p. 239-264). Amsterdam: John Benjamins.

Rizzi, L. (1991). Il sintagma preposizionale. Dans Renzi, L. & Salvi, G. (dir.), *Grande grammatica Italiana di consultazione*, vol. 2 (p. 507-531). Bologna: Il Mulino Editore.

Roy, I. (2006). Body part nouns in expressions of location in French. *Nordlyd*, 33(1), 98-119.

Stosic. D. (2007). The Prepositions "par" and "à travers" and the categorization of spatial entities in French. Dans Aurnague, M. Hickmann, M. & Vieu, L. (dir.), *The Categorization of Spatial Entities in Language and Cognition* (p. 71-91). Amsterdam: John Benjamins.

Sun, C. (2006). *Chinese: A Linguistic Introduction*, Cambridge: Cambridge University Press.
Talmy, L. (2000). *Towards a Cognitive Semantics*. Cambridge, MA: The MIT Press.
Ursini, F.-A. (2015). On the Syntax and Semantics of Italian spatial Ps. *Acta Linguistica Hungarica*, 63(1), 63-110.
Ursini, F.-A. & Huang, A. (2020). The anaphoric properties of spatial nouns and prepositions in Mandarin: A formal account. *Lingua*, 248(10), 29-61.
Ursini, F.-A., Long, H. & Zhang, Y. (2020). (Un)bounded categories in Mandarin. *Romanian Review of Linguistics/Revue roumaine de linguistique*, 65(2), 119-133.
Ursini, F.-A. & Baik, J. (2022). *Measure Phrases and Spatial Categories in Korean: The compositional roots of measurement*. Wuhan & Seoul, Manuscript.
Ursini. F.-A. & Tse, K. (2021). Region Prepositions: The view from French. *Canadian Journal of Linguistics*, 66(1), 31-59.
Ursini. F.-A. & Wu, T. (2022). *On Italian Spatial Prepositions and Measure Phrases: reconciling data with theoretical accounts*. Wuhan, Manuscript.
Vandeloise, C. (1986). *L'espace en français : Sémantique des prépositions spatiales*. Paris : Éditions du Seuil.
Vandeloise, C. (2003). *Langues et Cognition*. Paris : Hermès.
Vandeloise, C. (2017). Genesis of spatial terms. *Corela*, HS-23, DOI: 10.4000/corela.5011.
Zhang, N. 2017. Adpositions. Dans Sybesma, R., Behr, W., Gu, Y., Handel, Z., Huang, J. & Myers, J. (dir.), *Encyclopaedia of Chinese Language and Linguistics* (p. 709-718). Leiden: Brill.
Zwarts, J., & Winter, Y. (2000). Vector space semantics: A Model-Theoretic analysis of Locative Prepositions. *Journal of Logic, Language and Information*, 9(2), 169-211.
Zwarts, J. (2005). Prepositional Aspect and the Algebra of paths. *Linguistic and Philosophy*, 28(6), 699-740.

Francesco-Alessio Ursini has taught and conducted research in Hungary, Sweden, and China. He is currently research professor in Linguistics at Central China Normal University. He carries out research on spatial categories and place names in Romance, Germanic, and Sinitic languages.

Tse Keith is Research Scholar in Linguistics at the Ronin Institute and the Institute for Globally Distributed Open Research and Education (IGDORE). Currently, he is affiliated with Lancaster University (UK) and has published on lexical and functional prepositions in relation to Case and Differential Object Marking in Romance and Chinese.

Wu Tong is Ph.D of Université Sorbonne Nouvelle Paris 3 and currently lecturer of linguistics of the School of Chinese language and Literature of Central China Normal University. He has mainly published on Chinese Languages, Contrastive Linguistics (Chinese-European Languages-African Languages), Linguistic Typology, Generative Linguistics (Minimalist Program, Cartography)

PARTIE II

PRÉPOSITIONS COMPLEXES EN DIACHRONIE