Region Prepositions: The View from French

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Abstract

The goal of this article is to offer a formal account of region prepositions in French. We define region prepositions as prepositions that denote non-oriented locations and resist modification with measure phrases (e.g., *au nez de* in *#dix metres au nez de l'avion* 'ten meters from (in front of) the tip of the airplane'). We show that region prepositions may involve items that include inflected markers or items involving "bare" markers (*au bord de* 'at the edge of' vs. *à droite de* 'to the right of'). We analyze the relation between structure and semantic type to show that this distribution stems from the morpho-syntactic properties of their "internal location nouns" (e.g., *nez, bord, droite, sommet*). We offer a feature-driven analysis of these prepositions that hinges on a Lexical Syntax account and can capture all of the relevant data in a unified perspective. We conclude by discussing some theoretical consequences for accounts of spatial prepositions.

Keywords: French prepositions, internal location nouns, measure phrases, Lexical Syntax, cartography

Résumé

Le but de cet article est d'offrir une analyse formelle des prépositions de région en français. Nous définissons les prépositions de région comme des prépositions qui dénotent des emplacements non orientés et résistent à la modification par des phrases de mesure (par exemple *au nez de* dans *#dix mètres au nez de l'avion*). Nous montrons que les prépositions de région peuvent impliquer des éléments qui incluent des marqueurs fléchis ou des éléments impliquant des

marqueurs «nus» (*au bord de* vs *à droite de*). Nous analysons la relation entre la structure et le type sémantique pour montrer que cette distribution découle des propriétés morphosyntaxiques de leurs «noms de localisation interne» (ex. *nez*, *bord*, *droite*, *sommet*). Nous proposons une analyse axée sur les traits de ces prépositions dans le cadre de la Syntaxe lexicale qui peut capturer toutes les données pertinentes dans une perspective unifiée. Nous concluons en discutant quelques conséquences théoriques de notre article pour les analyses des prépositions spatiales.

Mots-clés: prépositions françaises, noms de localisation interne, phrases de mesure, Syntaxe lexicale, cartographie

1.   INTRODUCTION

Recent work within different theoretical perspectives has studied the morpho-syntactic properties of spatial prepositions (Rauh 2002, Cinque and Rizzi 2010, Hagège 2010). Their interplay with other spatial categories has been well documented (Libert 2013). Although recent work has investigated Romance prepositions in some detail (e.g., Spanish: Romeu 2014, Italian: Franco 2016), these remain understudied. French prepositions represent an exception: many of their semantic and morpho-syntactic properties are well understood (Aurnague and Vieu 2015). However, when one looks at how these properties are related, and how they may determine the interaction of prepositions with other categories, outstanding puzzles remain.

    One of these remaining puzzles involves a sub-type of preposition that we label *region prepositions*. Region prepositions include items referring to non-oriented, possibly convex locations defined with respect to a landmark object. Spatial relational nouns are often exapted to the prepositional domain for this role (e.g., English *edge* in *at the edge of*: Jackendoff 1991, Levinson 1994, Svorou 1994, Heine and Kuteva 2007). Languages featuring this distinct sub-type include Basque (Aurnague 1996, 1998), Arrernte (Wilkins 2000), Korean (Rhee 2004), and Kannada (Amritavalli 2007), among others. Svenonius (2010) similarly proposes the category of "bounded" prepositions, so-called because they denote enclosed (i.e., bounded) locations. The labels "bounded" and "region" thus roughly describe the same type of prepositions. However, conceptual and formal semantic analyses of (English) prepositions have often framed the discussion by appealing to the latter topological notion (e.g., "region functions" in Jackendoff 1983, 1990). We thus use the "region" label with the purpose of underlining the continuity of our analysis with these semantic accounts of prepositions.

    For French, previous work has proposed that the *noms de localisation interne* 'internal location nouns' (ILNs) determine the semantic type and interpretation of prepositions (Borillo 1988, 1998; Aurnague 1996, 1998). ILNs and their embedding prepositions determine the presence or absence of other categories in a sentence. As argued in Svenonius (2010), English bounded (region) prepositions resist combination with *Measure Phrases* (MPs), phrases denoting the measure of a dimension under discussion. French prepositions follow a similar yet complex pattern, as (1)–(4) show:

(1) *Mario   s'assied   a-u   piano.*
     Mario   SELF.sits   at-the   piano
     'Mario sits at the piano.'

(2) *Mario   va   devant   le   piano.*
    Mario   goes   ahead   the   piano
    'Mario goes in front of the piano.'

(3) *L'-hélicoptère   atterrit   a-u   sommet de la   colline.*
    The-helicopter   lands   at-the   top   of   the   hill
    'The helicopter lands on top of the hill.'

(4) *Mario   est   un   mètre   devant/#un   mètre   à   côté   de/#un   metre*
    Mario   is   one   metre   ahead/one   metre   at   side   of/one   metre
    à la table.
    at the   table
    'Mario is one metre in front/next to/at the table.'

In order to discuss these examples, let us introduce some basic definitions. Spatial prepositions are usually defined as heads introducing the spatial complement of a verb or *ground* NP (Haspelmath 1997). A ground NP (e.g., *piano* 'piano' in (1)) refers to the centre of a reference system (i.e., a 'ground'), underpinning a spatial relation (Talmy 2000: Ch. 1). The resulting *Prepositional Phrase* (PP) establishes a spatial relation between ground and a located entity or *figure*, mediated via the subject NP, *Mario* in (1)–(4). PPs can combine with verbs describing motion/direction and location (*atterit* in (3), *s'assied*, *va*, and *est* in (1), (2), and (4), respectively). Most prepositions depend on the verb's disambiguation into these types. French is thus (mostly) a verb-framed language (Talmy 2000: Ch.3, Melis 2003: Ch. 1).

Consider now (1)–(4). In (1), the figure's location is defined as external to the ground; no other spatial information is given. Thus, *à* belongs to the *geometrical* type of preposition (Vandeloise 1991). Prepositions such as *devant* and *au sommet de* in (2)–(3) denote "topological" relations between regions. The figure occupies a region defined via a part of the ground, whether it is "external" (i.e., *devant*) or "internal" to the ground (i.e., *sommet*: Aurnague 1998). Example (4) shows that the MP *un mètre* can combine with *devant* but not *à* or *à côté de*; otherwise, the sentence is *uninterpretable* (as shown by the "#" symbol). Overall, MPs seem to only combine with a certain type of preposition.

Previous work on French has not fully explored the morpho-syntactic conditions that license MPs (Aurnague et al. 2001, Aurnague and Vieu 2015). Furthermore, it has not addressed the possibility that MPs may combine only with internal or external region prepositions. Previous work on English prepositions has proposed that MPs identify *projective* prepositions: that is, prepositions denoting unbounded axes or projections of a ground (Zwarts and Winter 2000). Thus, Svenonius (2010: 134) proposes that bounded prepositions are the complementary sub-type to projective prepositions, given their distribution with MPs. While unbounded/projective *behind* can combine with MPs, bounded/region *next to* cannot do so (*ten metres behind the desk* vs. *#ten metres next to the desk*). Beyond English, the role of this alternation in identifying region and projective prepositions remains unexplored.

The goal of this article is thus to identify the region sub-type of prepositions in French and offer a formal account of its properties. We show that this type denotes either internal or external regions, and that they resist combination with MPs. We also show that this

distinction hinges on the lexical content of ILNs and their ability to denote "bounded" sets of locations (regions) or "unbounded" sequences of locations (projections). The distinction also contributes to the distributional properties of PPs that include ILNs as constituents ((1)–(4)). To achieve this goal, we first present previous studies and novel data (sections 2–3). We then propose a Lexical Syntax account of the data (Hale and Keyser 2002: section 4). Section 5 offers a discussion and section 6 concludes.

2.   PREVIOUS PROPOSALS ON FRENCH PREPOSITIONS

2.1.   Syntactic accounts: Preposition types and the role of ILNs

Reference grammars traditionally distinguish between simple and complex prepositions (*prépositions simples* and *prépositions complexes*: Price 2008: 520–545). Simple prepositions are mono-morphemic, though they can be disyllabic (e.g., *à* 'at/to', *parmi* 'among'). Complex prepositions feature an ILN that may precede and possibly follow simple prepositions (e.g., *côté* preceding *de* and following *à* in *à côté de* 'beside'). We list simple prepositions in (5); lists of complex prepositions vary, depending on how authors analyze their structure. We thus offer a non-exhaustive list in (6) (Price 2008: 545):

(5) **Simple Prepositions**: {*à* 'at, to', *chez* 'at, with', *dans* 'from, in, inside, into', *en* 'in', *entre* 'inside, between', *par* 'by, via, through', *pour* 'for', *parmi* 'among', *de* 'of', *sur* 'on, above, over', *sous* 'down, below'}

(6) **Complex Prepositions**: {*devant* 'in front of', *autour de* 'around', *loin de* 'away from', *hors de* 'out of', *derrière* 'behind', *jusqu'à* 'until, up to'…}

Simple prepositions can be polysemous (e.g., *sur* 'up', 'on', or 'above') and can cover both *directional* and *locative* meanings. Thus, *à* can describe a figure moving 'to' a ground (directional) but also being 'at' the ground (locative: Vandeloise 1988). Complex prepositions, instead, involve multi-morphemic structures. Some complex prepositions include *de* as a head (e.g., *hors de*), while others block its presence, for instance *derrière* 'behind' but not **derrière de*. Exceptions are prepositions such as *jusqu'à* 'next to', which include *à* as a head conflating with an ILN (Le Pesant 2011). The preposition *à* may also precede an ILN and conflate with it (e.g., *au-tour* lit. 'at.the-round'). Note that *de* does not have spatial meanings unless it occurs with verbs capturing elative motion (e.g., *sortir de* 'coming out of'). Its inclusion in (5) aims to represent this fact, but also its role in complex prepositions, fully discussed in section 3.

Much theoretical work offers evidence for another class of prepositions, *locutions prépositionnelles* ('locutional prepositions' or 'prepositional locutions') (e.g., Vandeloise 1987, 1988; Borillo 1988, 1998, 2000, 2001; Melis 2003). Locutional prepositions seem to be a cross-linguistically attested, although understudied, type of preposition (see Di Meola 2000 on German, Hoffmann 2005 on English). This type includes a first simple preposition acting as a "marker" of an ILN and a second preposition following the ILN. Markers can be inflected or uninflected (respectively *au bord de* 'at the edge of', *à côté de* 'at the side of'); "final" prepositions can include *à* or *de* (e.g., *face à* 'against', *dos à* 'at the back of').

Two corpus-based studies offering an extensive list of prepositions are Le Pesant (2011, 2012). In these, out of a list of 209 items, 23 are simple prepositions, which can be further divided into "direct" and "indirect" prepositions. Simple direct prepositions coincide with the list in (5) plus *vers*, *devant, contre, dans,* and *derrière.* Their label captures the fact that they directly combine with a ground NP. Simple indirect prepositions include *auprès de, autour de*, *hors de, loin de, près de*, and *face à*, which are prepositions requiring *de* as a head introducing a ground NP. Let us note that the labels "simple" and "complex" in reference grammars, and the labels "simple direct" and "simple indirect" in Le Pesant (2011, 2012) follow different criteria of identification for a sub-set of prepositions. We return to this point in footnote 1.

Previous work on the syntactic properties of prepositions has explored their distribution. For instance, Melis (2003) discusses how prepositions can introduce complements that are not "common" NPs (e.g., pronouns, place names). They show that prepositions and their corresponding PPs form the core element of sentence types known as *Basic Locative Constructions* (BLCs) (Levinson and Wilkins 2006: Ch. 1). BLCs are defined as sentences that can act as full answers to *where*-questions, thus carrying the same role of fragment answers in a language ((1)–(4)). Although Melis (2003) does not address their distribution in interrogative sentences, he analyzes the distribution of simple and complex prepositions in BLCs. Melis also shows that locutional prepositions can head PPs that are the spatial complements of verbs, describing the location/direction of the figure (as in (7), from Melis 2003: 109). We propose a concise but illustrative list of locutional prepositions in (8):

(7) *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.'

(8) **Locutional Prepositions**: {*au bord de* 'at the edge of', *au fond de* 'at the bottom of', *à côté de* 'beside, next to', *au devant de* 'at the front, in front of' *à droite de* 'to the right of', *à gauche de* 'to the left of', *en bas de* 'to the bottom of', *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, on the summit of', *au-dessous de* 'below', …}

At the same time, Melis (2003) also observes that some simple and complex prepositions may also combine with an indexical or pronominal ground (as in *par* in (9)). Additionally, they can combine with *de* when it introduces a ground NP (e.g., *parmi des chaises* 'among some chairs'), which thereby acts as an intermediate head combining the preposition and the ground NP.[1] Melis proposes that some prepositions can be reclassified as "complex" because of their distribution with pronouns and indexicals (e.g., *par, pour, parmi, sur, sous*). Other prepositions can be so reclassified since they cannot occur as elements mediating between an ILN and a ground NP

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[1]The existence of inflected prepositions suggests that the border between nominal and prepositional domains is not clear-cut in most cases (e.g., Svenonius 2016). This fact suggests that most dimorphemic prepositions (Le Pesant 2011's "direct" and "indirect" prepositions) belong to the category of complex prepositions.

(e.g., *chez, entre, devant, derrière*). A similar argument is made in Fagard (2010: Ch. 2), thereby leading to the list of simple prepositions offered in (10):

(9) *Mario   va   par ici.*
    Mario   goes   for here
    'Mario goes across here.'

(10) a. **"Novel" Simple Prepositions**: {*à, de, dans, en*}
      b. **"Novel" Complex Prepositions**: {*chez, entre, par, pour, parmi, sur, sous, devant, autour de, derrière*, …}

Overall, "novel" simple prepositions correspond to those items that can act as heads of complex prepositions or as markers of ILNs (e.g., *à* in *à droite de*). By "novel", we mean that the classification proposed in Fagard (2010) represents a new manner of classifying French prepositions, when compared to previous classifications from reference grammars (e.g., Price 2008). Simple and complex prepositions may display distinct semantic properties, which we discuss in more detail in section 2.2, after we address the semantic accounts of these preposition classes.

From a diachronic perspective, several studies have also investigated the gradual emergence of complex and locutional prepositions (e.g., Fagard 2006, 2008, 2009a, b, 2010, 2012; Fagard and De Mulder 2007, 2010; Fagard and Sarda 2009). A common trait of these studies is that they offer five criteria distinguishing locutional prepositions from other types. A first criterion is frequency: locutional prepositions such as *au cœur de* 'at the heart of' appeared as as expressions with a rigid internal order of items but not necessarily conveying spatial meanings in Medieval French. Over time, these sequences were increasingly associated with spatial meanings (e.g., 'in the innermost part of', for *au cœur de*). Thus, they underwent a process of lexicalization: the formation of a vocabulary item with a rigid, synchronically stable internal order of morphemes, retaining some internal complexity (e.g., *parmi, chez*).[2]

A second criterion is the presence of an inflected preposition/marker. Locutional prepositions that include an inflected preposition represent "less fixed" or novel items (e.g., *à l'intérieur de*). In these constructions, the loss of an article signals an older incorporation into the prepositional system (e.g., *en bas de* 'at the bottom of').

The third criterion actually consists of a cluster of criteria. Locutional prepositions resist the modification and pluralization of ILNs (**à le gros intérieur de*, **aux intérieurs de,* respectively), and their replacement or distribution with pronominal or indexical forms (e.g., **à quel intérieur de*). Thus, ILNs lose their status as nouns and become fixed morphological segments of these items.

Coordination of prepositions and semantic opacity represent the fourth and the fifth criteria. Prepositions can head phrases that can be coordinated (e.g., *à côté et au-dessous de la voiture* 'next to and underneath the car'). This fact indirectly

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[2]Fagard (2006. 2008, 2009a) and the other works cited in this paragraph also offer a thorough discussion on how lexicalization yields to grammaticalization, or how the emergence of new prepositions corresponds to their reinterpretation as new functional items. We do not address these aspects because they would lead us too far afield.

suggests that they can act as heads of a prepositional phrase, irrespective of their morphological type. Semantic opacity refers to the fact that the precise contribution of ILNs and simple prepositions cannot easily be teased apart. Thus, complex and locutional prepositions are treated as the result of diachronic processes that lexicalize morphologically complex items capturing specific spatial meanings. Hence, French spatial prepositions seem to form a still evolving, partially heterogeneous category.

French prepositions have not been thoroughly addressed in generative work, with the exception of Roy (2006).[3] Building on Rooryck (1996), who compares French, Dutch, and German prepositions, Roy (2006) observes that "body part" nouns (our ILNs) can have two distinct meaning types that emerge in possessive constructions. If the "whole" noun refers to an animate entity, then these nouns refer to a given body part. If the "whole" noun refers to an inanimate object, then ambiguity can arise. Thus, a sentence such as *la tête du lit est encore humide* 'The head of the bed is still damp' may involve either a "fixed" or a "relative" meaning. In the first case, *la tête* refers to the damp headboard of a bed; in the second case, it refers to its surrounding region.

Furthermore, Roy (2006) argues that relative meaning types lack certain distinctive properties of "full" nouns, such as the ability to take plural morphology, undergo adjectival modification, and take indefinite articles, among others (e.g., *une tête de lit* 'a headboard'). Therefore, her work proposes that these relative meanings are introduced via a category known as "Axial Part" (AxPart), whereas fixed/referential meanings are introduced via a category known as "Relational Noun" (RelN: see Svenonius 2006, 2010 for English). Roy's work therefore dovetails with non-generative work in identifying prepositions, including AxPart items as a type of locutional preposition (see Fagard 2006: Ch. 2). However, it leaves open the question of the relevance of these categories beyond their distribution in BLCs.

Overall, previous work on the morpho-syntactic properties of French prepositions identifies at least three sub-types: simple prepositions (e.g., *en*), complex prepositions (e.g., *autour de*), and locutional prepositions (e.g., *à l'intérieur de*). They propose that French prepositions form a sizeable but closed set and that they can act as heads of PPs in BLCs. Crucially, most studies do not explore the interaction of this category with MPs, leaving the matter unexplored. Before we tackle the topic of the interaction of prepositions with MPs, we discuss previous semantic accounts.

2.2. Semantic accounts: Relations, projections, and regions

Previous work on the semantic properties of French prepositions offers a thorough picture of their semantic types. Two intertwined lines of research can be found: cognitively oriented approaches (e.g., Vandeloise 1986, 1991) and model-theoretic approaches (e.g., Aurnague 1991, Vieu 1991). These approaches have motivated interesting theoretical syntheses (Aurnague and Vieu 2015). Here we summarize

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[3]Let us note here that the topics discussed in Roy (2006) for French were first mentioned in Borillo (1988), Svorou (1994), and Aurnague (1996, 2004), although these studies are not addressed in detail.

the key results of this line of research for two reasons. First, extant semantic classi-
fications allow us to capture the data related to the distribution of PPs with MPs.
Second, these accounts only partially identify the relation between the semantic con-
tribution of prepositions and ILNs with their morphological role in prepositions. We
discuss how this previous work indirectly motivates our account.

Let us begin by addressing cognitive linguistics-oriented research. In Vandeloise
(1986, 1991), French prepositions are treated as polysemous, like their English coun-
terparts (cf. Tyler and Evans 2003). A central meaning for each preposition (*impul-
sion*) can be defined, from which other meanings and meaning structures are derived
via "family resemblances", features/traits that each meaning can share. More
recently, Vandeloise (1994, 2003) explores the meanings associated with the prepo-
sitions *en* and *dans* and their English counterparts *in* and *inside*. A comparison
involving *à, dans,* and *sur* with *at*, *in*, and *on* is presented by Vandeloise (2008,
2017), who proposes that the two languages differ in how these "general" lexical
items may include meaning types in their networks (e.g., *at* lacks the directional
meaning that *à* can have). These accounts show that while French prepositions can
be polysemous, their meanings may vary over time.

Other work takes a similar perspective by building on these results. A crucial
innovation is the study of the diachronic dimension (e.g., Fagard 2006, 2010). Via
a corpus-based study on the emergence of novel prepositions, this work shows that
each item can develop or lose meanings via the well-known semantic processes of
narrowing and broadening and via metaphoric mappings. Studies focusing on
single prepositions include *par* (Aurnague and Stosic 2002), *côté* and *devant*
(Fagard and De Mulder 2007, 2010; Fagard and Sarda 2009), and *à travers* (Stosic
2001, 2002, 2007; Hoelbeek 2014, 2017), among others. The broad picture that
these studies paint is one in which complex and locutional prepositions may
develop the ability to refer to locations defined via specific parts of the ground.
This process occurs via the increasing lexicalization of ILNs as part of prepositions,
adding their meanings and features to those of the prepositions (see also Svorou 1994,
Heine and Kuteva 2007).

A parallel line of inquiry is presented in Vandeloise (1987, 1988). According to
Vandeloise, *à* introduces the ground when it occurs as a simple preposition.
However, when an ILN follows this preposition, *à* marks the ILN as denoting the
relevant location that a figure occupies. Thus, Vandeloise suggests that *à
l'intérieur de*, *à l'extérieur de*, and *à côté de* involve a subtle interplay between
the meaning of *à* and those of the ILNs. This preposition partially loses its
meaning denoting a "general" geometrical relation and simply signals that an ILN
denotes a location, rather than a part. The contribution of *de*, then, is to establish a
relation between this more specific location and the ground.

Vandeloise does not believe that a formal treatment of these properties can be
achieved. However, the use of features/traits to identify meanings and their relations
is key to how subsequent work builds formal treatments of prepositions (Borillo 1988,
1998, 2000; Aurnague 1991; Vieu 1991; Aurnague and Vieu 1993; Aurnague et al.
1997; Stosic 2007). These studies propose that the meanings of spatial prepositions
can be modelled via five assumptions/axioms of first order predicate logic.

First, five types of spatial categories can be distinguished within an ontology of space. Spatial portions are immaterial spaces that can be only defined via associated material entities (e.g., *l'intérieur*). Locations are parts of space that some entities stably occupy over time in a reference frame (e.g., *Paris*). Objects can occupy locations while lacking a fixed position in space (e.g., *la voiture*). Mixed entities are entities that can be either treated as locations or as objects, depending on the sentence they occur in (e.g., *la maison*). Substances (e.g., *le vin* 'the wine') form the fifth type. Ground NPs and ILNs can find their denotation in one of these five types, with ILNs identifying one specific location within the relative frame of reference defined via the ground. Objects usually act as figures, locations as grounds, and spatial portions as "parts" of a space.

Second, complex prepositions involve mereological relations holding between a ground conceived as a "whole" and collections of spatial portions/parts defined with respect to the ground. These parts can then be further specified as belonging to one of the aforementioned five types, hence defining specific types of parthood relations. For instance (simplifying formal matters a great deal), the preposition *au bord de* is assumed to denote the relations *extremity(U,X,Y)* and *part(X,Y)*. A portion X is part of an object Y, and a location U occupied by the portion X is defined as an extremity. In these and subsequent accounts, it is suggested that ILNs and their prepositions may also denote different types of relations. Examples include orientation (i.e., projective), topological, and distance-based relations (e.g., Aurnague 1995, 1996, 1998, 2004). Subsequent experimental evidence has shown that such distinctions guide the processing of ILNs and prepositions in context. Hence, the semantic content of ILNs seems to guide the overall interpretation of PPs and BLCs (Aurnague et al. 2000, Aurnague et al. 2007).

Similarly, Asher and Sablayrolles (1995) models the semantics of prepositions and verbs of motion (e.g., *aller* 'to go', *traverser* 'to cross') as denoting "halos" (i.e., regions) defined with respect to the ground. Furthermore, Aurnague et al. (2001) study the distribution of PPs as syntactic adjuncts and note that some complex prepositions can occur with MPs (e.g., *dix mètres derrière la voiture*). They thus suggest that these prepositions also introduce a measurement "scale" (i.e., distance) from which MPs select a segment of a given length (here, ten meters). The work, however, only discusses *derrière* and a few other prepositions. It thus does not fully address the precise morpho-syntactic details underpinning the distribution of MPs with prepositions.

Aurnague and Vieu (2015) aptly summarize this wealth of research, proposing a tripartite "semantic cartography" of French prepositions (see also Aurnague and Vieu 2013). Complex prepositions are assumed to locate figures in regions (i.e., spatial portions), thus being "topological" in nature. While some complex prepositions denote parts of grounds and are thus classified as "internal" (e.g., *à l'intérieur de*), other prepositions denote orientations/axes, and are classified as "external" (e.g., *derrière*). Simple prepositions are classified as geometrical/functional, by virtue of their enriched, partially non-spatial meanings (e.g., *sur*). This work observes that some external prepositions (e.g., *derrière*) can combine with MPs. However, this fact is not explored beyond this initial observation, leaving the full exploration of these subtle distributional patterns in French and other languages for future research.

Let us take stock. Previous work analyzing the semantic properties of French prepositions has suggested that these items can denote geometrical relations or relations involving internal or external regions (e.g., *à l'intérieur de* vs. *derrière*). However, their distribution with MPs and the morpho-semantic properties that license this distributional pattern are seldom discussed. Hence, the relation of the region type to other proposed prepositional meaning types (e.g., geometrical, internal/external region, projective) is also unexplored. We thus need a broader overview of the prepositions that can have these different meaning types, allowing us to address whether and how these conditions are related to their morphological type.

3.   OLD AND NOVEL DATA

The goal of this section is to present a broader overview of the distribution of MPs with French prepositions. We present novel data involving MPs once we have shown that all prepositional sub-types (i.e., simple, complex, locutional) display syntactic properties warranting a unified account. We begin by observing that some of the studies reviewed in section 2.1 (e.g., Melis 2003, Le Pesant 2012) discuss in detail the distribution of PPs in sentences (our BLCs) and their interaction with different types of verbs and ground NPs. Melis (2003: Ch. 2) observes that PPs can be involved in various forms of extraposition, one example being a form of PP fronting known as *locative inversion* (Cornish 2005; den Dikken 2006, 2010; Fuchs 2014). These previous studies offer evidence mostly focusing on simple and complex prepositions; here we focus on locutional prepositions and their role in BLCs.

PPs may also be given as fragment answers to questions involving the spatial *wh*-word *où* 'where'. Spatial prepositions can act as PPs forming congruent answers to *où*-questions (Jackendoff 1972, Merchant 2001: Ch. 2, Boone 2014: Ch. 2).[4] For French prepositions, the previous literature has not fully discussed its relevance; hence, we take this occasion to discuss its theoretical import via (11)–(15):

(11) Q: *Où   est   Mario*?   A: *À   la   gare.*
       Where is   Mario?   At   the   train.station
       'Where is Mario? At the train station.'

(12) Q: *Où   est   Mario?*   A: *Derrière/devant   la   gare.*
       Where is   Mario?   Behind/ahead   the   station
       'Where is Mario? Behind/in front of the train station.'

(13) Q: *Où   est   Mario?* A: *À   l'intérieur/à   côté   de   la   voiture.*
       Where   is   Mario?   At   the.interior/at flank of   the   car
       'Where is Mario? In the interior/to the side of the car.'

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[4]Note here that one can also offer answers apparently not involving spatial information (e.g., (11) can be answered via *au travail* 'at work'). In such cases, we can say that reference to places and locations occurs via a form of metonymy, since these PPs refer to the places where a certain activity occurs (Jackendoff 1972: Ch. 4). We thank an anonymous reviewer for bringing up the issue.

(14) *Derrière   la   table,   un   homme   travaille   intensément.*
     Behind   the   table,   a   man   works   intensely
        'Behind the table, a man works intensely.'

(15) *À   gauche/à   l'intérieur   de la   voiture, Mario   fume   une   cigarette.*
     At   left/at   the.interior of the car,   Mario smokes a   cigarette
        'To the left/in the interior of the car, Mario smokes a cigarette.'

The fragment answers in (11)–(13) confirm that any morphological type (simple *à*, complex *derrière* and *devant*, locutional *à l'intérieur de,* and *à côté de*) can head a PP answer to an *où*-question. Similarly, a fronted or inverted PP can include any type of preposition as its head, as (14)–(15) show. We have complex *derrière* in (14), and locutional *à gauche/à l'intérieur de* in (15). Together with the BLC data, these data show that each preposition type can head a PP, irrespective of their morphological sub-type (i.e., simple, complex, or locutional).

Let us now turn to a discussion of NP ellipsis (Melis 2003: 112–115, Fagard and De Mulder 2007: 20, Le Pesant 2011: 20–21). This operation targets a ground NP and possibly the head of the PP containing it (Merchant 2001, Svenonius 2010, Boone 2014: Ch. 4). The pronounced part or *remnant* usually involves the segment(s) that can refer to a specific location, at least in English prepositions (e.g., *in front* in *in front (of the car)*). An open question that we can easily answer is whether this test applies to simple and complex prepositions. Previous work (e.g., Melis 2003) offers ample evidence regarding locutional prepositions. Crucially, the test shows that simple prepositions cannot undergo ellipsis, unlike the other types (16). Complex prepositions involve nuanced licensing patterns, however: *chez*, *entre*, *parmi*, *sur,* and *sous* cannot undergo ellipsis, while all other complex prepositions can (as in *derrière/devant* in (17)).[5] For locutional prepositions, the remnant invariably involves the unit corresponding to the combination of an (un)inflected marker and an ILN (18):

(16) **Mario   est   à   (la   gare).*
     Mario   is   at   (the train.station)
        'Mario is at (the train station).'

(17) *Mario   est   derrière/devant   (la   voiture).*
     Mario   is   behind/ahead   (the car)
        'Mario is behind/in front (of the car).'

(18) *Mario   est   à   gauche/à   l'intérieur/sur   le   sommet   (de   la   voiture).*
     Mario   is   at   left/at   the.interior/on   the top   (of   the   car)
        'Mario is to the left/in the interior/on the top (of the car).'

---

[5]These examples and the data discussed in section 2.1 suggest that "complex" prepositions may be divided into (at least) two further types. The group cited does not combine with ILNs and does not undergo ellipsis (e.g., *chez*), unlike "full-fledged" complex prepositions (e.g., *autour de*). A similar point has been observed for Italian prepositions (e.g., Franco 2016 on *per* 'through', *su* 'on, up', and a few others). For our purposes, reasoning with a single category of complex prepositions is a sufficiently accurate choice.

These data also show that remnants can involve two types of internal structures. The first involves an apparently single vocabulary item (e.g., *derrière* in (17)); the second involves a possibly inflected preposition acting as a "marker" of an ILN (*à l'intérieur* in (18)). Previous work suggests that prepositions lacking this marker may have undergone a diachronic process of univerbation (e.g., *au-tour* from *au* and *tour*: e.g., Vandeloise 1998; Le Pesant 2011; Fagard 2010, 2012). These processes may simply represent the result of two vocabulary items being reinterpreted as a single item (and, possibly, category). We can therefore conclude that PPs may potentially include at least three types, with respect to syntactic tests. The first is a simple preposition that can undergo ellipsis. The second is a ground NP. The third is a preposition/marker combining with an ILN and forming a distinct, possibly complex unit that can stand as a remnant.

Let us move to the MP data, based on an elicitation task. Native speakers of (continental) French (N = 30) were asked to evaluate sentences using a Likert scale ("1" being "unacceptable", "5" being "perfect"). All examples were designed and verified with the help of a native speaker informant, who also acted as a pilot participant for the test. We opted for this experimental method because corpora data involving MPs turned out to be very rare. We also aimed at establishing a form of triangulation, by having corpora data verified against experimental data (Rothbauer 2008). We leave open the possibility that regional varieties might have played a role in judgments, though most speakers offered explicit observations regarding the role of influencing factors (e.g., register).

All examples marked as "#" received average scores of 2;0 or lower; perfectly acceptable examples, scores of 4;0 or higher. Speakers were invited to write comments. For many examples scored as "3" and "4", most speakers observed that the examples were not perfect but nevertheless quite acceptable (or were not quite deviant, between 3;0 and 4;0). For a number of examples, participants often offered sharply contrasting answers (e.g., most participants offering "5" as answers, but some offering "1" for the same test sentences). For this reason, we report average scores and token answers per value below the examples (following De Clercq and Haegeman 2018). Using this information, we show that intra-speaker variation may be considerable, but we also underline the fact that general conclusions on acceptability are consistent with this form of variation (Schütze and Sprouse 2013).[6]

As foreshadowed in the introduction via (1)–(4), the distribution of prepositions with MPs acts as a test that establishes a preposition's semantic type. While projective prepositions can combine with MPs (e.g., *derrière*), geometrical prepositions (e.g., *en*) cannot do so. Once we consider a broader set of data, the picture

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[6]Note that De Clercq and Haegeman (2018) consider "3", "4", and "5" scores to confirm the grammaticality of a sentence. We believe that our scoring can avoid the pitfall of considering lexical representations for items to be homogeneous across speakers. We thank an anonymous reviewer for raising the issue.

becomes considerably more complex. To illustrate this, we introduce the novel data in (19)–(28):[7]

(19) *Mario   marche   un   kilomètre   dans   Paris.*
      Mario   walks   one   kilometre   inside   Paris
      'Mario walks a kilometre inside Paris.'
      (Score: 4.66, answers: 1^2 2^0 3^0 4^2 5^{26})

(20) *#Mario   va   deux   mètres   en/à   la   salle.*
      Mario   goes   two   metres   in/at   the   living.room
      'Mario goes two metres in/at the living room.'
      (Score for *en* : 1.13, answers: 1^{26} 2^4 3^0 4^0 5^0)
      (Score for *à* : 1.26, answers: 1^{22} 2^8 3^0 4^0 5^0)

(21) *Mario   marche   cent   mètres   #par/à travers   les   champs.*
      Mario   walks   one.hundred   metres   for/through   the   fields
      'Mario walks one hundred meters by/through the fields.'
      (Score for *à travers*: 4.06, answers: 1^1 2^2 3^6 4^{11} 5^{10})
      (Score for *par*: 1.33, answers: 1^{21} 2^8 3^1 4^0 5^0)

(22) *Mario   va   dix   mètres   derrière/devant   la   voiture.*
      Mario   goes   ten   metres   behind/ahead   the   car
      'Mario goes ten meters behind/in front of the car.'
      (Sc. for *derrière*: 4.4, answers: 1^3 2^0 3^3 4^2 5^{22}; *devant* 4.53, answers: 1^2 2^0 3^2 4^2 5^{24})

(23) *Les   garçons   marchent   un   kilomètre   autour   de   la   ville.*
      The   boys   walk   one   kilometre   around   of   the   city
      'The boys walk one kilometre around the city.'
      (Score: 4.13, answers: 1^0 2^6 3^0 4^6 5^{18})

(24) *#Mario   est   assis   un   mètre   à   côté   de   la   voiture.*
      Mario   is   sat   one   metre   at   flank   of   the   car
      'Mario sits one metre near the car.'
      (Score for *à côté de*: 1.4, answers: 1^{20} 2^9 3^0 4^1 5^0)

(25) *#Mario   est   assis   dix   mètres   à   l'intérieur/extérieur   de   la   maison.*
      Mario   is   sat   ten   metres   at   the.interior/exterior   of   the   house
      'Mario sits ten metres inside/outside the house.'
      (Score for *à l'intérieur de*: 1.8, answers: 1^{20}, 2^5 3^0 4^1, 5^4)
      (Score for *à l'extérieur de*: 1.63, answers: 1^{21} 2^5 3^1, 4^0 5^3)

(26) *#La   lampe   pend   dix   centimètres   sur   le   sommet   de   la   table.*
      The   lamp   hangs   ten   centimetres   on   the   top   of   the   table
      'The lamp hangs ten centimetres over the top of the table.'
      (Score for *sur le sommet de*: 1.46, answers: 1^{23} 2^8 3^1 4^0 5^0)

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[7]Some speakers (n=7) suggested that structures involving *à* preceding an MP are also acceptable. Locative verbs and measure phrases denoting "singular" units (e.g., *Mario se trouve à un mètre derrière la voiture* 'Mario is located at one metre behind the car') seem to be preferred in this case. Speakers did not suggest that these structures differed from structures lacking *à,* meaning-wise (22). We believe that these data offer further support for our analysis, but also that they warrant distinct further investigation.

(27) #*Mario   marche   un   kilomètre   a-u   milieu   de   la   ville.*
     Mario   walks   one   kilometre   at-the   centre   of   the   city
     'Mario walks one kilometre in the centre of the city.'
     (Score for *au milieu de*: 1.3, answers: 1^{23} 2^6 3^0 4^1 5^0)

(28) *La   lampe   est   dix   centimètres   à   gauche/droit   de   la   chaise.*
     The   lamp   is   ten   centimetres   at   left/right   of   the   chair
     'The lamp is ten centimetres to the left/right of the chair.'
     (Sc. *à gauche de*: 4.13, ans.: 1^2 2^0 3^0 4^{18} 5^{10}; *à droit de*: 4.26, ans.: 1^1 2^1 3^0 4^{15} 5^{13})

In (19), a distance of one kilometre is measured as the distance that Mario walks within Paris. Although the polysemous *dans* can cover strict and loose 'inclusion' (cf. English *inside*), it covers at least one meaning that is projective in nature (Vandeloise 2008). This is not the case for *en* and *à*, as (20) shows. These two simple prepositions only denote geometrical relations (inclusion for *en* and "abstract" geometrical relation for *à*) between figure and ground, and lack a distance component in their meaning. A similar reasoning extends to *par* and *à travers* in (21). Both prepositions cover meanings describing a figure navigating a stretch of space. However, while *par* seems to imply that the distance involves the whole field and may not involve directed movement, *à travers* involves a form of directed and hence measurable movement (see also Aurnague and Stosic 2002). Thus, the first preposition resists combination with MPs; the second licenses it.

Similarly, *devant* and *derrière* can combine with an MP (22). Furthermore, *autour de* may combine with the MP *un kilometre* (23), whereas *à côté de* cannot do so (24). For the latter preposition, participants observed that *à côté de* may be highly deviant but not unacceptable with MPs if very small distances are involved (e.g., *un centimetre à côté de la voiture* 'one centimetre next to the car'). However, for the most part, the participants rejected its co-occurrence with MPs in sentences. The locutional prepositions *à l'intérieur/extérieur de* block MPs, as (25) shows, as do *sur le sommet de* and *au milieu de*, and locutional prepositions including *en* and *sur* as markers ((26)–(27)). On the other hand, *à gauche/droit de* can occur with MPs, as (28) shows. Two non-exhaustive lists summarising this distribution are given in (29)–(30):

(29) **Region Preposition**s: **Complex Prep.**:={*à côté de, par, parmi, près de,...*},
     Locutional Prep.:={*à l'intérieur de, à l'extérieur de, au milieu de, sur le sommet de,...*}

(30) **Projective Prepositions**:**Simple Prep.**:={*dans*}, **Complex Prep.**:={*autour de, derrière/devant,...*}, **Locutional Prepositions**:={*à gauche de, à droit de, au nord de, au sud de, à l'ouest de, à l'est de,...*}

Overall, four key results emerge from our discussion. First, simple prepositions resist distribution with MPs except *dans*, which can cover meanings related to an 'internal' projection. Second, complex and locutional prepositions display a heterogeneous distribution. Whether an item belonging to one of these two morphological classes can be classified as a projective or a region preposition depends only on its meaning. Third, the presence of (un)inflected *à* or other markers (i.e., *en*, *sur*) seems not to play a role in the occurrence of complex and locutional prepositions with MPs. Fourth, the occurrence of PPs with MPs is not a clear-cut matter, for at

least two reasons. First, intra-speaker variation reveals points of divergence even when sentences are perfectly acceptable. Second, certain prepositions (e.g., *dans*, *à côté de*) may also depend on the presence of certain verbs (and perhaps their selected meaning in the environment of these verbs), for their licensing with MPs. What the lists in (29)–(30) represent, then, is that different simple, complex, and locutional prepositions may (indirectly) combine with MPs: their morphological type does not determine this pattern. Furthermore, each item can be associated with a particular semantic type, but ambiguity is possible.

These results also suggest that extant classifications may not entirely capture these data. We can highlight three reasons for this claim. First, ILNs may combine with definite articles and thus act as relational nouns (e.g., *à côté de*). Alternatively, they disallow this pattern and occur "bare" (i.e., as AxPart items: *à gauche*). Hence, Roy (2006)'s morpho-syntactic distinction does not map onto a clear semantic distinction, since some putative AxPart items cannot combine with MPs, and some RelNs can do so. Second, while *à côté de* and *à l'intérieur de* denote external internal parts or regions of their grounds, respectively, they both resist occurring with MPs. Conversely, *dans* and *derrière* denote internal and external projections, respectively, but can also occur with MPs. Thus, Aurnague and Vieu's (2015) distinction between internal and external region prepositions seems to act as a semantic dimension orthogonal to the region/projective dimension. Third, accounts distinguishing between projective and non-projective prepositions conflate simple and locutional prepositions (e.g., Zwarts and Winter 2000). Our data, however, suggest that locutional prepositions can resist distribution with MPs because this type of preposition can capture distinct meaning types.[8]

Overall, we have reached our first goal: to offer an overview of the novel data that also supports the introduction of region prepositions as a distinct morpho-semantic type. We also have shown that this type is intimately related to projective prepositions, and that geometrical prepositions can be mostly reduced to the directional/locative alternation. That is, simple prepositions (*à*, *en*, *de*) cover "general" spatial relations, which may also involve aspects of motion or stasis (cf. Vandeloise 1991). Thus, region and projective meaning types may both be connected to complex prepositions. Furthermore, we have shown that previous accounts require more fine-grained tools of analysis to account for the locutional preposition type. This is the subject of the next section.

4. THE ACCOUNT

Our account of the morpho-syntactic properties of French prepositions follows the "P within P" hypothesis proposed within Lexical Syntax (Hale and Keyser 2002: Ch. 4, Mateu 2002). The key assumptions in our account are as follows.

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[8]An anonymous reviewer proposes that the licensing of MPs may depend on a Path component in verbs. Relevantly, a restricted group of informants (n=7) evaluated MPs and PPs in free relative-like constructions (e.g., *dix mètres derrière la voiture est où Mario est allé* 'ten metres behind the car is where Mario has gone': see Caponigro and Pearl 2009), and MP-based answers to *où*-questions (e.g., *dix mètres derrière la voiture*). Participants generally found the structures to be acceptable; however, we leave the topic aside for space reasons.

First, language-specific categories can project one of four language-general head types. Depending on the valence of a vocabulary item and its syntactic context, an item instantiates a 0-place, 1-place, or 2-place head type, based on how many arguments they combine or *merge* with. A 0-place head can act as a "bare" argument (i.e., a phrase). A 1-place head can act as an affix or as a marker. A 2-place head type represents a "relational" head merging with a specifier and a complement. The Lexical Syntax framework proposes another type of 2-place head; however, we can ignore this distinction without loss of precision in our analysis (Mateu and Amadas 2001, Hale and Keyser 2002: 13–14).

Second, we take a partially different stance with regards to the structure of prepositions and PPs than is seen in classic and cartographic approaches (e.g., Roy 2006). The central assumption here is that ILNs and their markers form a distinct unit that occurs as one of the two arguments of a head preposition. We make this choice for three reasons. First, complex items occurring in complex and locutional prepositions often involve forms of conflation. Examples include conflated items (e.g., *au-tour* 'around') or items having undergone univerbation (e.g., *derrière* 'behind' from Latin *de retrum* 'from back'). Second, these items can become remnants in ground NP ellipsis structures, hence acting as a single unit with respect to this operation.

Following these two assumptions we can conclude that these complex units act as arguments of a larger PP phrase. The ground NP data suggest that remnants are a single syntactic unit that can nevertheless contain different morphological structures. If we consider them "stacked" projections of a preposition, as cartographic proposals suggest, complex prepositions would involve apparently heterogeneous structures acting as remnants (roughly, RelN phrases or AxPart phrases). These structures would also involve functional projections assigned to ILNs and their embedding markers. However, our data invariably suggest that ILNs carry lexical content, which then becomes part of a preposition (Aurnague and Vieu 2015, Matushansky and Zwarts 2019). Similarly, our data suggest that remnants seem to be arguments of PPs, rather than projections of prepositional heads. Therefore, treating these units as arguments allows us to capture their lexical and syntactic properties in a direct manner.

Third, these complex prepositions inherit their meaning from the ILNs that diachronically act as their "roots". For instance, *autour*, *derrière,* and *à l'intérieur* inherit their projective or region meanings from their underlying ILNs (e.g., *intérieur*, *arrière*, *tour*). However, each meaning type can block or license the presence of MPs once a full phrase is formed, as part of a larger PP. We thus assume that ILNs may involve a distinction that resembles the AxPart/RelN distinction in cartographic approaches. Yet, this distinction does not determine the category and structure assigned to each vocabulary item, but only the features assigned to a preposition and the PP it projects from this preposition. In other words, ILNs determine the region or projective features assigned to a preposition, but do so as "part" of a preposition being merged as the argument of a second preposition. This cumulative effect is consistent with treatments in previous literature that also focus on the semantic properties of this category (e.g., Vandeloise 1988, Melis 2003, Aurnague and Vieu 2015).

Fourth, we assume that simple prepositions *qua* heads (e.g., *de*) project 2-place heads, which take ground NPs as their complement and possibly another prepositional phrase as their second argument (a *specifier*, in standard generative terms). Each projected category can be further enriched with its assigned morphological features. We capture this latter aspect by using formal (morpho-syntactic) features (Chomsky 2001, Adger 2010, Adger and Svenonius 2011, Sag et al. 2012). Each head H is represented as projecting a category (e.g., P, V, D, and N).[9] The features associated to each category (e.g., *tense* for verbs) follow the label and are presented as "attribute:value" pairings (e.g., *tense:past*). Categories and features with values are represented as ordered sequences of sub-scripts (e.g., $H_{<P,p>}$, where this reads: a preposition P is a head carrying a *p(rojective)* feature). We trade precision for readability, so we only assign features to prepositions below.

We use the following notation. Simple prepositions correspond to 2-place head types, represented with the label P. In their distribution as markers, they are 1-place head types, represented with the label P' (P prime). The resulting phrase is a P'P, a variant on the "P within P" hypothesis. We then assume that simple Ps are ambiguous: they can carry *d(irectional)* or *l(ocative)* "path" feature values. ILNs correspond to NPs (i.e., 0-place heads) and are merged as the complements of members of the P' category. They carry the feature values *p(rojective)* or *r(egion)*. Thus, we represent region and projective features as a morpho-semantic dimension orthogonal to the locative/directional dimension.[10] Verbs and nouns carry temporal/aspectual features. However, we omit them since they are not relevant to our discussion.

Before we spell out the details of our analysis, a preliminary comparison between this analysis and previous proposals may help readers to better appreciate the novelties we introduce. In cartographic approaches, prepositions involve sequences of functional heads (e.g., Svenonius 2010). In our account, prepositions involve a "pure" functional head mediating between a ground DP and an embedded P'P containing lexical and functional categories. We consider ILNs to be a super-category of RelNs and AxParts, though we treat them as arguments (i.e., NPs) of another preposition. Since we consider *p* and *r* to be possible feature values associated with ILNs, we do not differentiate prepositional structures into two slightly different types involving the AxPart- and RelN-based structures. As the use of Lexical Syntax entails, we do not assume that each morpheme in a preposition projects a functional (i.e., 2-place) head. Different elements have different valences, an analysis that finds support in the data discussed in section 3.

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[9]This assignment can be modelled as the result of a category-less root merging with a categorizer (e.g., *v*, *n*, and so on). Here we can reason at a coarser-grained level of analysis without loss of empirical accuracy.

[10]*Projective* and *region* features can be conceived as the combinations of a *space* feature and a ±*degree* feature. Thus, the equations *region=[+space;-degree]* and *projective=[+space;+degree]* hold. The use of features and *p* and *r* permits us to offer a more compact account of the data. See Adger and Svenonius (2011), Sag et al. (2012: 84–86), and references therein, for discussion of complex (layered) features.

We can illustrate the resulting novel proposal by offering the structures corresponding to each preposition type in (31)–(34):

(31) a. $[_{<PP,\pm d,def>}[\emptyset_{<P',\emptyset>}] [H_{<P,\pm d,def>}[_{NP} H]]]$

    b. $[_{PP,\pm d,def>}[\emptyset_{<P',\emptyset>}] [au_{<P,\pm d,def>}[_{NP} \text{piano}]]]$

(32) a. $[_{<PP,\pm d,+r,def>}[_{<P'P,\pm r>}[H_{<P'p>}[_{<NP,\pm r>} H]] [H_{<P,\pm d,def>}[_{NP} H]]]$

    b. $[_{<PP,\pm d,p,def>}[\text{sur le}_{<P'P,p,def>}[\text{sommet}_{<NP,r>}]] [\text{de la}_{<P,\pm d,def>}[_{NP} \text{table}]]]$

(33) a. $[_{<PP,\pm d,\pm l,def>}[H_{<P'P,p,ef>} [_{NP} H_{<P,\pm l>}]] [H_{<P,\pm d,def>}[_{NP} H]]]$

    b. $[_{<PP,\pm d,r,def>}[au_{<P'P,\pm d,def>}[\text{milieu}_{<NP,\pm l>}]] [\text{de la}_{<P,\pm d,def>}[_{NP} \text{ville}]]]$

(34)

    a. $[_{<PP,\pm d,\pm l,def>}[H_{<P'P,\pm d,def>}] [H_{<P,\pm d,def>} [_{NP} H]]]$

    b. $[_{<PP,\pm d,\pm l,def>}[_{<P'P,\pm d,def>} \text{derrière}] [\emptyset\text{-la}_{<P,\pm d,def,>}[_{NP} \text{voiture}]]]$

    c. $[_{<PP,\pm d,\pm l,def>}[_{<P'P,\pm d,def>} \text{autour}] [\text{de la}_{<P,\pm d,def>}[_{NP} \text{ville}]]]$

    d. $[_{<PP,\pm d,\pm l,def>}[_{<P'P,\pm d,def>} \text{par}] [\emptyset\text{-les}_{<P,\pm d,def,>}[_{NP} \text{champs}]]]$

    e. $[_{<PP,\pm d,\pm l,def>}[_{<P'P,\pm d,def>} \text{par}] [\emptyset_{<P,\pm d,def,+dx>}[_{NP} \text{ici}]]]$

For simple prepositions, we assume that they involve null P'Ps (e.g., *au piano* in (31b)). We simplify the representation of inflected prepositions by treating definite features of the definite article as an integral part of their structure (i.e., we have $<P,\pm d,def>$: Caha 2009, Svenonius 2016). Since these prepositions either have a directional or locative meaning, we use a positive or negative value for the feature *d* to represent this ambiguity. The corresponding PP is also ambiguous: it must merge with a verb to be disambiguated (Tungseth 2008, among others).

This entails that features *percolate* from the heads to phrases, in P'Ps and PPs. The proper treatment of percolation involves a formal apparatus that would take us too far afield from the topic of this article if presented in full. Here we present only the core principle: that features belonging to each merged category are unified into a single feature structure. For instance, a P' with a feature *s* merging with a spatial noun with a feature *r(egion)* forms a P'P with the *r* and *s* features. From $<P',s>$ and $<NP,r>$ we have $<P'P,s,r>$ (Shieber 1986: 27, Travis and Lamontagne 1992, Adger 2010: 230–234, Sag et al. 2012: 89–94, Svenonius 2016: 202).[11] Features can cyclically project along the clausal spine, and may form complex feature clusters associated to "higher" constituents (e.g., "spans" in Svenonius 2016). Thus, features may become accessible to various syntactic operations beyond their local merge domain, e.g., agreement, anaphoric relations, and feature matching, when MPs are involved.

Locutional prepositions involve the merger of an ILN carrying either *p* or *r* features. Once this ILN, a 0-place head, merges with a P', the resulting P'P inherits these features via percolation. In the P'P *sur le sommet* 'on top' in (32b), the P' *sur le* marks

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[11]We leave aside the representation of features as being interpretable when on arguments (i.e., as being represented as *+f*) or uninterpretable when on heads (i.e., represented as *–f*), as our discussion of the "±" notation suggests. Again, this level of detail suffices to account for the data at hand.

the noun *sommet* as part of a preposition, and not as the definite NP *le sommet* 'the top'. The same mechanism is at work in (33b), which includes the inflected preposition *au milieu* 'in the centre'. Thus, we predict that P' heads determine that a spatial noun's meaning refers to a location rather than to a part. If prepositions as 2-place heads (i.e., Ps) capture geometrical relations, then in their distribution as 1-place heads (i.e., P's/markers) they capture relations involving region/projective senses.

Complex prepositions including optional heads involve two slightly different structures, as the pairs in (34b–c) and (34d–e) show. While *derrière* involves a silent head, *autour* includes *de* as the pronounced head. "Novel" complex prepositions such as *par* receive a similar treatment. For instance, *par* includes a silent "∅" head that can select a deictic ground NP, *ici*, and thus the feature "+dx" ((34e), based on (9)), or a silent head and a definite article (34d). We can now offer an account of BLCs, as (35) shows:

(35)   a. $[_{VP}[_{NP} H]$ $[H_V$ $[_{<PP,\pm d,def>}[$ $\varnothing_{<P',\varnothing>}]$ $[H_{<P,\pm d,def>}[_{NP} H]]]]]]$

b. $[_{VP}[_{NP}$ Mario] $[va_V$ $[_{<PP,\pm d,def>}[\varnothing_{<P',\varnothing>}]$ $[$ a-la$_{<P,\pm d,def>}[_{NP}$ table]]]]]]

c. $[_{VP}[_{NP}$ Mario] $[va_V$ $[_{<PP,\pm d,def>}$ a-u $[bord_{<P',\varnothing>}]]$ $[de$ la$_{<P,\pm d,def>}[_{NP}$ table]]]]]]

The structure in (35a) shows that BLCs do not select a specific PP as the complement of a verb. Any of the morphological types of preposition can thus merge in these sentences.

Consider now *où*-questions and locative inversion sentences. We import two key assumptions from frameworks modelling question-answer data in discourse contexts to account for these data (Jäger 2005, Sag et al. 2012, Ursini and Long 2020). We consider our analysis to be preliminary, though hopefully on the right track. First, we consider answer phrases to be phrases of a type matching the features that a *wh*-word carries. French *où* lacks overt spatial features but nevertheless requires answers of a matching type. We model this fact via the structures in (36b–c). The structure in (37b), on the other hand, captures the locative inversion data. A silent head R takes a VP (i.e., a clause) and a PP as its arguments and establishes that the PP acts as an adjunct phrase to the clause (den Dikken 2006, 2010):

(36)   a. $[_{VP}[_{VP}[H_{<P,x>}]$ H_V $[H_{NP}]][H_{<P,a>}]]$, with $<P,x>=<P,a>$

b. $[_{VP}[_{VP}[$ où$_{<P,x>}]$ est$_V$ $[_{NP}$ Mario]][derrière $\varnothing$-la voiture$_{<P,a>}]]$, with $<P,x>=<P,p>$

c. $[_{VP}[_{VP}[$ où$_{<P,x>}]$ est$_V$ $[_{NP}$ Mario]][à l'intérieur de la voiture$_{<P,r>}]]$, with $<P,x>=<P,r>$

(37)   a. $[_{RP}$ $[_{PP} H]$ $[\varnothing_R$ $[_{VP} H]]]$

b. $[_{RP}$ $[_{<PP,p,def>}$ derrière la table] $[\varnothing_R$ $[_{VP}$ un homme travaille intensément]]]$

Given the template in (37a), (37b–c) show that *derrière la voiture* 'behind the car' and *à l'intérieur de la voiture* 'at the interior of the car' can be answers to *où*-questions. They match the features of *où* and offer a specific feature value (projective for *derrière la voiture* and region for *à l'intérieur de la voiture*) that establishes the cohesiveness of the question-answer pairs (see Jäger 2005: Ch. 6). The structure in (37a) also shows that any type of preposition can head a fronted or inverted PP, as per our predictions. Thus, via (36)–(37) we formally capture how the *ou*-question

and the locative inversion tests confirm the full-fledged status of locutional prepositions. Therefore, our account can already systematically capture the subtle differences in the distributional properties of preposition (morphological) types. It does so by offering an alternative view to current cartographic approaches to AxPart and RelN categories (e.g., Svenonius 2010, Franco 2016). However, our account shares with these frameworks a view where different preposition types heading PPs can combine with MPs or be answers to *où*-questions, etc.

Before we fully expand this point, we address the ellipsis data. The account of ground NP ellipsis patterns is based on two key assumptions. First, ellipsis can be licensed when a phrase refers to an entity that is discourse-given (i.e., inferable from the context). Thus, the features that the elided constituent carries establish the content of this reference relation (Merchant 2001: Ch. 2, Jäger 2005: Ch. 4, Adger 2010: 240, Sag et al. 2012). Second, the remnant must be a constituent, even if the elided material can form a fragment (Boone 2014: Ch. 2). Consider (38):

(38)   a. [$_{VP}$ [$_{NP}$ H] [H$_V$ [$_{<P,p>}$[$_{P'P}$ H] (H$_{<P,\pm\ d,def>}$ H$_{NP}$)]]],
           with $<P,x>=<P,y>$, $<P,x>$ inferable from the context;

       b. [$_{VP}$ [$_{NP}$ Mario] [va [$_{<PP,p>}$[$_{P'P}$ devant] ($_{<P,x>}$ ∅ la voiture)]]],
           with $<P,x>=<P,\pm\ d,def,NP>$, $<P,\pm\ d,def,NP>$ inferable from the context;

       c. [$_{VP}$ [$_{NP}$ Mario] [va [$_{<PP,p>}$[$_{P'P}$ à l'intérieur]]] ($_{<P,x>}$ de la voiture)]],
           with $< P,x>=<P,\pm\ d,def,NP>$, $<P,\pm\ d,def,NP>$ inferable from the context

The template is given in (38a). The specific structure in (38b) shows that the remnant P'P *devant* licenses an inference about a (silent) governing head *de* and a ground NP, *la voiture*. Hence, the constituent and established identity can be elided. The same analysis applies to *à l'intérieur de la voiture*, as (38c) shows. P'Ps *qua* remnants can act as "spatial" complements of a verb. Therefore, only complex and locutional prepositions can undergo ellipsis. Since simple prepositions lack overt P'Ps, ellipsis would need to either elide the whole PP, creating the ungrammatical **Mario va (à la gare)*, or the ground NP. Our account correctly excludes this possibility (i.e., we also obtain **Mario va à (la gare)*). Thus, our account predicts the syntactic distribution of all preposition types in ellipsis contexts.

We can now account for the distribution of MPs with prepositions. Our central assumption is that a silent Deg head can merge with a PP and an MP, its complement and specifier, respectively. This head only licenses a grammatical and interpretable structure when the spatial features of MP and PP match (Svenonius 2010, Morzycki 2015, Franco 2016). We present this analysis and its sentential import in (39)–(42):

(39)   a. #[[H$_{<MP,p>}$] [H$_{Deg}$ [PP$_{<P,r>}$]]]

       b. [$_{<DegP,\#>}$[dix centimètres$_{<MP,p>}$] [∅$_{Deg}$ [sur le sommet de la table$_{<P,r>}$]]]

(40)   a. [$_{<DegP,p>}$[H$_{<MP,p>}$] [H$_{Deg}$ [PP$_{<P,p>}$]]]

       b. [$_{<DegP,p>}$[dix mètres$_{<MP,p>}$] [∅$_{Deg}$ [derrière la voiture$_{<P,p>}$]]]

(41)   a. #[[H$_{<MP,p>}$] [H$_{Deg}$ [PP$_{<P,∅>}$]]]

       b. [$_{<DegP,\#>}$[dix mètres$_{<MP,p>}$] [∅$_{Deg}$ [à la voiture$_{<P,r>}$]]]

(42) a. [$_{VP}$ [$_{NP}$ H] [H$_V$ [$_{<DegP,p>}$[H$_{<MP,p>}$] H$_{Deg}$ [PP$_{<P,p>}$]]]]]

  b. [$_{VP}$ [$_{NP}$ Mario] [est$_V$ [$_{<DegP,p>}$[dix mètres$_{<MP,p>}$] [$\varnothing_{Deg}$ [derrière la voiture $_{<P,p>}$]]]]]

  c. [$_{<VP,\#>}$[$_{NP}$ Mario][marche$_V$[$_{<DegP,\#>}$[un kilomètre$_{<MP,p>}$] $\varnothing_{Deg}$ [au milieu de la ville $_{<P,r>}$]]]]

  d. [$_{<VP,\#>}$ [$_{NP}$ Mario] est$_V$ [$_{<DegP,\#>}$[dix mètres$_{<MP,p>}$] $\varnothing_{Deg}$ [à la voiture$_{<P,r>}$]]]

As (39a) shows, *sommet* carries an *r* feature that percolates at a PP level. The Deg head identifies this feature with the *p* feature that *dix mètres* 'ten meters' carries; the mismatch causes the structure to be uninterpretable. This is not the case in (40b), because *derrière* also carries a *p* feature. The simple preposition *à* in (41b) involves a silent/empty P'P, and hence it does not specify a feature value corresponding to a region/projection meaning. A feature mismatch arises again: hence, the uninterpretability of the structure.[12]

The structure in (42a), then, shows the general structure for BLCs, including MPs. When an MP and a PP match in features, they license an interpretable phrase and sentence (see *derrière* in (42b)). The opposite holds when a region preposition is merged (see *au milieu de* in (42c)). A geometrical preposition similarly causes a sentence to be uninterpretable, although this result occurs because no matching feature is merged (as in *à* in (42d)). Thus, our account can capture how region and geometrical prepositions can resist combination with MPs, although via different principles. For region prepositions, there is a feature mismatch between MP and the full PP embedding a region P'P. For geometrical prepositions, there is no P'P that can establish a feature-matching relation.

Before we move to the discussion, we wish to offer some considerations regarding the status of PPs and MPs as arguments in BLCs. One could argue that in combination with verbs lacking a goal component (e.g., *marcher*), PPs act like adjunct-like elements. Thus, PPs would denote the extension of the locations in which an event of motion happens. The MP would then be the direct complement of a verb (see Romeu 2014: Ch. 4, Ursini 2015 for recent discussions). Our account excludes this possibility, since it aims to treat all PPs as (syntactic) complements of verbs, given their uniform distribution. We believe that in an adjunct-oriented approach, however, the features that PPs and MPs contribute would enter into a matching relation at a different point in a derivation and would render a sentence uninterpretable if this matching did not take place. In other words, even if our structural analysis of PPs and MPs might turn out not to be accurate, the feature-matching principle would still offer a correct account of the data.

5. DISCUSSION

We believe that five key results emerge from our account. First, we have offered a broader empirical picture that builds on extant proposals. Previous work has observed

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[12]We abuse notation by assuming that a DegP is uninterpretable (i.e., we have *<DegP,#>*) if the features of its arguments do not match. It would be more opportune to talk about the ungrammaticality of these structures leading to semantic uninterpretability. In this case, we trade precision for clarity of presentation.

that French prepositions can include inflected markers and ILNs (e.g., Vandeloise 1988; Borillo 1998; Fagard 2006; Le Pesant 2011, 2012). Our discussion of the data shows that these two categories form a constituent/phrase, a P'P, which is one of the two arguments of a prepositional head. The resulting PPs can be merged in BLCs, question-answer pairs, ground NP ellipsis contexts, locative inversion sentences, and with MPs. Simple prepositions lack a more complex structure (i.e., a P'P) and thus an ILN, and so they cannot merge with MPs. They lack the features that determine whether a preposition belongs to a region or projective type. Instead, complex and locutional prepositions carry either type of feature via ILNs and P'Ps' contributions. Therefore, they are either permitted or not permitted to merge with MPs, depending on which features they inherit from the ILNs in their structure.

Second, our account acts as an alternative to generative work that rigidly distinguishes between AxPart and RelN categories (e.g., Roy 2006, Svenonius 2006, 2010). These studies assume that prepositions including AxPart merge with MPs, as they always carry projective meanings. They thus form a complementary category to region (bounded) prepositions, which involve RelN heads (see Svenonius 2010: §2). Our data show that this clear-cut morpho-semantic distinction is not entirely attested in French, although a distinction between prepositions carrying an inflected marker and those lacking it seems empirically motivated. We take this as evidence that our feature-driven account is on the right track, because it assumes that ILNs may carry either a *r(egion)* feature or a *p(rojective)* feature, which then percolates to the phrasal and sentential levels. As foreshadowed in section 4, we offer a partially different account of these categories and how they are realized in French from standard cartographic accounts. However, we also propose certain points of convergence, as we discuss in the remainder of this section.

Third, the account partially reconstructs the categories proposed for prepositions in cartographic approaches. This reconstruction captures the intuition that *de* as a relational element acts as a type of structural case marker (e.g., den Dikken 2006: Ch. 4, Franco 2016). Simple *à* acts as a marker that introduces ILNs and the ambiguous (directional/locative) readings associated with simple and complex prepositions (cf. Vandeloise 1987, 1988; Franco 2016 on Italian data). Hence, our P' category partially approximates the "Path" category, which in cartographic work captures directional or locative meanings (Svenonius 2010 and references therein). ILNs approximate the AxPart and RelN categories as a unified category (unlike Roy 2006, Svenonius 2010) and P as the "Kase" category, which mediates a basic relation between the ground NP and the location that a figure occupies. Therefore, we suggest that the AxPart and RelN categories are two "facets" of one category. ILNs as the resulting super-category, we contend, act as a lexical category that is, however, slowly undergoing a process of "exaptation" to the prepositional domain, while maintaining its ability to refer to either regions or projections.

Fourth, our account indirectly expands previous semantic theories of French prepositions and their ontological proposals. We propose that the penta-partite ontology proposed in Stosic (2007) and previous work can include two sub-types of locations: regions and projections. We also propose that regions and projections stand in a part-of relation with the ground's extended space (Aurnague et al. 1999). The fact that

MPs can only merge with projective prepositions shows that only projections/axes include a semantic dimension of measurement, from which MPs select segments with a given length (Aurnague et al. 2001, Svenonius 2010, Morzycki 2015: Ch. 4). Our account of French prepositions is consistent with work on MPs and their distribution in other Romance languages (e.g., Romeu 2014, Franco 2016). We consider this a welcome result.

Fifth, and perhaps a consequence of our second and third results, our account may be conceived as a starting point for further typological investigations. It has become increasingly clear that while some languages may support a clear distinction between AxPart- and RelN-like categories (e.g., English), other languages may offer a less clear-cut picture. A picture similar to the one presented here for French can be thus found in other Romance languages (e.g., Italian: Franco 2016). In this language family, the emergence of distinct AxPart and RelN categories seems to be a still unfolding process and may follow a path similar to French. Other languages have, however, begun to be analyzed in detail. In Mandarin, the lexical content of the post-position-like category known as "localizers" (e.g., *lǐ* in *zài chē lǐ*, lit. 'at the car in') seems to mostly determine distribution with MPs. Thus, localizers seem to be a category that raises non-trivial questions about the empirical feasibility of a sharp AxPart/RelN divide (Ursini et al. 2020).

An even subtler interplay of what might be classified as axial part items or relational nouns can be observed in other languages. For instance, Franco et al. (2017) observes that in Uralic languages, teasing the two categories apart may be problematic. Oftentimes, case morphology may be the only cue that a relational noun refers to a location, rather than to an object (see Roy 2006). A similar observation is offered on Uzbeki and Inuktitut spatial categories in Johns and Thurgood (2011), who also briefly discuss the interplay of these categories with MPs. Overall, we speculate that these considerations could be extended to many languages beyond the familiar Western European types. We believe that our account may be ideally suited for tackling this type of variation. However, for reasons of space we leave such an endeavour for future research.

6. CONCLUSION

This article has presented evidence supporting the existence of region prepositions in French (e.g., *à l'intérieur*) and has analyzed their distribution with regard to MPs. It has shown that prepositions belonging to this semantic type are distributed across the complex and locutional morpho-syntactic types of prepositions (Fagard 2010, Le Pesant 2012). Thus, region prepositions form a complex morpho-semantic type. We have also shown that their occurrence with MPs not only identifies region prepositions as a distinct morpho-semantic type, but also distinguishes this novel category from previously introduced types, such as geometrical, internal, and external prepositions (Aurnague and Vieu 2015) and geometrical and projective prepositions (Matushansky and Zwarts 2019). We thus present novel evidence regarding this understudied type of prepositions and a formal account of the data in the framework of Lexical Syntax.

The article can therefore be considered a stepping stone for further work on at least two topics. The first is a further investigation and classification of region

prepositions, in Romance languages and beyond (e.g., Basque: Aurnague 1996). The second is a formal treatment of these data, starting from the assumption that features *p* and *r* are instructions related to the semantic types assigned to prepositions. Thus, ILNs and prepositions carrying the *r* feature are to be interpreted as denoting regions; those carrying the *p* feature denote projections. Approaches that model denotations of prepositions as vectors/projections (Zwarts 1997; Zwarts and Winter 2000; Svenonius 2008, 2010) and those modelling them as regions (Nam 1995, Aurnague and Vieu 2015) abound. Our account indirectly suggests that a synthesis would be empirically desirable, coupled with a relational semantics defined over regions and projections (cf. Aurnague et al.'s 1999 use of a *part-of* relation). However, we must leave this and other related endeavours for future research.

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