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# The Semantics of Dynamic Space in French

*Edited by*  
Michel Aurnague  
Dejan Stosic

John Benjamins Publishing Company

# The Semantics of Dynamic Space in French

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### **Volume 66**

The Semantics of Dynamic Space in French  
Descriptive, experimental and formal studies on motion expression  
Edited by Michel Aurnague and Dejan Stosic

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Université de Toulouse-CNRS

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# Recent advances in the study of motion in French

## A survey

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### 1. Dynamic space in language and cognition

As temporal research much earlier, and after decades of sporadic studies (e.g. Cooper 1968; Leech 1969), spatial semantics emerged as an autonomous field of research within linguistics in the early 1980s. This period was marked by the publication of several major studies (e.g. Herskovits 1982, 1986; Talmy 1983; Vandeloise 1984, 1986) that greatly contributed to enhancing and strengthening the emerging domain. These analyses all shared the aim of relating the linguistic expression of space to the cognitive representations it may be associated with. Directly relating spatial configurations out there to linguistic productions is not accurate, it was claimed, and what has to be understood is which aspects of spatial arrangements cognition picks out (and in what way) in order to build representations that are consistent with locative expressions in language(s). Thus, linguistic research is a good way to access some spatial representations hosted by our minds/brains – those related to language(s) – and to articulate them to information provided by other perceptual modalities (sight, action and touch, hearing, proprioception, etc.; cf. Jackendoff 1996). Because spatial semantics is not reducible to an “objective” space, external to the speaker, and relies heavily on our cognitive representations of external “reality”, it is customary to speak of *space in language and cognition* that is to say space as *represented* in language and cognition.

Among these spatial representations, one can distinguish static ones where the underlying configurations are motionless from dynamic ones where the relationships between entities evolve. We can thus speak of static vs. dynamic space in language and cognition. In many languages, spatial descriptions, be they static or dynamic, involve minimally three main ingredients: a located entity usually called “target” (Vandeloise 1991), “trajector” (Langacker 1987) or “figure” (Talmy 1983); a locating or reference entity usually called “landmark” (Langacker 1987; Vandeloise

1991) or “ground” (Talmy 1983); and a spatial relation between these two entities. For static descriptions, the relation is often expressed by a copula, a general static predicate, a posture verb or a positional, usually combined with an adpositional element applied to the noun denoting the landmark (Grinevald 2006; Kelly and Melinger 2001; Levinson and Wilkins 2006). For dynamic descriptions, different degrees of dynamicity can be distinguished, from changes of posture to motions or displacements introduced by one or more verbal and adpositional elements (again applied to the landmark noun). Obviously, this pattern is not unique and spatial constructions in languages of the world can vary along many dimensions (see e.g. Levinson and Wilkins 2006). When they are present in a description, however, targets (or trajectors, figures) and landmarks (or grounds) display strong contrasts as the latter are larger, more salient, and more stable than the former, among other things. These contrasts should remind us that the main purpose of spatial descriptions is to *locate* a target with respect to a landmark (see, for instance, the notion of “search domain” of a target or trajector in Langacker 1987), a point which is often forgotten when dealing with *dynamic* spatial descriptions in language.

Dynamic space and more specifically the expression of motion is, precisely, the main topic of this book. Motion markers and constructions have given rise to an extensive literature in the last twenty or thirty years. Some studies examining the syntax-semantics interface have focused on motion descriptions in order to tackle more general phenomena, among which Aktionsart or inner aspect (telicity vs. atelicity) and unaccusativity vs. unergativity (e.g. Krifka 1995; Levin and Rappaport Hovav 1992, 1995; Tenny 1995; Tenny and Pustejovsky 1999). Concomitantly, a whole body of literature has grown up around the expression of motion itself, either on specific languages or from a more cross-linguistic perspective (e.g. Aske 1989; Berman and Slobin 1994; Bowerman et al. 1995; Creissels 2006; Grinevald 1994; Hickmann 2006; Slobin 2003; Stosic 2002; Talmy 1985, 2000; Vulchanova and van der Zee 2012). Studies on French have not remained on the fringe of these developments and show an interesting historical background in this domain, which we will come back to later (e.g. Asher and Sablayrolles 1995; Boons 1987; Guillet and Leclère 1992; Kopecka 2006; Lamiroy 1983; Laur 1991; Sarda 1999; Stosic 2007).

This major research trend has made a significant contribution towards a better knowledge of the meaning components that languages use to describe motion, and a better identification of the morphological, lexical and syntactic means that convey these semantic features. Many new terms and conceptual tools were coined as a result, such as: manner of motion, directed motion, change of location/place, boundary crossing, direction, vector, path, trajectory, source/departure (initial), goal/arrival (final), traversal (medial), etc. However, these terms and concepts are not always given a precise definition and, when they are, significant variations

appear from one author to another. For instance, while Jackendoff (1983, 1990) applies the term “path” to the *motion* carried out by a target (or trajector, figure), with several subcategories of paths being distinguished (bounded paths, unbounded paths or directions, routes...), Talmy (2000, vol. 2: 25) defines this meaning component of spatial events as “the path followed or *site occupied* by the Figure object with respect to the Ground object” (our emphasis), thus grouping together static and dynamic situations. Even the same author’s definition of a term or concept can become distorted or misunderstood when taken up by other scholars. For instance, whereas Talmy’s “vector component” of a path makes it possible to distinguish between several kinds of paths (static paths, dynamic paths and among them bounded and unbounded paths), the success of the path vs. manner opposition has often resulted in a rather fuzzy use of the former concept – without the latter one (manner) being correctly delimited either.

## 2. Analyzing dynamic space in French: A longstanding line of research

The main aim of this book is to draw up an overview of recent research on the semantics of dynamic space in French, without any claim to exhaustiveness. It is intended for both scholars and advanced students wishing to have access to results and reflections about the expression of motion in French. More generally, it deals with several important topics of motion description in language and offers an immersion in this research field with French as a guiding thread. Similar volumes on static or dynamic space have been recently published for other languages and language families (e.g. Hasko and Perelmutter 2010; Šarić 2013; Stolova 2015; Xu 2008). Their interest does not merely lie in the application of existing theoretical frameworks and questionings to the language(s) under examination. The specificities of the data studied are likely to generate new issues and questions and even to challenge existing theoretical frameworks and concepts which, as we tend to forget, were themselves often influenced by the language(s) on which the analysis was based (often English). Moreover, although focused on a particular language (or language family), this kind of publication does not preclude comparisons with data from other languages, quite the contrary. This is the case of several of the chapters in this book which include cross-linguistic references or adopt a clear cross-linguistic perspective.

In French, research on spatial semantics was strongly boosted by the publication of Vandeloise’s book *L’espace en français* in 1986. This study and its translation into English (Vandeloise 1991) deeply impacted the linguistic field (beyond France and French-speaking researchers) by claiming that the semantics of spatial relations in language cannot be reduced to geometrical constraints but

is highly dependent on “functional” aspects of entities and the world, such as: anthropomorphic principles/form of the human body, naive physics (in particular force dynamics), access to perception, potential encounter, or general and lateral orientations. Vandeloise specified that he used the term functional “in the sense of utilitarian” (Vandeloise 1986: 31 note 7, 1991: 239 note 6): “[...] the conceptualization of space involved in language is not a static topological or geometrical representation, but rather a dynamic representation linked to the *use of space that hosts our daily experience in the world*” (our emphasis; Vandeloise 2006: 153).<sup>1</sup> At the same time, Vandeloise proposed a full-fledged framework for capturing the functional meaning of spatial prepositions (Langacker 2010), a framework that he subsequently used throughout his extensive production.

However, interest in the expression of space in language had already been perceptible for quite some time in French linguistics, specifically within the theoretical approach of “lexicon-grammar” launched by M. Gross (1975).<sup>2</sup> From the first publications on intransitive constructions by Gross’s collaborators, special attention was paid to locative verbs and constructions – see, for instance, Tables 35L and 35ST in Boons et al. (1976: 216–242, 333–342) – which later resulted in a series of studies focusing explicitly on motion predicates (e.g. Boons 1985, 1987; Guillet and Leclère 1992). Among the many phenomena highlighted by these authors, it should be noted that they were among the first to point out that some motion verbs and constructions were likely to give rise to a static interpretation (see Table 35ST in Boons et al. 1976), a phenomenon widely commented on since then and often known as “fictive motion” (Talmy 1996, 2000) – also called “virtual motion” (Talmy 1983; Langacker 1999), “subjective motion” (Langacker 1986), “abstract motion” (Langacker 1986) or “non-actual motion” (Blomberg and Zlatev 2014). Another very important issue in the lexicon-grammar approach (see e.g. Boons 1987) consisted in differentiating dynamic verbs denoting simple “movement” (*mouvement*) such as *s’asseoir* ‘to sit down’, *s’étirer* ‘to stretch’ or *se (re)tourner* ‘to turn over, turn round’ (changes of posture), from verbs referring to a motion or “displacement” (*déplacement*) such as *arriver* ‘to arrive’, *foncer* ‘to tear along’, *marcher* ‘to walk’ or *se rendre* ‘to go to’. This opposition between movement vs. motion or displacement can be minimally traced back to Tesnière (1959: 307–310)<sup>3</sup> and it is still central in

1. Vandeloise argued that many static configurations are dynamic as forces apply to them. Situations involving movement or motion are said to be “kinetic”. In this book, we will not take up this terminology but will adopt the usual opposition between static and dynamic localization.

2. Most of the research on lexicon-grammar was conducted in the former LADL lab in Paris, from the 1970s to the 1990s.

3. However, in Tesnière (1959) this distinction is quite different from more recent work on dynamic space in French and it mainly aims at introducing subcategories within verbs and

research on dynamic space in French, perhaps because of the encoding of the path component of motion in the verb (a “verb-framed language” in terms of Talmy’s (1985, 2000) typology). As we will see throughout the following chapters, it led to further distinctions being made within the categories of movement vs. motion/displacement and to a finer-grained picture of paths and trajectories. Together with Vandeloise for static space, the lexicon-grammar had a major impact on the development of research on dynamic space and motion in French and generated several important studies, in particular on the initiative of A. and M. Borillo in Toulouse (e.g. Asher and Sablayrolles 1995; Borillo A. 1998: 37–50, 131–152; Borillo M. and Sablayrolles 1993; Laur 1991, 1993; Muller and Sarda 1998; Sarda 1999; Stosic 2001, 2002).

Over the last twenty years, and cross-cutting the work on stativity and dynamicity, studies on spatial semantics in French have taken special care to delimit the ontological nature of the landmark entities denoted by the nominal elements that propositions and verbal units select. This particular concern was initially guided by the detailed analysis of prepositions such as *dans* ‘in’ (Vandeloise 1986; Vieu 1991), *à* ‘at’ (Aurnague 2004, 2009; Vandeloise 1987, 1988) or *par* ‘by’ and *à travers* ‘through’ (Stosic 2001, 2002) and it led to distinguishing several kinds of spatial entities: objects, locations/places, mixed entities (buildings, houses), material entities, space portions, substances, pipes (a subcategory of objects), roads (a subcategory of locations/places), etc. The convergent behavior of proper names of geographical locations and relational spatial nouns (also called “Internal Localization Nouns” in French) with respect to locative adpositions and cases has been often noted in the literature (see e.g. Burenhult and Levinson 2008; Cablitz 2008; Hill 1996) and it also shows itself in French through the locating use of the preposition *à* ‘at’ (Vandeloise 1987, 1988). This behavior was given a unified explanation through the “abstract” notion of location/place and the possibility of defining objects contrastively (Aurnague 2004, 2009). Part-whole relations is another crucial aspect that has to be dealt with in relation to the ontological nature of spatial entities in language and cognition (Aurnague and Vieu 1993; Vieu 1991; Vieu and Aurnague 2007; Winston et al. 1987). A collective volume has been dedicated to these issues in the present series of John Benjamins (Aurnague et al. 2007)

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events that are now regarded as belonging to the (macro-)category of motion or displacement (Aurnague 2011; Boons 1987). Tesnière’s goal was to draw a line between verbs of “change of placement” (in particular atelic verbs of manner of motion: e.g. *foncer* ‘to tear along’, *marcher* ‘to walk’, *rampier* ‘to crawl’) and verbs of “change of relation and placement” (strict motion: e.g. *arriver* ‘to arrive’, *partir* ‘to go (away), to leave’, *se rendre* ‘to go to’), – see Aurnague’s chapter in this volume. In so doing, he was a true precursor as he spotted the opposition between verb-framed (French) and satellite-framed languages (German) that would later become famous in the wake of Talmy’s observations (see also Bally 1932/1965: 349–351).



with data from French and other languages. Although these ontological concerns were mostly applied to static spatial relations, they need to be transferred to the dynamic domain with, for instance, the following questions to be answered: are motion verbs sensitive to the location/place vs. object distinction as suggested by the expression *changement de lieu* ‘change of location/place’ that is widely used in the literature? or could it be the case that the term *lieu* is used here in a very loose way (without any precise definition) and simply stands for landmark (or ground) so that what is really meant is a change of landmark or a change of relation with respect to a landmark? This type of question is far from trivial for a serious analysis of dynamic space to be carried out, in French as well as in other languages.

This brief survey of research on spatial semantics in French over the last few decades is evidence of a growing interest in the study of the linguistic means and strategies available in this language when encoding spatial information. The present volume aims to bring together some recent findings in the field of dynamic space and to show how these cumulative, in-depth studies of French data can increase our general understanding of the way motion is processed in language and cognition.

### 3. Scope of the book

For the sake of consistency and efficiency, the issues raised in the different chapters of the book mostly concern the description of “autonomous” or “spontaneous” motion (e.g., *Max est parti de la salle d’audience* ‘Max left the courtroom’), as opposed to explicitly “caused” motion (e.g., *Les policiers ont emmené Max* ‘The police officers took Max away’). As regards the predicates involved in particular, this kind of spatial situation is expressed by a fairly large range of verbs, whether intransitive (e.g. *foncer* ‘to tear along’, *marcher* ‘to walk’, *ramper* ‘to crawl’), “indirect” transitive (e.g. *arriver* ‘to arrive’, *partir* ‘to go (away), to leave’, *se rendre* ‘to go to’), or “direct” transitive (e.g. *atteindre* ‘to reach’, *quitter* ‘to leave’, *traverser* ‘to cross’).

The material thus delimited is analyzed from a threefold perspective articulating *descriptive*, *experimental* and *formal* approaches to motion in language. Together with its focus on French, this is undoubtedly another specificity of this volume. French is only a testing ground in this respect, and we are convinced that combining analyses and methods from descriptive/functional linguistics, psycholinguistics, cognitive psychology, formal semantics, the philosophy of language or Natural Language Processing is a good way to create the conditions for the enrichment and refinement of each kind of analysis in the studied field. Psycholinguistics and cognitive psychology, for instance, need strong descriptions of linguistic facts to be available, in order to formulate hypotheses and design

experiments (Nespoulous 1990). The same can be said of Natural Language Processing, at least when it is based on symbolic tools and deep (i.e. not shallow) knowledge about linguistic meaning. And of course, descriptive and formal linguists expect feedback from these different disciplines. While only some of the above-mentioned disciplines are included in the present series of chapters (descriptive and formal linguistics, psycholinguistics and cognitive psychology, Natural Language Processing), we believe that this minimal “platform” is sufficient to illustrate the advantages of multiple and complementary spotlights on dynamic space in language(s). A similar multidisciplinary approach was followed in (Aurnague et al. 2007) when searching for the categorization of spatial entities in language and cognition.

The book has been divided into four parts (and ten chapters) that reflect the complementary points of interest and methodologies according to which the semantic analysis of autonomous motion has been carried out: Arguments, modifiers, asymmetry of motion (Part I); Manner of motion and fictive motion (Part II); Psycholinguistic issues (Part III); Formal and computational aspects of motion-based narrations (Part IV). The following sections introduce and summarize the contents of each of these parts.

### 3.1 Arguments, modifiers, asymmetry of motion

A first set of issues has to do with the semantic and syntactic relationships between the verb and the possible adverbials or adpositional elements appearing in motion descriptions. In particular, the syntactic function of locative PPs deserves to be examined carefully in order to determine their status of complement vs. adjunct. In diachrony, what traces do we have of previous satellite-like adverbials of French and the way they were replaced by constructions involving a verb and a locative adposition? The semantic contribution of verbs and adpositions to the description of motion events and the possible spatial “asymmetries” arising in the corresponding linguistic units and expressions is another point addressed here.

Asymmetry of motion is precisely the topic of the first chapter of the book, by M. Aurnague. The “importance of goals” or “goal (path) bias” (Lakusta and Landau 2005) relates to our apparent proclivity to pay attention to the “goal” of a motion event rather than to its possible “source”. Although mentioned in cross-linguistic research (e.g. Bourdin 1997), “goal bias” and, more generally, asymmetry of motion have been little studied in French. Aurnague’s contribution intends to partly fill this gap by focusing on strict autonomous motion expressed by intransitive or “indirect” transitive verbs (e.g. *aller* + *Prep* ‘to go + Prep’, *arriver* ‘to arrive’, *entrer* ‘to go into, to enter’, *partir* ‘to leave’, *se rendre* ‘to go to’, *sortir* ‘to go out’). Some constructions associating a directional or manner of motion predicate with

an accurate spatial PP can also refer to such eventualities (e.g. *courir + Prep* ‘to run + Prep’, *descendre + Prep* ‘to go down + Prep’, *glisser + Prep* ‘to slide + Prep’, *ramper + Prep* ‘to crawl + Prep’). The author first sets out the theoretical framework in which strict autonomous motion is analyzed. Notions of *change of placement* and *change of basic locative relation* (Boons 1987) are introduced in order to capture the predicates’ spatio-temporal content (Aurnague 2011) and a first asymmetry between “initial” and “final” verbs is emphasized at this stage. Then, a couple of properties also related to asymmetry are examined, namely the possibility for the different verbs to appear in implicit landmark constructions (e.g., *L’homme est sorti, et lentement s’est éloigné* ‘The man went out, and slowly moved away’) and their association with a spatial PP having an opposite “polarity” (e.g., *Il est arrivé ce matin de Toulouse où il a échappé de justesse à la gestapo* ‘He arrived this morning from Toulouse where he only just escaped from the gestapo’). It is claimed that implicit landmark constructions mainly depend on the spatio-temporal structure of the verbs – in particular, their centering on a change of relation – while the recourse to a locative PP with an opposite polarity (to that of the verb) strongly correlates with the former constructions. The chapter continues with an analysis of the system of spatial prepositions in the light of the two concepts of change of basic locative relation and change of placement. This panorama reveals that very few prepositional elements of French are intended to express a “change of relation and placement”, that is to say a real or strict motion. Such an outcome is fully consonant with the characterization of French as a typical verb-framed language. After that, Aurnague sums up the main properties through which asymmetry shows up in French descriptions of strict autonomous displacements and seeks to investigate their possible links. The author also suggests that, beyond its “imprints” in linguistic structures, the preference for goal-oriented descriptions of dynamic space (as revealed by speakers’ productions) may be partly due to a specific pragmatic principle.

The second chapter, authored by L. Sarda, is devoted to the syntactic status of locative PPs associated with different classes of motion predicates in French. By addressing the complex issue of whether locative constituents combining with motion verbs are arguments or adjuncts, Sarda provides an in-depth empirical study of how lexical semantics constrains the syntax of motion events. She first discusses the limits of Talmy’s typological framework for realizing fine-grained semantic analysis of the argument structure of motion predicates and argues that French data do not support a strict opposition between path verbs and manner verbs. For instance, while *partir* ‘to leave’ conveys only the path component and *marcher* ‘to walk’ only manner, motion verbs such as *s’enfuir* ‘to run away’ and *dégringoler* ‘to tumble, to rush down’ obviously conflate in their semantics both path and manner. In order to better capture the fundamental criteria for describing the

lexical meaning of motion verbs in French, the author resorts to the classification proposed by Aurnague (2011, this volume), and to a conception of the manner component as a set of parameters involved in the lexical meaning of some motion verbs, following Stosic (2009, this volume). This allows the author to show that various features of manner can be co-lexicalized with a change of relation, and that some features of path can enable certain manner verbs to express directed/telic motion events, which provides evidence for how the semantic content of motion verbs constrains their syntactic behavior.

The second part of Sarda's study tackles the issue of the obligatoriness or optionality of the PP constituent in combination with four different classes of verbs, for each of which the author selected two representative items. In order to evaluate the argumentlike or adjunctlike behavior of locative PPs in such constructions, the author uses two complementary methods. On the one hand, she performs a series of syntactic tests borrowed from Lazard (1994), Lakoff and Ross (1976) and Nichols (1986) about the presence, form and position of locative PPs when combined with motion verbs. On the other hand, Sarda conducts a corpus study in a usage-based perspective, providing a fine-grained analysis of about a hundred occurrences per chosen verb with and without a PP, totalling more than one thousand utterances extracted from Frantext.<sup>4</sup> Both the tests and the data exploration allow the author to offer an empirically based answer to questions that are difficult to resolve by intuition alone about the status of locative constituents, and the extent to which they are required or not, governed or not, and/or can remain unexpressed. Sarda's chapter thus provides not only an in-depth pilot study of the argument structure and argument realization of motion verbs in French, but also a solid methodological and theoretical basis for their further exploration.

The third chapter of the volume (by B. Fagard) offers a diachronic analysis of a specific type of evolution that has occurred from Latin to Modern French leading to a significant typological change in the motion domain. Taking as his starting point Talmy's (1985, 2000) well-known typological dichotomy between Satellite-framed and Verb-framed languages, Fagard first recaps the evidence showing that French, like all other Romance languages, is Verb-framed, while Latin, from which it derives, belongs to Satellite-framed languages. Indeed, in the expression of motion events, the lexicalization patterns found in Classical Latin are very similar to what presently exists, for instance, in Modern Germanic and Slavic languages. This clear typological shift entails the loss of satellites in diachrony, in particular during the period between Old French, which was structurally still Satellite-framed,

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4. Frantext (<http://www.frantext.fr>) is a large online textual base for written French (12th c. to 21th c.) maintained by ATILF, a joint research unit of CNRS and Université de Lorraine located at Nancy. Data from Frantext are used in several contributions in this volume.

and Modern French (see Iacobini and Fagard 2011). More specifically, while in Classical Latin the path component was principally encoded by verb prefixes and/or particles, in Modern French it is conveyed by verbs and prepositional phrases. The main purpose of Fagard's chapter therefore consists in an attempt to track and to document this evolution in order to determine exactly when and how satellites disappeared. In order to do this, the author conducted an extensive quantitative and qualitative diachronic corpus-based study of over 25 polyvalent expressions in the period from Old to Modern French, providing a very careful and complete survey of their decline throughout the diachrony of French. These expressions, which could behave as adverbs, particles or adpositions, were used in Old French as verb satellites.

Using grammaticalization theory, and construction grammar as a framework, Fagard applies a three-level approach to deal with possible patterns of lexicalization of the path component in the diachrony of French. Following Traugott (2008), he distinguishes between macro-, meso- and microconstructions. Verb-particle constructions thus appear as a particular type of mesoconstruction, which is subdivided into five microconstructions, namely: "caused motion", "path", "manner", "deixis" and "satellite" microconstructions. This allows him to show that, during the vast time span of almost 12 centuries (900–2013), verb-particle constructions gradually evolve from a frequent and productive pattern of lexicalization in Old and Middle French to a very few lexicalized remains in Classical and Modern French. In line with previous research, the author claims that Medieval French is a key period for the shift from a Satellite framed to a Verb framed type. However, thanks to his fine-grained analysis of a series of microconstructions through five successive periods, Fagard points out that the verb-particle construction does not disappear all at once, but rather by a gradual change in the frequency of microconstructions, as well as by their gradual internal semantic evolution.

### 3.2 Manner of motion and fictive motion

The issues just commented on were mainly concerned with the path component of motion. Other topics share the common trait of relying less on this aspect of dynamic spatial events. Here, we include the French verbs and constructions whose meaning is not primarily intended to operate a *true localization* of the target, that is to say to *update* its location with respect to a landmark. Manner of motion as well as fictive motion or non-actual motion clearly belong to this second set of topics.

Stosic's contribution addresses the issue of the lexical encoding of manner in the semantic domain of dynamic space. The chapter provides both a survey of different approaches to manner in lexical semantics and an in-depth lexical analysis of the lexicon of manner of motion verbs in French. Firstly, the author offers an

overview of five possible strategies that contribute to the expression of manner in French, namely lexical, syntactic, morphological, grammatical and prosodic (see Moline and Stosic 2016). By bringing to the fore different mechanisms shared by all five linguistic strategies for encoding manner, Stosic proposes a more comprehensive, unifying definition of the concept of manner. In line with previous research, it is also argued that the concept of manner is compositional by nature, and by no means monolithic, because it encompasses a wide range of semantic values. Secondly, the author undertakes a detailed semantic analysis of a very large lexicon of motion verbs in French, aiming to reveal underlying patterns of how the manner component is constructed at the lexical level. In doing so, more than 560 manner of motion verbs are identified in the general lexicon of motion verbs. This empirical result shows that the lexicalization of manner of motion in French is widespread, and contradicts the generally accepted theoretical view that French, as a verb-framed language, is impoverished in manner of motion verbs. Another interesting result of Stosic's empirical exploration of manner of motion verbs in French is that the lexicalization of manner affects all semantic categories of motion verbs. By adopting the main oppositions of Aurnague's (2011) classification of motion verbs, the author shows that the majority of manner of motion verbs are atelic and describe "weak motion" and "change of disposition", but also that more than 20% of them are telic, as they involve a change of basic locative relation.

Next, Stosic raises the issue of the compositionality of the manner component at the lexical level and demonstrates that it is made up of a very restricted set – precisely thirteen – of more elementary, non-idiosyncratic semantic features (or parameters), such as: BODY MOTION PATTERN, SPEED, SHAPE OF THE PATH, FIGURE CONFIGURATION, INSTRUMENT, etc. At the lexical level, manner thus appears to be rather a cluster concept and not at all a unitary, indecomposable notion. An extended version of Levin and Rappaport Hovav's (1998) model of lexical decomposition is used to represent the meaning of manner of motion verbs. In line with Levin and Rappaport Hovav's model, manner fulfils the function of a constant, and acts more precisely as the modifier of the general motion predicate GO or MOVE. One or two of the thirteen semantic parameters are assumed to occupy a modifier position in the representation of the meaning of each manner of motion verb: its/their role then consists in diversifying, and thereby in modifying, the root predicate. This is precisely what triggers the manner interpretation at the lexical level. Stosic's chapter thus sketches out a more general approach to the lexical coding of manner and opens new perspectives to investigate it.

Following on from Stosic's contribution, Stosic and Amiot's chapter examines another kind of means for expressing manner in the motion domain, namely morphology. Contrary to lexical and syntactic devices and strategies for expressing manner, that have been extensively studied during the last three decades,

morphological devices are dealt with when studying the expression of the path component, but are far from being considered when talking about the encoding of manner. In line with previous research dealing with evaluative morphology, aspectuality, manner and space semantics, the authors argue that many affixational and non-affixational processes of what is called “evaluative” and “pluractional” morphology participate in the expression of manner of motion (see, among others, Cusic 1981; Stump 1993; Stosic and Amiot 2011). This claim is particularly valid for the verbal domain, because, in the languages of the world, there is a wide range of morphological markers that, thanks to values such as diminution, augmentation, iteration, internal plurality, distribution, randomization, and so on, express a non-canonical way of performing the action described by the base verb (e.g. *sauter* ‘to jump’ > *sautiller* ‘to hop (around)’, *voler* ‘to fly’ > *voleter* ‘to fly here and there, to flutter around’). The main focus of Stosic and Amiot’s chapter is the interaction, or rather the compatibility, between evaluative morphology and motion. Undertaking an in-depth morphological and semantic analysis, the authors’ twofold aim is firstly to investigate to what extent it is possible in French to form evaluative verbs from motion verbs, secondly to establish and to describe principles that enable or block evaluation of motion processes.

Stosic and Amiot take as their starting point previous research on this topic, which has predicted the relative reluctance of motion verbs to be used as bases for forming evaluative lexemes. What is generally found is only a small set of basic manner of motion verbs such as *to run*, *to jump*, *to fly*, *to walk*, and some others depending on language. In order to test the validity of this preliminary research, the authors undertake an extended empirical analysis based on a large amount of data collected mainly from modern lexicographic resources but also from the web, by using several morphological patterns of extraction. According to Stosic and Amiot, in French, about fifty motion verbs proved to be used as bases for the formation of more than sixty evaluative verbs. These verbs are almost all formed by suffixation and hardly ever by prefixation, and they mostly describe atelic processes. It is also observed that not all evaluative motion verbs express manner because some of them are only used for pragmatic marking of an informal usage of language and do not involve any modification in the realization of the motion processes described by base verbs. Stosic and Amiot conclude their chapter with a discussion of the main principles governing the evaluation of motion processes on the basis of French data. What is particularly stressed is the importance of considering the aspectual nature of the process described by the base verb, as well as the need to make a clear distinction between the referential and pragmatic meanings of evaluative lexemes.

Like manner, fictive motion or non-actual motion (Talmy 1996, 2000; Blomberg and Zlatev 2014) has not been the subject of many studies in French, although it

was identified early on as a matter of interest (Boons et al. 1976). However, and contrary to manner, it gave rise to a great deal of research and discussion in English language literature. Cappelli's chapter tries to fill this gap by providing a large range of data from French, in the light of which the main assumptions put forward by scholars can be discussed. The author begins by remarking that the linguistic phenomena grouped together under the notion of fictive motion differ significantly from one study to another, as do the explanations put forward to account for these phenomena. Following Blomberg and Zlatev's (2014) observations, the three main psychological motivations recurrently mentioned by researchers are illustrated: enactive perception, mental scanning and imagination. After identifying some elements that may be at the source of these discrepancies, Cappelli claims that, as for manner, the study of fictive motion should be based on a clear categorization of (actual-) motion verbs and events making it possible to assess the very nature of the predicates that give rise to this kind of interpretation. He also advocates using a large corpus of attested examples and considering fictive motion beyond the sentence, at the discourse level. After setting out the theoretical framework used for classifying dynamic spatial verbs, together with the corpus of French examples built up by the author from Frantext, fictive motion is first examined within the sentence. It is shown that the targets (or trajectors, figures) involved in the attested examples are not systematically travelable entities or even stretched/elongated entities (opening the way to a mental scanning). Other parameters mentioned in the literature (e.g. Matsumoto 1996) are also discussed, such as the "manner condition" or the possibility (or not) for duration, speed and instrumentality to play a role in the expression of fictive motion. Along the way, the author provides interesting observations about the importance of entities' function and force dynamics, the properties of the paths denoted by verbs that lack a complement (in attested examples: e.g. *descendre* 'to go down', *disparaître* 'to disappear', *s'élancer* 'to rush forward', *tomber* 'to fall') or the difficulty for "migration paths" (described by verbs such as *émigrer* 'to emigrate', *migrer* 'to migrate') to give rise to fictive motion interpretations. At the discourse level, Cappelli suggests that almost all of the "composite" examples in his corpus (Cappelli 2013) come under the descriptive mode of discourse defined by Smith (2003) while the three kinds of spatial descriptions highlighted by Tversky (1996) appear in these examples: routes, surveys and gaze tours. Discourse also proves to be the most appropriate level to explore the possible manifestations of subjectivity and perceptual modalities (in particular sight or vision) in fictive motion descriptions.



### 3.3 Psycholinguistic issues

The possible impact that the expression of dynamic space in a given language may have on *non-verbal cognition* has become a very important line of research, since Talmy's (1985, 2000) seminal work on lexicalization patterns (with the opposition between verb-framed and satellite-framed languages),<sup>5</sup> and the emergence of a revisited version of linguistic relativity (e.g. Gumperz and Levinson 1996). Recent work on this issue has focused on activities occurring together with the verbal expression of motion, whether they contribute directly to the content communicated such as *gesture*, or only accompany it such as *eye movements*. The third part of the volume is thus devoted to this kind of psycholinguistic research carried out on both French and other languages.

Soroli, Hickmann and Hendriks' contribution takes data from French as the main thread and compares them to observations related to other languages, either typologically similar or not (in regard to the way they refer to dynamic space), extracted from the authors' own protocols or reported by other scholars. The chapter begins by recalling the many questions that the opposition between verb-framed and satellite-framed languages raises when applying it to a variety of languages of the world and the subsequent refinements that have been proposed in order to account for data that do not fall under such a strong dichotomy (for instance, the notion of "equipollently-framed" languages proposed by Slobin 2004). The different – and often divergent – ways in which the notions of path and manner are handled in the linguistic as well as in the psycholinguistic or experimental literature is another question tackled by the authors who explain their own views on the subject. Then, the authors review the main evidence currently available in the field of dynamic space about the language-cognition interface. Production measures that have generated a great amount of work are first reported, whether they involve semi-controlled or controlled tasks (e.g. picture books vs. video-clips) or even free narrations (e.g. spontaneous conversations with children). Beyond possible discrepancies about the stage at which the motion constructions/patterns of a specific language start conditioning children's productions, all of these experiments confirm that the typological characteristics of languages (in regard to dynamic spatial descriptions) have a clear impact on the way spatial properties of dynamic scenes are accessed and selected by subjects/speakers before being encoded and articulated in a suitable discourse. However, observing language

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5. Recall that while canonical motion constructions of verb-framed languages express path of motion through the main verb of the clause, satellite-framed languages do the same thing through a satellite or adpositional element, allowing the verb of the construction to denote manner of motion. In satellite-framed languages, but not in verb-framed ones, path and manner are thus typically included or conflated in a single clause.

effects on (off-line) linguistic productions can appear somewhat circular and *on-line* measures are needed in order to better see how cognitive mechanisms really operate.

The remainder of the chapter is thus dedicated to experiments that attempt to access on-line processes related to visual perception. A first set of work investigates how subjects explore visual stimuli (e.g. motion scenes depicted in pictures, video-clips or animated cartoons) while preparing to speak (e.g. Soroli and Hickmann 2011). They mainly aim at determining whether language has an impact on how speakers allocate visual attention to the different parts or components of these “visual events”. Yet, whereas the exploration of visual motion scenes within production or similarity judgment (categorization) tasks explicitly involving linguistic material offers interesting on-line information, it may not provide sufficient evidence to state a *true* impact of language on *non-verbal cognition*. That is why several experiments were designed, that include interference activities (e.g. tapping, sounds, repetition of non-words or numbers) meant to prevent “internal verbalization” and a direct influence of language on the subjects’ non-verbal processing (e.g. Trueswell and Papafragou 2010).

Fibigerova and Guidetti’s chapter examines gesture and its relations with speech when talking about dynamic space. The domain of gesture is introduced to the reader by distinguishing several sorts of hand/body movements and by focusing on *co-verbal gesture* whose main properties are highlighted. The authors argue that because of their physical and concrete nature, motion events are very well suited to be depicted by gesture. They can complement speech in two ways: conveying mental contents that are not necessarily verbalized, or emphasizing those elements of the utterance that constitute the core ideas of the speaker’s intentions (Kendon 2004; McNeill 1992). Concerning dynamic space and the expression of *path* and *manner*, gesture accompanying a motion description can be characterized according to the meaning components it conveys (path, manner, path + manner) and to the internal organization of the gesture (single vs. several gestures; content of each gesture stroke). Thus, a central question is whether the gestural patterns observed in a given language are or are not congruent with the pattern of canonical motion constructions in the language (see Note 5). Previous work on this issue indicated that speakers of typologically distinct languages such as French, English and Czech displayed similar gestural patterns, mainly resorting to only-path gestures (e.g. Fibigerova et al. 2012). Fibigerova and Guidetti’s chapter tries to go one step further in the comparison of motion descriptions in French (verb-framed) and Czech (satellite-framed), examining carefully the *structure* of both verbal production and co-verbal gesture: how many clauses and gestures are used by speakers for a given motion event/stimulus (*number* variable)? when both path and manner are expressed (*complexity* variable), how do they distribute over

clauses and gesture strokes (multi-clause and multi-gesture cases), in particular is there a clause or gesture that associates path and manner? The experiment designed by the authors involved participants of different ages (children and adults) who were presented with short video-clips of motion events. They had to recount the contents of the videos to an assistant accompanying the experimenter. After describing the whole protocol and the coding process, the results are presented in three steps, namely speech, gesture, and speech-gesture relations, for which the two variables previously mentioned – number and complexity – are systematically examined.

### 3.4 Formal and computational aspects of motion-based narrations

Research on the formal representation of motion in language and its computer processing is another complementary field that is likely to positively interact with both descriptive and psycholinguistic work. Formal models of the expression of motion can, for instance, intend to reflect phenomena and hypotheses put forward by descriptive linguistics while, under certain conditions, the computational processing of motion utterances' meaning can be viewed as simulating/implementing cognitive models. These facets of current studies on dynamic space in French are the focus of this fourth part of the book. They are mainly illustrated through the analysis of motion-based narrations such as travel narratives and hiking descriptions or guidebooks.

Lefevre, Moot and Retoré's chapter is the first contribution dedicated to the formal and computational aspects of motion in French. Like Cappelli, the authors address the question of dynamic space – and its relations with static space – through the analysis and processing of linguistic descriptions relying on fictive or non-actual motion (Talmy 1996, 2000; Blomberg and Zlatev 2014). More precisely, they aim at proposing a syntactic-semantic formalization of descriptions of this kind collated in a French corpus of travel narratives though the Pyrenees (17th–20th centuries). For this first attempt at the formal modeling of fictive or non-actual motion in French, one of the interpretations or experiences usually cited when explaining such a phenomenon (Blomberg and Zlatev 2014) is emphasized, namely the imaginary or “virtual traveler” (be it the speaker or any other imaginary/virtual entity).

The syntax-semantics interface is tackled through a categorial grammar (Lambek calculus) associated with an extensional fragment of Montague grammar (Montague 1974) and its basic semantic types. Such a framework is not well equipped to deal with selectional restrictions and meaning transfers. Therefore, a richer system of semantic types has to be provided together with some mechanisms of type shifting or coercion to be applied when a semantic mismatch occurs

between a predicate and an argument. The framework is thus further adapted to associate each lexical entry with one or more “morphisms”, that provide alternative meanings of the lexeme in terms of (enriched) semantic types, and with operations intended to control co-predication. The resulting framework is called “Montagovian generative lexicon” (Retoré 2014) in reference to both Montague’s and Pustejovsky’s (1995) proposals. A final specificity of the formal modeling is that the different meanings of the lexical entries are expressed through  $\lambda$ -DRT formulas of “Discourse Representation Theory” (van Eijck and Kamp 1997).

Lefevre, Moot and Retoré introduce various semantic types that will be useful for the analysis of their corpus of itineraries: events, persons or animate beings, immobile entities (mainly locations), paths... Several functions are also available to associate paths with events or immobile entities (such as lanes and roads) or to retrieve the source or goal/destination of a path. Fictive motion is then addressed as a problem of mismatch between the type(s) required by a motion predicate and that assigned to the lexicon entry of its grammatical subject. For instance, a verb such as *descendre* ‘to descend, to go down’ expects an animate subject in order to be correctly processed and a sentence such as *Le chemin descend* ‘the lane is descending/going down’ is not licensed by the formal system because a lane is a static or immobile entity. Two coercion functions are thus created (through “morphisms”, cf. supra) to make fictive motion descriptions acceptable, one that associates an immobile entity like a lane or road with a “path of motion” (coercion from immobile entities to paths) and another one that coerces the person or animate being in subject argument position of the verb to the path corresponding to the motion event.

The last chapter of the book, by Gaio and Moncla, further investigates the formal and computational processing of motion-based narrations by focusing on hiking descriptions of French and other Romance languages (Spanish, Italian) that are more and more abundant on the web. This contribution seeks to automatically parse and formally encode specific information contained in hiking descriptions – related to places and spatial actions associated with them – in order to reconstruct and map the verbally described itinerary. This main aim is divided up into three subtasks: annotating places and their associated spatial relations in texts (geoparsing), geolocating places according to their context of evocation (geocoding), and reconstructing the itinerary on a map.

The first step consists in identifying and extracting from the texts the names of locations/places or toponyms they contain, a task that requires shallow parsing and comes under the general domain of “Named Entity Recognition and Classification” (NERC) (e.g. Buscaldi and Rosso 2008; Purves and Derungs 2015). Strategies for recognizing toponyms (and, more generally, named entities) can be classified in two main categories: data-driven approaches and knowledge-based

approaches. While the authors choose a knowledge-based approach, they first implement a fine-grained grammar for the recognition and classification of toponyms which is not limited to *pure proper names* of places but distinguishes several levels of *descriptive proper names* (association of pure proper names with descriptive expansions). This grammar is extended to a more complex “VT” construction grammar intended to associate the “extended named entity” (ENE) and its specific internal structure with the verb (usually a motion verb) and possible adpositional locative relation(s) present in its immediate co-text. If a correct parse tree is found the ENE becomes a candidate to be an “Extended Spatial Named Entity” (ESNE). Geocoding can then start with the double objective of selecting true place names among the candidate ESNE and locating their referents on a map through geocoded representations. The VT structure associated with a candidate ESNE possibly supplemented by information on its ontological types and subtypes (e.g. city, lake, river) – extracted from the intra-sentential context or inferred – is the way chosen by the authors to query geographical resources such as gazetteers (Moncla and Gaio 2015). Associating the name of a location/place with the appropriate referent in terms of geographical coordinates raises complex problems related, for instance, to referential ambiguity or to the lack of information for fine-grained toponyms. The chapter sets out specific strategies for these two cases. Once all the place names of a hiking description have been identified, together with the location of their referents, the last part of the processing chain aims at reconstructing the itinerary that is the closest to the real route. Gaio and Moncla’s contribution follows with a series of experiments and evaluations of their proposal, based on the multilingual corpus PERDIDO (French, Spanish, Italian).

#### 4. New perspectives for the study of dynamic space in language and cognition

Focusing on data from French and influenced by at least three decades of investigation on the expression of space (in this language), the contributions in this volume are likely to open new perspectives for the study of motion in language and cognition in general. It is not our intention to make a full survey of these new avenues and research. We will rather illustrate them by discussing the inescapable opposition between path and manner used in a myriad of studies, included in this book.

#### 4.1 Searching for the semantic components of motion events

As early as 2006, Levinson and Wilkins highlighted the *problems and limitations of the path vs. manner contrast* when describing the grammars of space of a sample of languages including non-European ones – e.g. Arrernte, Jaminjung, Kilivila, Yé! Dnye, Warrwa, Yukatek Maya (Levinson and Wilkins 2006: 527–530). They pointed out “the need for a better understanding of the semantic components involved in motion events” and insisted that a crucial issue is “the notion of motion itself” (Levinson and Wilkins 2006: 531). On the basis of the dozen idioms observed, they suggested (Levinson and Wilkins 2006: 531–533) that at least two modes of describing and conceptualizing dynamic spatial situations exist in languages, depending on whether motion is conceived as a continuous change through space (“translocation”, atelic/*durative* inner aspect) or in a more discontinuous way by means of spatial changes of state (telic inner aspect, *non-durative* or “punctual”). The notion of *change of placement* within the terrestrial framework highlighted in Aurnague (2011) is in accordance with the view of a continuous/*durative* displacement in space (see Aurnague’s and Cappelli’s contributions in this volume).<sup>6</sup> In contrast, *change of basic locative relation* with respect to a landmark (Boons 1987) reflects the discontinuous/*non-durative* way of conceptualizing and verbalizing motion. Not only are these concepts (separately) materialized in the verbs and associated events of the same language but, as shown by French data, they open the way to combinations and categories organizing dynamic spatial eventualities on a continuum from near staticness to real motion/displacement (see Stosic’s and Stosic and Amiot’s contributions in this volume). Because it is mostly centered on the internal changes of a moving target (or trajector, figure), manner of motion often involves predicates and utterances implying a continuous point of view on dynamic spatial events, a correlation which probably contributed to making the latter property of motion – as well as the opposition between continuity/*durativity* and discontinuity/*non-durativity* – less visible. However, the expression of manner does indeed cross-cut the two conceptualizations of motion commented on above and can sometimes combine with discontinuous displacements in the semantics of verbs (e.g. speed or discreteness co-occurring with initial changes of basic locative relations; see Stosic’s contribution in this volume).

Beyond the validity of the path vs. manner opposition in the analysis of spatial language and the search for alternative or additional contrasts, it should be noted that the very notions involved in this opposition are far less well defined. Let us first discuss the concept of path.

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6. The terrestrial framework is implicit and verbs of mere change of placement do not need to include any landmark entity in their argument structure.

## 4.2 Path and localization

Studies on motion that are grounded on the path vs. manner distinction often forget that a major semantic and pragmatic function of spatial descriptions in language is to make it possible to locate the target entity (or entities) evoked in the description or, at least, to efficiently contribute to its (their) localization. Notions of “search for the target” (or trajector) and “search domain of the target”, for instance, have proved to be very important in the analysis of spatial markers and descriptions (e.g. Vandeloise 1987, 1988; see also Langacker 1987; Zlatev 1997). In spite of some specific tools provided by scholars who originally dealt with paths – see, in particular, Talmy’s (1985, 2000) “vector component” –, many researchers handle this conceptual category without due care, notably making no clear distinction between dynamic predicates that *do not necessarily update* the location of the moving target (with respect to a landmark; e.g. *avancer* ‘to advance, to move forward’, *tourbillonner* ‘to whirl (round), to swirl (round)’, *vagabonder* ‘to roam, to wander’, *zigzaguer* ‘to zigzag along’) and predicates that *compulsorily* operate such an updating (e.g. *arriver* ‘to arrive’, *partir* ‘to leave’, *se rendre* ‘to go to’). Beyond semantic considerations, it should be noted that spatial PPs associated with these two kinds of verbs very often fulfil different syntactic functions: they are modifiers in the former case (at least in one interpretation) and real complements in the latter one.

Another widespread view on paths is their systematic decomposition into two or even three “phases” or parts – initial, final and sometimes medial –, with possible focuses on some of them achieved through cognitive mechanisms such as “windowing of attention” (Talmy 2000). Yet, recent work on English corpora (e.g. Stefanowitsch and Rohde 2004) suggests that, even in this language,<sup>7</sup> sentences such as *When his parents went out of the town, he quickly cut loose* or *He escaped from Alcatraz* do not involve any other phase than a source or initial displacement in their underlying path. The same thing can be observed in a description such as *Max est parti de chez lui à 8 heures* ‘Max left home at 8 o’clock’ in French, and very probably occurs in other languages (mostly verb-framed or including serial verbs: Bohnemeyer et al. 2007) where the internal structure of motion verbs is possibly

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7. In our opinion, the general view of a “path of motion” possibly made up of two or more phases/parts has been greatly influenced by the properties of *canonical motion descriptions in English* together with *extra-linguistic* considerations. The atelic character of many verbs of manner of motion and the possibility of combining these durative or continuous predicates (see above) with a series of satellites or adpositions expressing successive changes of locative relations with respect to different landmarks, have significantly contributed to promoting such a conception of paths. English speakers (and linguists!) are indeed quite accustomed to compact sentences with a series of dynamic spatial PPs “stacked” after the verb, allowing them to introduce complex/extended paths or “journeys” (Slobin 1996, 2004).

grounded on only one of the three phases or “changes of basic locative relation” previously mentioned (in particular initial or final ones). As illustrated above, these kinds of verb often give rise to sentences denoting only the corresponding change of locative relation, without any other putative components of the path being recoverable from the co-text or the situational context, or even being conceptually needed for the understanding of the utterance.

### 4.3 Interacting with manner

Regarding manner, a major effort remains to be made in order to highlight the meaning properties or features underlying this notion, unless one decides to process it as a heterogeneous or fuzzy concept (e.g. Mani and Pustejovsky 2012: 48–52). The psycholinguistic experiments set out in (Slobin et al. 2014) constitute a significant step forward in this direction but a descriptive analysis of the motion lexicon is indispensable in each language and is likely to bring to light even more semantic components of manner, including those that combine with path (see below). At least, that is what emerges from the observation of French data drawing on a large list of verbs (see Stosic’s contribution in this volume), several properties that were not present in Slobin et al.’s experiments being revealed by the lexical decomposition: e.g. discreetness, extension of motion, purpose/aimlessness. Tracking the different features of manner of motion in language implies a case-by-case individuation emphasizing the peculiarities of each of them but it also needs to identify their *common semantic function* as true specifiers of more general motion predicates (beyond their apparent heterogeneity). This is a necessary condition for bringing the features together under the domain of manner of motion. Even more crucially, manner in dynamic spatial events questions the very limits between manner and path and, more generally, the way these two notions interact. For instance, while the predicates indicating the lack of a goal (e.g. *errer* ‘to wander’, *divaguer* ‘to ramble, to wander’, *rôder* ‘to roam (about), to loiter (about)’, *vagabonder* ‘to roam, to wander’) are often considered as falling within the category of manner,<sup>8</sup> what kind of information do the verbs describing the form or shape of the target’s trajectory (e.g. *louvoyer* ‘to tack’, *tourbillonner* ‘to whirl (round), to swirl (round)’, *serpenter* ‘to snake, to wind’, *zigzaguer* ‘to zigzag along’) convey: manner, manner and path, or just path (for connected discussions, see Nikanne and van der Zee 2012; Vulchanova and Martinez 2013)? Also, the usual conception of manner and path mechanically leads to considering that verbs such as *dégringoler* ‘to tumble, to rush down’ and *s’enfuir* ‘to run away’ convey both

8. Note that these verbs indirectly suggest an erratic displacement and are thus likely to also introduce constraints on the form or shape of the target’s trajectory.



of these notions (manner + path) and are, in this respect, closer to each other than the former to *courir* 'to run' (only manner) and the latter to *partir* 'to go (away), to leave' (only path). Rather than a matter of manner, this grouping follows from the view on paths previously mentioned where some events are brought together independently of their ability or not to update the location of the target. Yet, while the events denoted by *dégringoler* and *courir* can entirely take place *within* an encompassing landmark (no change of basic locative relation occurs with respect to it; see Aurnague's and Cappelli's chapters in this volume), *s'enfuir* and *partir* necessarily denote a change of locative relation with respect to the landmark underlying their semantic content. As we can see, the now classic conception of manner and path and their interaction blurs other very important aspects of dynamic space in language such as the opposition between durative vs. non-durative displacements reported by Levinson and Wilkins (2006) – an opposition which is correlated with a continuous vs. discontinuous view on motion processes (see above). Instead of manner itself, it is the way this notion is articulated to motion which is at issue here and this observation echoes Levinson and Wilkins' statement that there is still much to be done in order to capture the very concept of motion in language and cognition (especially that of path in our opinion). One possible solution could consist in limiting path events to those markers that obligatorily update the location of the moving target with respect to a landmark (landmark-oriented motion, discontinuous), and to distinguish these cases from those in which the marker's content is rather *focused* on the *moving target itself* or on its *immediate trajectory* (target-oriented motion, continuous).<sup>9</sup> A significant part of the expression of manner may show itself with verbs following this second pattern (focalization on the target or the target's immediate trajectory). Obviously, such a proposal should be explored in greater depth to be fully operational but this kind of reflection is likely to contribute to a debate which is, we believe, quite open at the moment.

As can be seen, dynamic space and motion is a central domain for exploring the relations between language and cognition through a multidisciplinary investigation involving a variety of methods and approaches. Far from being fully delineated, it is obvious that a number of questions in this domain are still not satisfactorily resolved, including basic issues (such as the meaning components of motion in language) on which one would expect a well-established and consensual view to exist. This is, at least, what this book tries to show by highlighting some of these outstanding questions, and providing empirical and theoretical elements intended to push forward future discussions.

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9. After all, such a distinction would not be absurd if one considers that a major specificity of verb-framed languages is to express *changes of locative relations* through some of their verbs while true satellite-framed languages do the same through satellites and prepositions.

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PART I

# Arguments, modifiers, asymmetry of motion





# About asymmetry of motion in French

## Some properties and a principle

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This chapter addresses the issue of “goal bias” and asymmetry of motion in French. The semantics of verbs of strict autonomous motion is first captured through their spatio-temporal schemata defined in terms of change of basic locative relation and change of placement. The possibility, for the verbs, of appearing in implicit landmark constructions, their association with a spatial PP having an opposite “polarity” and the prepositions’ contribution to dynamic spatial descriptions are successively reviewed in order to identify the most important properties of asymmetry of motion in French. Several of these properties seem to ensue from the spatio-temporal structure of motion events. A pragmatic principle is also highlighted, which is likely to favor the emergence of goal bias in language.

**Keywords:** goal bias, strict motion verbs, implicit landmark, opposite polarities, prepositions, event structure

### 1. Introduction: From goal bias to asymmetry of motion

Highlighted in linguistics from the mid-1980s (Ikegami 1987), the systematic study of asymmetry of motion events in language and cognition has grown significantly over the last ten to fifteen years, specifically in the field of psycholinguistics and cognitive psychology (e.g. Lakusta and Landau 2005; Regier and Zheng 2007). Linguists’ and cognitive psychologists’ interest focused mainly on the phenomenon known as “importance of goals” or “goal (path) bias”, that is to say our particular proclivity to pay attention to the “goal” of a motion rather than to its (possible) “source” when conceptualizing and describing a dynamic spatial event (this phenomenon is also targeted by terms and concepts such as “attention to endpoints” or “goal-over-source-principle”). In language, this bias does not only show up as a greater recourse to goal-oriented markers in speakers’ productions.

Most of the time, it also implies that a more extended and elaborate set of linguistic means is available to identify goals of motions.

Although mentioned in cross-linguistic research (Bourdin 1997; Kopecka and Ishibashi 2011), goal bias and, more generally, asymmetry of motion have been little studied in French. This chapter intends to partly fill this gap by focusing on the description of *strict autonomous* (i.e. non-explicitly caused) *motions*. In French, this kind of displacement is often expressed by intransitive or “indirect” transitive verbs (e.g. *aller* + *Prep* ‘to go + Prep’, *arriver* ‘to arrive’, *entrer* ‘to go into, to enter’, *partir* ‘to leave’, *se rendre* ‘to go to’, *sortir* ‘to go out’). Some constructions associating a directional or “manner of motion” predicate with an accurate spatial PP can also refer to such eventualities (see Section 2). The analysis carried out in this chapter tries thus to bring to light the *main* formal and semantic evidence for the asymmetry of motion as arising in the description of strict (autonomous) displacements. Several of the properties highlighted have been checked in a corpus drawn up from the textual base Frantext, that also provided the attested examples included in the text (see the introductory chapter for information on Frantext, and the Appendix for more details on the corpus analysis).

The chapter starts by setting out the theoretical framework used for the analysis of strict motion in French and, in particular, for capturing the semantic content of verbs (Section 2). A first asymmetry is emphasized at this stage. The possibility, for the different verbs, to appear in implicit landmark constructions and their association with a PP having an opposite “polarity” is then studied (Section 3). This evidences two additional features of asymmetry of motion. Section 4 proposes an analysis of the prepositional system of French within the theoretical approach adopted for dynamic space. The main properties (eight in total) through which asymmetry is manifested in descriptions of strict displacements are then summed up (Section 5) and their possible links are investigated. One of these properties – related to the very structure of events in language and cognition – proves to be more basic and to condition several of the manifestations of motion asymmetry in French. Finally (Section 6), it is hypothesized that, beyond its “imprints” in linguistic structures, the preference for goal-oriented descriptions of dynamic space (as revealed by speakers’ productions) may be partly due to a specific pragmatic principle. This principle can be seen as a bridge between the cognitive and linguistic foundations of goal bias and, more generally, of the asymmetry discussed here.

## 2. A semantic framework for dynamic space in French

The theoretical framework within which the expression of dynamic space in French is tackled was set out in (Aurnague 2011). Although useful for delimiting

the role of locative prepositions in descriptions of dynamic space (see Section 4), it was originally designed to characterize and classify verbs of strict (autonomous) motion.

This framework tries to overcome two shortcomings present in many studies on dynamic space. First, it avoids directly characterizing verbs of strict motion in terms of their aspectual behaviour (inner/lexical aspect, Aktionsart: Smith 1991; Vendler 1957). Scholars commonly draw a distinction between manner of motion verbs and verbs that denote a motion in the strict sense without providing precise and operational spatial criteria but resorting, instead, to aspectual properties (atelicity vs. telicity). Second, the spatial (rather than aspectual) concepts brought out in the classification are defined as precisely as possible, verifying their consistency with other notions involved in dynamic and static space. For instance, the observation of the landmarks<sup>1</sup> or reference/ground entities accepted by the preposition *à* ('at') in its static locating use (Vandeloise 1988) has shown that a sofa, a carpet or a bucket are linguistically categorized as objects – *Max est sur le/??\*au canapé* 'Max is on/at the sofa'; *Max est sur le/??\*au tapis* 'Max is on/at the carpet'; *Le chat est dans le/??\*au seau* 'The cat is in/at the bucket' – rather than as locations,<sup>2</sup> as this use of *à* selects "specified locations" (Aurnague 1996, 2004): *Max est au village/hangar* 'Max is in the village/shed'; *Le chat est au grenier* 'The cat is in the attic'. Consequently, it will be hard to claim that utterances such as *Max est venu sur le canapé/tapis* 'Max came onto the sofa/carpet' or *Le chat est entré dans le seau* 'The cat went into the bucket' involve any "change of location/place".<sup>3</sup>

1. According to Langacker (1987) and Vandeloise's (1991) terminology. The locating or reference entity of a static or dynamic spatial relation is called "ground" by Talmy (1985, 2000). The located element will be designated "target" (Vandeloise 1991), a term which is equivalent to Langacker's (1987) "trajector" and Talmy's (1985, 2000) "figure".

2. A location is a material entity determining a space portion, which is fixed in a given frame of reference. This definition follows from the study of *à* and of French Internal Localization Nouns (ILNs: e.g. *avant* 'front', *gauche* 'left', *intérieur* 'interior', *bord* 'edge', *centre/milieu* 'center/middle', *extrémité* 'extremity'). It has also benefited from the analysis of Basque data (ILNs; locative and possessive "genitives") (Aurnague 1996, 2004).

3. From this point of view, the approaches which usually provide the landmark of a static or dynamic description with a space portion or region (often called place/location; e.g. Jackendoff 1983, 1990) give too much weight to the former entity (landmark) in the semantics of the prepositions (a function applies to the nominal object of the preposition) and reduce the whole range of spatial configurations to the geometrical relation of inclusion. They are, therefore, unable to capture the many functional constraints (e.g. containment, support) relating targets and landmarks which still play an essential role in the behavior of several prepositions (Carlson and van der Zee 2005; Vandeloise 1991).

In this classification, motion processes are characterized by means of the notions of *change of placement* and *change of basic locative relation*. The former concept distinguishes verbs denoting a change of placement within the terrestrial/earth's reference framework – e.g. *avancer* ‘to advance, to move forward’, *foncer* ‘to tear along’, *glisser* ‘to slide (along)’, *grimper* ‘to climb’, *marcher* ‘to walk’, *patrouiller* ‘to patrol’, *zigzaguer* ‘to zigzag along’ – from predicates describing a movement/motion restricted to the target’s (i.e. “located” entity’s) own frame of reference as is the case with “changes of posture” – e.g. *s’asseoir* ‘to sit down’, *s’agenouiller* ‘to kneel down’, *s’étirer* ‘to stretch’, *se lever* ‘to get up’, *se recroqueviller* ‘to huddle’, *se (re)tourner* ‘to turn over, turn round’. The notion of basic locative relation stems from Boons (1987) who used it to differentiate between verbs of action on entities such as *adosser* ‘to stand/lean (the back) against’, *défricher* ‘to clear’ or *dévisser* ‘to unscrew, to undo’ and verbs such as *chasser* ‘to chase out/away’, *enfourner* ‘to put in the oven/kiln’ or *hisser* ‘to hoist’. Whereas one can put the back of a cupboard (*adosser*) against a wall with which the cupboard was already in contact (the negated and then asserted relation is *être adossé à* ‘to stand (the back) against’ and not a basic locative relation such as *être contre* ‘to be against’), the eventuality introduced by a verb such as *enfourner* is definitely underlain by the negation and later assertion of the basic locative relation *être dans* ‘to be in’.<sup>4</sup> Verbs of change of placement do not entail, by themselves, any change of basic locative relation with respect to the landmark potentially mentioned in the sentence (e.g., *Max a marché dans la forêt* ‘Max walked in the forest’), contrary to verbs denoting a true motion (verbs of motion in the strict sense) such as, for instance, *entrer* ‘to go in, to enter’ (negation and assertion of *être dans*; see Example (2)). However, the possibility displayed by predicates of motion in the strict sense of combining with a PP headed by the preposition *par* ‘by’ (Aurnague and Stosic 2002; Stosic 2002, 2007) – through the “path” interpretation of the preposition – seems to indicate that a verb such as *se poser* ‘to land, to settle’ does not belong to this category (unlike *entrer*), although it does bring into play a change of basic locative relation (relation of support/contact: *être sur* ‘to be on’):

- (1) *?(?) L’oiseau s’est posé sur la maison par le jardin.*  
 the bird be.PRS.3SG land/perch-PTCP on the house by the garden  
 ‘The bird landed/perched on the house by/through the garden’
- (2) *L’oiseau est entré dans la maison par le jardin.*  
 the bird be.PRS.3SG enter-PTCP in the house by the garden  
 ‘The bird went into the house by/through the garden’

4. A basic locative relation is expressed by a simple or complex preposition/adposition of the language under consideration, here French.

The contrasts revealed by the association with a *par*-headed PP can be explained by the fact that the semantics of motion verbs in the strict sense combines the notion of change of basic locative relation **and** that of change of placement. The evaluation of these notions involves two distinct referents: the terrestrial frame of reference for the change of placement and the landmark entity – whether explicitly mentioned or not – for the change of basic locative relation. Moreover, they give rise to a rich range of combinations (see Stosic’s chapter in this volume) as changes of placement do not entail, by themselves, any change of relation (cf. *supra*) and, conversely, some changes of basic locative relation (e.g. relation of support/contact) do not go together with a change of placement.

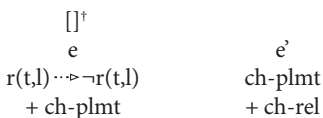
The interaction of the concepts just highlighted was studied through the examination of intransitive (or indirect transitive) verbs of French denoting a strict motion (i.e. a change of relation *and* placement), for which a classification was proposed (Aurnague 2011). The verbs analyzed were selected from the list compiled by Laur (1991) who drew on several previous inventories (Boons 1991; Boons et al. 1976; Gross 1975; Guillet and Leclère 1992). The *polarity* of a motion verb in the strict sense depends on the structure of the underlying change of relation: it is initial if this relation is asserted and then negated (“positive” information comes first:  $r \rightarrow \neg r$ ), and final in the symmetrical case (the assertion of the relation follows its negation; final positive information:  $\neg r \rightarrow r$ ).<sup>5</sup> Moreover, and unlike most approaches that do not clearly define it, a precise content is given to the notion of medial polarity – the assertion of the relation is both preceded and followed by its negation  $\neg r \rightarrow r \rightarrow \neg r$ , from which it ensues that very few verbs or verbal locutions of French really denote a medial change of relation and placement (e.g. *couper par* ‘to cut across’, *passer par* ‘to go through’).

(Aurnague 2011) distinguished eight classes of verbs of change of relation and placement, equally divided between initial and final polarity predicates. The first two classes of motion verbs (initial) are shown in Figure 1. Class 1a expresses an *independent initial change of relation* (e.g. *partir, s’en aller* ‘to go (away), to leave’; colloquial variants: *se barrer, se tirer* ‘to go (away), to clear off’) and class 1b an *extended initial change of relation* (e.g. *s’échapper* ‘to escape’, *s’enfuir* ‘to run away’, *se sauver* ‘to run away’; *se carapater* ‘to skedaddle’, *se cavalier* ‘to clear off’, *se tailler* ‘to beat it’, *se trotter* ‘to dash (off)’). The basic locative relation involved in these

5. The symbol “ $\rightarrow$ ” used here and subsequently indicates the transition from one state (in the present case, a basic (static) spatial relation) to another:  $s_1 \rightarrow s_2$ . This transition is an event (e) whose relations with the corresponding states ( $s_1$  and  $s_2$ ) can be formally represented in the following way (the relation of “abutment”  $\supset$  indicates immediate temporal precedence (Kamp and Reyle 1993)):  $s_1 \supset e \supset s_2$ .

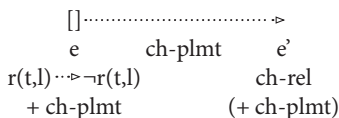
processes is, very likely, the preposition *à* 'at' in its static locating use (Aurnague 2011; Vandeloise 1988).

a. *Partir*



a. Independent initial change of relation

b. *S'échapper, s'enfuir*



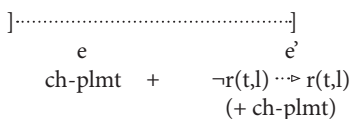
b. Extended initial change of relation

**Figure 1.**

† Square brackets delimit the semantic content of the verbs. Abbreviations: t: target; l: landmark; ch-plmt: change of placement; ch-rel: change of basic locative relation; incl./cont.: inclusion/containment.

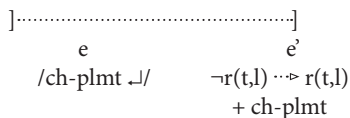
These initial classes can be compared with two final categories of verbs (Figure 2) whose specificities will be pointed out further, namely *final changes of relation with integrated prior motion* (e.g. *aller à* 'to go to' and, more generally, *aller + Prep* 'to go + Prep', *se rendre* 'to go to', *venir* 'to come'; colloquial forms: *s'abouler* 'to come', *s'amener* 'to come along', *rappliquer* 'to come, to turn up') and *final changes of relation with presupposed prior motion* (e.g. *arriver* 'to arrive', *aboutir* 'to end up', *accéder*, *parvenir* 'to reach, to get to').

a. *Aller à, se rendre, venir*



a. Final change of relation with integrated prior motion

b. *Arriver, parvenir*



b. Final change of relation with presupposed prior motion

**Figure 2.**

The basic locative relation of inclusion/containment (*dans* 'in') gives rise to two additional classes (Figure 3) which are, however, symmetrical with respect to

polarity (*inclusion/containment-type initial or final changes of relation: sortir* ‘to go out’ vs. *entrer* ‘to go in, to enter’, *pénétrer* ‘to enter, to penetrate’).

a. <i>Sortir</i>	<i>alternative repres.</i>
[]	[]
e	e
$r(t,l) \rightsquigarrow \neg r(t,l)$	$r(t,l) \rightsquigarrow r'(t,l)$
+ ch-plmt	+ ch-plmt
r = incl./cont.	

a. Inclusion/containment-type initial change of relation

b. <i>Entrer</i>	<i>alternative repres.</i>
[]	[]
e	e
$\neg r(t,l) \rightsquigarrow r(t,l)$	$r'(t,l) \rightsquigarrow r(t,l)$
+ ch-plmt	+ ch-plmt
r = incl./cont.	

b. Inclusion/containment-type final change of relation

Figure 3.

Finally, Figure 4 shows *double changes of relation with initial or final saliency*, which are the only processes and verbs to clearly integrate a double change of basic locative relation in the underlying spatio-temporal structure (e.g. *déménager* ‘to move (house)’, *émigrer* ‘to emigrate’ vs. *immigrer* ‘to immigrate’). Another distinctive feature of their meaning stems from the “typing” of the landmarks with respect to which the two changes of relation and placement take place (accommodation/residence, country, homeland, etc.).<sup>6</sup>

a. <i>Déménager, émigrer</i>	
[.....]	
e	e'
$r(t,l1) \rightsquigarrow \neg r(t,l1)$	+ $\neg r(t,l2) \rightsquigarrow r(t,l2)$
+ ch-plmt	+ ch-plmt

a. Double change of relation with initial saliency

b. <i>Immigrer</i>	
[.....]	
e	e'
$r(t,l1) \rightsquigarrow \neg r(t,l1)$	+ $\neg r(t,l2) \rightsquigarrow r(t,l2)$
+ ch-plmt	+ ch-plmt

b. Double change of relation with final saliency

Figure 4.

6. One of these changes of relation (and placement) seems, nevertheless, to be more “salient” than the other, as the morphological properties of these verbs often indicate (*dé-*, *é-/ex* vs. *im-* prefixes).



A first asymmetry between initial and final motion eventualities immediately emerges when observing the different spatio-temporal schemata just highlighted, but it requires double changes of relation with initial or final saliency (Figure 4) to be left aside. This momentary exclusion is fully justified by the specific semantic content of these verbs (double change of relation, typing of the landmarks: see above).

Proceeding along these lines, one can see that the internal structure of strict initial motions (as depicted in Figures 1a, 1b, 3a) is *centered* on an initial change of basic locative relation *concomitant* with a change of placement. In other words, the subsequent motion possibly expressed by a final spatial PP added to the verb does not belong to the latter's semantic content. Thus, the sentence *Max est parti à l'université à 8 heures* 'Max left for the university at 8 o'clock' is spatio-temporally equivalent to the description in discourse *Max est parti (de chez lui) à 8 heures. Il allait à l'université* 'Max left (home) at 8 o'clock. He was going to the university', in which the subsequent motion corresponds to a backgrounded distinct eventuality. This subsequent motion may indeed not be completely achieved, in spite of a perfective tense being used in the utterance (3).<sup>7</sup> Several other clues support the idea of centering on the initial change of relation and placement, among which the modification by a temporal PP headed by *en* 'in' (4). Understanding these constructions involves carrying out some kind of reinterpretation or "accommodation", which consists in adding a non-dynamic event that precedes the initial change of relation (e.g., preparation for leaving; *Après l'appel de Luc, Max est parti à l'université en 10 minutes* 'After Luc's call, Max left for the university in 10 minutes'). As can be observed, the subsequent motion (denoted by the final spatial PP) remains outside the temporal measure introduced by *en*, unless the sentence is reinterpreted by substituting *aller/se rendre à* 'to go to' for *partir à*.

- (3) *Max est parti à l'université mais il n'y est jamais arrivé.*  
 Max be.PRS.3SG leave-PTCP at the university but he NEG-there be.PRS.3SG  
 never arrive-PTCP  
 'Max left for the university but he never got there'
- (4) *Max est parti à l'université en 10 minutes.*  
 Max be.PRS.3SG leave-PTCP at the university in 10 minutes  
 'Max left for the university in 10 minutes'

7. Here is an attestation of this kind of example: *Mercredi dernier, une mère de famille fait appel à la police car sa fille est partie à l'école ce matin-là, mais n'y est jamais arrivée* 'Last Wednesday, a mother called the police because her daughter left for school that morning, but she never got there' (<http://archives.24heures.ch/VQ/LAUSANNE/-/article-2009-01-1387/117-polouestado-retrouvee-errant-dansun-supermarcheprilly>; page accessed in June 2011).

The behavior of extended initial changes of relation (e.g. *s'échapper* 'to escape', *s'enfuir* 'to run away', *se sauver* 'to run away'; cf. Figure 1b) does not conflict with the previous statement, although it might seem paradoxical at first sight. Whereas the semantics of these verbs seems to be centered on the initial change of relation and placement – the sentence *Pollux le chien s'est échappé du restaurant* 'Pollux the dog escaped from the restaurant' is true immediately the target left the restaurant –, other facts indicate some ability to refer to the subsequent motion introduced by a final PP. In particular, this subsequent motion is more difficult to deny than in (3): *?Max s'est sauvé/enfui au village mais il n'y est jamais arrivé* 'Max ran away to the village but he never got there'. In Aurnague (2011), I maintained that while the property of centering on the initial change of relation remains, several semantic features of the verbs under examination (speed, target's attempt to avoid the control exerted by the landmark) can be activated in order to describe a subsequent motion (in Figure 1b, this motion is materialized by a dotted arrow extending from the initial change of relation and placement).

Contrary to initial predicates, final dynamic verbs are not systematically centered on the (final) change of basic locative relation conveyed in their semantics. Except for the predicates based on inclusion/containment (Figure 3b), the other two categories of verbs previously set out (Figure 2) are indeed made up of a change of placement *preceding* the final change of relation, this non-concomitance being likely to *prevent* the centering on the latter element (change of relation). This is particularly evident for final changes of relation with integrated prior motion (e.g. *aller à*, *se rendre* 'to go to', *venir* 'to come'; Figure 2) that *include* in their semantic content a previous change of placement (prior to the final change of relation). The modification of these verbs by a temporal PP headed by *en* 'in' (5) results in the measurement of the previous change of placement (included in the verbal meaning) and, as expected, produces very natural utterances. On the other hand, changes of relation with presupposed previous motion (e.g. *arriver* 'to arrive', *aboutir* 'to end up', *accéder*, *parvenir* 'to reach, to get to'; Figure 2a) have a more ambivalent nature and functioning. These verbs only refer to a final change of relation (and placement) – event of arrival, ending (up), etc. – and can in a way be considered as centered on this element. At the same time, although not directly describing a previous change of placement (prior to the final change of relation), the content of these predicates presupposes the existence of such an event (see the part between slashes in Figure 2; in this respect, note that the negation of the final change of relation does not entail the negation of the presupposed prior motion: *Max n'est pas arrivé (à son bureau)* 'Max did not arrive (at his office)'). This "double game" explains that, while being centered on a final change of relation (and placement), the verbs of this class license the activation of the presupposed part of their meaning in certain circumstances. As often noted, they both fulfill the tests usually

used to single out achievements (e.g. modification by a PP headed by *à* ‘at’: 6) and those corresponding to accomplishments (e.g. modification by an *en*-headed PP: 6). From a spatio-temporal point of view, the “secondary” landmark introduced by a spatial PP headed by *par* ‘by’ can be directly connected to the final landmark of the motion event (7: Aragon-France), or located at some distance from the latter (7: Portugal-France), within the prior trajectory of the target.

- (5) *Max (s’)est allé/rendu/venu à l’université en 10 minutes.*  
 Max be.PRS.3SG go/go to/come-PTCP at the university in 10 minutes  
 ‘Max went/came to the university in 10 minutes’
- (6) *Max est arrivé à l’université à 10 heures/en 10 minutes.*  
 Max be.PRS.3SG arrive-PTCP at the university at 10 o’clock/in 10 minutes  
 ‘Max arrived at the university at 10 o’clock/in 10 minutes’
- (7) *Les réfugiés sont parvenus en France par l’Aragon/le Portugal.*  
 the refugees be.PRS.3PL reach-PTCP in France by Aragon/Portugal  
 ‘The refugees got to/reached France via Aragon/Portugal’

Among the eight categories of motion processes previously highlighted (Figures 1–4), final changes of relation with integrated prior motion (Figure 2a) are the most numerous, provided that verbs *and constructions* introducing this kind of process are taken into account. It is, indeed, a well-known fact that some intransitive predicates denoting a simple change of placement can combine with a spatial PP in order to describe a final change of relation and placement (e.g., *Max a couru dans le pré* ‘Max ran into the meadow’; however, note that the interpretation involving a change of relation and placement is only optional). The verbs of change of placement appearing in these constructions (e.g. *avancer* ‘to advance, to move forward’, *courir* ‘to run’, *déraper* ‘to slip, to skid’, *descendre* ‘to go down’, *dévaler* ‘to tear down’, *foncer* ‘to tear along’, *glisser* ‘to slide’, *ramper* ‘to crawl’, *se traîner* ‘to drag o.s.’) display specific semantic features that have been grouped together under the notion of “tendentiality” – speed, (intentional) opposition to a force, direction (linear oriented motion), carrying along by a force (Aurnague 2011) –, and a significant proportion of the constructions thus obtained matches the characteristics of final changes of placement with integrated prior motion. A full presentation of the theoretical framework used to analyze the meaning of motion predicates is set out in (Aurnague 2011), including references to the most relevant research on this issue at both the syntax-semantics interface (e.g. Jackendoff 1983, 1990; Levin 1993; Levin and Rappaport Hovav 1992) and the semantic level (e.g. Slobin 2003, 2004; Talmy 1985, 2000).

### 3. Implicit landmarks and opposite polarities

The uses of French verbs of strict motion in which the landmark of the underlying dynamic process is not explicitly mentioned (either through a nominal description or through a pronoun or an adverbial) have been little studied.<sup>8</sup> Yet, this kind of construction reveals a clear asymmetry between initial and final strict motion predicates that can be explained, to a large extent, through the spatio-temporal structure of the corresponding eventualities. Moreover, implicit landmark constructions seem to be closely correlated to another phenomenon, namely the possibility to combine a verb and a spatial PP having opposite polarities (see below). The anaphorization of the landmark of a strict motion process will be examined for the first six categories of verbs set up in Section 2 (Figures 1–3). The specific case of double changes of relation with initial or final saliency (Figure 4) will be tackled at a later stage.

Independent and extended initial changes of relation (e.g. *partir*, *s'en aller* 'to go away', *s'échapper* 'to escape', *s'enfuir* 'to run away') as well as (initial) changes of relation based on inclusion/containment (e.g. *sortir* 'to go out') can give rise to implicit landmark constructions (8)–(10). As indicated in Section 2, the verbs belonging to these classes have a semantic content centered on the initial change of relation (and placement) they introduce. It is, in my view, this property – centering of the process on the change of relation and, therefore, on the landmark – that makes their integration in the implicit construction possible, provided that an accurate landmark, with respect to which the target can be located, is present in the discourse model and that attention is focused on it.<sup>9</sup>

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8. The constructions that associate a motion verb and a direct infinitival clause – and denote a final change of relation and placement – are neglected here (Lamiroy 1983; Aurnague 2011) since the incorporation of the infinitival clause leads to automatically introducing a final reference entity, whether *expressed or not*, which operates as the landmark of both the motion predicate of the main clause and the eventuality of the infinitive: *Max est allé retrouver Luc (à l'université)* 'Max went and joined Luc (at the university)' vs. \**Max est allé* (see below).

9. Without going into details, it should be mentioned that the approach to anaphoric phenomena adopted here is a cognitive one in which a mental discourse representation is constructed and updated from different sources, among which, the "text"/utterance (written or oral production) and the situational context (e.g. Cornish 1999; Kleiber 1994). According to Cornish (1999), (discourse) deixis consists in shifting the addressee's attention to an element of the universe of discourse (already present in the representation or introduced by the current discourse segment) whereas anaphora refers to an element previously in focus.

- (8) *Il est parti une nuit... en coupant simplement à la cisaille les deux rangs de barbelés de l'enceinte de son oflag.*  
 he be.PRS.3SG leave-PTCP one night by clipping simply with the shear(s) the two rows of barbed wire(s) of the fence of his oflag  
 (R. Abellio, *Heureux les pacifiques*, 1946)  
 'He left one night... by simply clipping through the two rows of barbed wire of the fence of his oflag'
- (9) *Au deuxième [coup de revolver], il y a eu des cris, un blessé, et tout le monde s'est enfui.*  
 at the second [gun shot] there PRO has have-PTCP some cries one injured and all the people be.PRS.3SG run away-PTCP  
 (A. Camus, *La Peste*, 1947)  
 'At the second [gun shot], there were cries, an injured person, and everybody ran away'
- (10) *L'homme est sorti, et lentement s'est éloigné.*  
 the man be.PRS.3SG go out-PTCP and slowly be.PRS.3SG go away-PTCP  
 (M. Genevoix, *Ceux de 14*, 1950)  
 'The man went out, and slowly moved away'

Final verbs of strict motion display a more contrasting panorama. While the predicates involving the inclusion/containment relation license, here again, the implicit landmark construction (e.g., *Qui donc est entré ?* 'Who entered?' (P. Claudel, *La J.F. Violaine 2. version*, 1901)), other categories of verbs do not seem to give rise to such a use. This is clearly the case for final changes of relation with integrated prior motion (e.g. *aller + Prep* 'to go + Prep', *se rendre* 'to go to'). As highlighted in Section 2, the semantic content of these verbs is not centered on the (final) change of relation they introduce because it includes a change of placement preceding this change of relation (see Figure 2a). This event structure has immediate consequences because the landmark with respect to which the final change of relation will take place is often unavailable during the prior change of placement. More precisely, if the situational context (11) or the co-text (13) make it possible to situate a change of placement within an encompassing spatial environment, the final landmark of the whole motion eventuality is usually not focused (as a *goal* or *final* landmark) and, sometimes, not present in the universe of discourse either during this phase of the process. Thus, the final landmark has to be explicitly identified in the utterance (12), (14).<sup>10</sup>

10. Although it follows from the spatio-temporal structure of the verbs, the need for overtly mentioning the landmark is probably encoded in their very constructional properties. In

- (11) *Max marche d'un pas décidé (sur le boulevard).*  
 Max walk-PRS.3SG with a pace steady (on the boulevard)  
 'Max is walking at a steady pace (on the boulevard)'
- (12) *Max va à la mairie d'un pas décidé.*  
 Max go.PRS.3SG at the city hall with a pace steady  
 'Max is going to the city hall at a steady pace'
- (13) *Aussitôt arrivé sur le chemin, Max a couru à grandes enjambées.*  
 as soon as arrive-PTCP on the path Max have-PRS.3SG run-PTCP at  
 big strides  
 'As soon as he reached the path, Max broke into a swift run'
- (14) *Aussitôt arrivé sur le chemin, Max s'est rendu au village à grandes enjambées.*  
 as soon as arrive-PTCP on the path Max be-PRS.3SG go to-PTCP at the  
 village at big strides  
 'As soon as he reached the path, Max strode quickly on to the village'

However, final changes of relation with integrated prior motion license implicit landmark constructions in two specific cases: when the verb's meaning needs the strict motion to be contemplated from the (final) landmark of the process (deixis, perspective point: e.g. *venir* 'to come' (15) and the more colloquial *s'abouler* 'to come', *s'amener* 'to come along' or *rappliquer* 'to come, to turn up');<sup>11</sup> when it involves world knowledge and situational data, and indicates, for instance, that the target is returning to its habitual location (e.g. *rentrer* 'to come/go back, to come/go (back) home, to return (home)' (16)). These different configurations require the landmark with respect to which the final change of relation is evaluated to be already known during the prior change of placement.

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French, this syntactic-semantic rule seems to apply uniformly and the final landmark thus has to be expressed (via a clitic pronoun) even when it is present and highlighted in the discourse: *C'est une très belle ville. Max \*est allé/y est allé.* 'It is a very nice city. Max went/went there'; *Demain le musée sera ouvert. Nous pourrions \*aller/y aller* 'Tomorrow the museum will be open. We could go/go there'. The same constraint holds for constructions with grammatical ellipsis: *Max est allé à l'université. Luc \*est allé/y est allé aussi* 'Max went to the university. Luc went/went there too'.

11. In line with (Wilkins and Hill 1995), French only encodes *final* perspective in the domain of strict motion processes. Contrary to what is often stated, predicates like *partir* 'to go (away), to leave' or *aller + Prep* 'to go + Prep' do not have a "deictic" semantics in the sense that they in no way require the speaker and/or the interlocutor to be located near the – underlying or added – initial landmark (at some point in time) or to have a particular relation with this entity.

- (15) *je voulais encore dire à monsieur le président que M. Sanasoff*  
 I want-PST-1SG also tell to mister the president that Mr Sanasoff  
*est venu deux fois depuis samedi.*  
 be.PRS.3SG come-PTCP twice since saturday  
 (G. Duhamel, *La Passion de Joseph Pasquier*, 1945)  
 ‘I also meant to tell the President that Mr Sanasoff has come twice since last Saturday’
- (16) *Tiens, c’est Max. C’est à cette heure-ci qu’il rentre !*  
 ah there’s Max. It is at this hour that he return home-PRS.3SG  
 ‘Ah, there’s Max. So this is the time he returns home!’

Final changes of relation with presupposed prior motion (e.g. *arriver* ‘to arrive’, *aboutir* ‘to end up’, *accéder*, *parvenir* ‘to reach, to get to’) can also be problematic in implicit landmark constructions. Their proclivity to denote a final change of relation (and placement) and the centering on the (final) landmark that ensues should pave the way for the anaphorization of the latter entity. This is, indeed, what happens with the verb *arriver* (17). But their ambivalent behavior pointed out in Section 2 shows up here again, with the predicates *aboutir*, *accéder* and *parvenir* hardly licensing implicit landmark descriptions. Unlike *arriver*, the meaning of these verbs includes specific components and constraints – difficulties/obstacles, guidance, (lack of) intention to reach the landmark – that result in giving a particular saliency to the presupposed prior motion (preceding the final change of relation) and in blocking their integration in implicit constructions (Aurnague 2015).<sup>12</sup>

- (17) *Alors le maire est arrivé et il a fait*  
 then the mayor be.PRS.3SG arrive-PTCP and he have.PRS.3SG make-PTCP  
*trois grands saluts de tout le corps.*  
 three big bows with whole the body (M. Barrès, *Mes cahiers*, t. 1, 1898)  
 ‘Then the mayor arrived and made three low bows’

From the eight classes of verbs examined up to now, it appears that initial predicates of strict motion uniformly integrate the implicit landmark construction because

12. To a certain extent, the saliency of the change of placement brings *aboutir*, *accéder* and *parvenir* closer to final changes of relation with integrated prior motion which, as we saw, only appear in implicit landmark constructions in a restricted number of cases (deictic content, recourse to world knowledge). However, the role of prior motion in the rejection of implicit uses is probably different here (it is not really a matter of unavailability of the final landmark during the prior motion) and, for some of the verbs, it is likely to relate to differences in degree of semantic transitivity. From this point of view, *accéder* and *parvenir* can be considered closer to *atteindre* ‘to reach’ than *arriver* (see Hopper and Thompson 1980 and Sarda 1999).

of their *centering* on the change of relation (and placement) and, thus, on the associated spatial landmark – which, of course, has to be present in the discourse model. On the other hand, implicit uses are not systematic for final dynamic processes which are not always centered on the (final) change of relation they refer to, whether they directly incorporate a previous change of placement in their spatio-temporal structure or presuppose the existence of such an element and make it salient. However, some properties and mechanisms such as *deixis/perspective point* and *world knowledge* can sometimes counterbalance the non-centering on the final change of relation and make the (final) landmark available during the previous change of placement. An additional parameter is likely to condition implicit landmark constructions. It concerns the last two categories of dynamic spatial processes analyzed in this work, namely double changes of relation with initial and final saliency (e.g. *déménager* ‘to move (house)’, *émigrer* ‘to emigrate’ vs. *immigrer* ‘to immigrate’). Here, it is the landmarks’ *typing* entailed by the verbal meaning (see Section 2) that makes implicit uses possible. But this is a quite different situation as the descriptions obtained do not really require referential anchoring (with respect to well identified landmarks) and occur very easily in plural or generic descriptions:

- (18) *Max a déménagé (de nombreuses fois dans sa vie).*  
 Max have.PRS.3SG move house-PTCT (many times in his life)  
 ‘Max has moved house (many times in his life)’
- (19) *Celui qui immigré découvre un nouveau monde.*  
 the one REL immigrate-PRS.3SG discover-PRS.3SG a new world  
 ‘Anybody who immigrates discovers a new world’

The asymmetry between initial and final verbs of strict motion brought to light by implicit landmark constructions is all the more interesting since it correlates, to a large extent, with another syntactic-semantic property. Thus, the association of a dynamic verb and a spatial PP with opposite polarities seems to be conditioned by the possibility for the verbal unit to give rise to the implicit landmark construction. Corpus data reflect this correlation and include descriptions with “opposite” verbs and PPs for almost all of the categories previously mentioned (20–25),<sup>13</sup> while this kind of construction is nearly absent for the verbs that do not accept implicit uses

13. Inclusion/containment-type final changes of relation constitute the only exception to the correlation claimed (e.g., ??\**Max est entré de la cour* ‘Max went in from the yard’). This peculiar behavior of *entrer* is likely to follow from two main factors: the fact that this verb (like *sortir* ‘to go out’) is especially centered on the landmark it introduces and, without being deictic, often implies a certain closeness to this entity; the importance of certain “post-states” in relation to “pre-states”.



(e.g., \**Max est allé/s'est rendu de Rennes* 'Max went from Rennes'; \**Max a abouti du carrefour* 'Max ended up from the crossroads'; ??\**Max est parvenu de Toulouse* 'Max got from Toulouse').

- (20) *notre cher président du conseil, aussitôt après sa chute, est parti à la Sierra avec un fusil...* (A. Malraux, *L'Espoir*, 1937)  
 our dear president of council straight after his fall be.PRS.3SG  
 leave-PTCP at the Sierra with a gun  
 'our dear prime minister, straight after his fall, left for the Sierra with a gun...'
- (21) *Le traître, protégé de l'état-major, s'est enfui à Londres...* (G. Clémenceau, *Vers la réparation*, 1899)  
 the traitor protected by the staff be.PRS.3SG run away-PTCP at  
 London  
 'The traitor, protected by the staff, ran away to London...'
- (22) *il est sorti tout seul dans la plaine...* (H. Barbusse, *Le Feu*, 1916)  
 he be.PRS.3SG go out-PTCP alone in the plain  
 'he went out alone in(to) the plain...'
- (23) *il est venu de Rennes avec moi.* (Villiers de L'Isle-Adam, *Contes cruels*, 1883)  
 he be.PRS.3SG come-PTCP from Rennes with me  
 'he came from Rennes with me'
- (24) *Il est arrivé ce matin de Toulouse où il a échappé de justesse à la gestapo.* (R. Vailland, *Drôle de jeu*, 1945)  
 he be.PST.3SG arrive-PTCP this morning from Toulouse where he  
 have.PRS.3SG escape-PTCP just to the gestapo  
 'He arrived this morning from Toulouse where he narrowly escaped the gestapo'
- (25) *Samba Cissé a immigré du Sénégal...* (Samba's film synopsis)  
 Samba Cissé have.PRS.3SG immigrate-PTCP from Senegal  
 'Samba Cissé immigrated from Senegal...'  
 (<http://www.linternaute.com/cinema/film/1782520/samba/>; page accessed in April 2015)

The convergence of the strict motion verbs associating with an opposite spatial PP and the predicates that can be used without the landmark of the dynamic process

being explicitly mentioned is not really coincidental: it indicates that the change of relation and placement expressed in the verb's semantics has to be implied (in spite of the landmark not being mentioned) for a PP with opposite polarity to be added.

#### 4. Spatial prepositions from a dynamic viewpoint

The study of strict motion in French cannot be limited to the category of verbs and has to take into account another important element in the expression of dynamic space, namely prepositions. Leaving aside the complex geometrical and functional content of locative adpositions (Aurnague 2004; Aurnague & Vieu 1993; Carlson & van der Zee 2005; Vandeloise 1991), this section presents a brief panorama of the main prepositions involved in strict motion descriptions of French, in the light of the concepts previously pinpointed: change of basic locative relation and change of placement (see Section 2). It specifically aims at determining the contribution of spatial prepositions to the construction of dynamic eventualities (in terms of the two concepts highlighted) and the possible asymmetries arising from the distribution and use of these markers. This incursion into the prepositional domain starts with the expression of final changes of relation (and placement), before tackling initial dynamic processes (for reasons of space, medial changes of relation and placement will only be touched upon). Along the way, the prepositional marking of simple changes of placement is also mentioned.

In French, the most common way of expressing a final change of relation and placement consists in associating a static preposition (e.g. à 'at', *dans* 'in', *sur* 'on') or prepositional locution (e.g. *à l'arrière de* 'at the back of', *au bord de* 'at the edge of', *à l'extérieur de* 'outside of') with a verb of change of relation and placement, either initial or final (see Section 2), or sometimes a simple change of placement (see the notion of "tendentality" in Section 2 and (Aurnague 2011): *Max s'est rendu/est venu dans le centre-ville* 'Max went/came to the town center'; *Max a couru à l'arrière du bâtiment* 'Max ran at/to the back of the building'). Final motion predicates like *se rendre* 'to go to' or *venir* 'to come' in the first of the two examples, are very instructive about what goes on in such constructions. Because a *final change of relation and placement* underlies the semantics of the verbs at issue (see Figure 2a), this verbal element is typically waiting for an adposition that conveys the same notion (e.g. *come + to* in English). In other words, and although it may appear pretty simple at first sight, I claim that the instantiation or matching of the change of relation denoted by the verb ( $\neg r \rightsquigarrow r$ ) with a static locative relation (e.g.  $r_1$ ) is not a straightforward operation. Rather, the presence of a change of placement preceding the final change of relation in various classes of (final)

motion predicates (Figure 2),<sup>14</sup> and the knowledge that the final configuration is not yet active during this previous motion since the target entity remains in the state *r* throughout it, have facilitated the *reconstruction* of the change of relation by negating the semantic content of the static preposition (previous state:  $\neg r1$ ) and simultaneously processing this static relation (*r1*) as the “positive side” of the final change. Verbs *and* constructions characterized as changes of relation with integrated prior motion constitute the largest category among predicates of strict motion (see Section 2) and they probably played a non-trivial part in the (re)use of static prepositions for referring to final changes of relation (in French as well as in other languages, specifically “verb-framed” ones (Talmy 1985, 2000)). In any case, this final interpretation of static prepositions is now entrenched in the very structures of language (encoding by a syntactic-semantic rule) so that even an initial verb like *sortir* ‘to go out’, whose semantic content consists in the assertion and following negation of the relation *être dans* ‘to be in’, requires the preposition *dans* ‘in’ in an associated spatial PP to receive a final interpretation: *Max est sorti dans la cour* ‘Max went out into the yard.’<sup>15</sup> It should be emphasized that not all static spatial prepositions are equivalent with respect to changes of relation and changes of placement (see Section 2 and Aurnague 2011): while most of them denote both changes when integrated in an appropriate construction (e.g. *dans* ‘in’, locating use of *à* ‘at’, prepositional locutions headed by *à*), others only introduce a change of relation (without a concomitant change of placement; e.g. *sur* ‘on’, routine-based interpretation of *à* ‘at’ (Vandeloise 1988)).

Before tackling the adpositional expression of initial changes of relation, let me say a few words about French prepositions conveying a simple change of placement (without any change of relation), be it real or “fictive” (the present work

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14. Whether this change of placement is fully integrated in the predicate’s semantic content (final change of relation and placement with integrated prior motion; cf. Figure 2a) or is a presupposed part of its spatio-temporal structure (final change of relation and placement with presupposed prior motion; Figure 2b). Concerning the importance of the previous change of placement and the associated state evoked in the following, see the concept of “extended change of state” in Rothstein (2004: 106, 155).

15. This is all the more interesting as the spatial PP associated with *sortir* does not introduce any independent or extended motion – following the initial change of relation (and placement) – that could be responsible for the reinterpretation of the preposition as a final change of relation (see the discussion on independent and extended initial changes of relation in Section 2). Additionally, it should be noted that, according to the above assumption, the (re) use of static spatial prepositions as initial changes of relation has not been possible because the spatio-temporal schema of initial predicates is centered on a change of relation and placement (see Section 2) and does not *include* a following motion (with an associated extended state consisting in the negation of the initial spatial configuration).

is not concerned with fictive motion, but see (Cappelli 2013; Talmy 2000) and Cappelli's contribution in this volume). Two main groups of prepositional markers are involved in the expression of changes of placement. The markers belonging to the first group (*à travers* 'through', "imprecise" localization use of *par* 'through' (Stosic 2002, 2007) and, more peripherally, *le long de* 'along' and *autour* 'around')<sup>16</sup> allow the speaker to refer to one or more targets whose motion is confined to the landmark entity; no change of basic locative relation occurs with respect to it (26–27). The notion of change of placement that underlies these prepositional elements leads to the rejection of static descriptions of the form *être* + PP 'to be + PP' involving a single "non-extended" target, whereas equivalent descriptions with "topological" or "projective" prepositions sound acceptable: \**Max est à travers le bois* 'Max is through the wood' vs. *Max est dans le bois* 'Max is in the wood'; ??*La balle est le long du mur* 'The ball is along the wall' vs. *La balle est contre/devant le mur* 'The ball is against/in front of the wall'.

(26) *Max a couru/marché à travers le bois.*  
 Max have.PRS.3SG run/walk-PTCP through the wood  
 'Max ran/walked through the wood'

(27) *La balle de tennis a roulé le long du mur.*  
 the ball of tennis have.PRS.3SG roll-PTCP along the wall  
 'The tennis ball rolled along the wall'

The second group of prepositions that involves the notion of change of placement includes directional markers such as *vers* 'towards' ("proximal", non-directional, uses of this preposition are left aside) and *dans la/en direction de* 'in the direction of'. Although the notion of direction is not confined to dynamic situations (Aurnague 2004), here we are primarily interested in the numerous uses of these markers underlain by motion.<sup>17</sup> As (28) shows, the prepositions or prepositional locutions at issue do not imply any change of basic locative relation with respect to the landmark introduced (except, perhaps, for distance). Another illustration of this lack of final change of relation is provided by the faculty to select "pure" directions (29). As the notion of change of relation is not involved in the semantics of these markers, I exclude the term of "final polarity" (see the definition of polarity

16. Note that *le long de* and *autour* are not as closely related to the notion of change of placement (real or fictive) as *à travers* and the imprecise use of *par*. Although they can appear in dynamic descriptions, the former items are originally static: *La corde est le long du mur* 'The rope is along the wall'; *La corde est autour du pilier* 'The rope is around the pillar'; \**La corde est à travers la cour* 'The rope is through the yard'.

17. A real or fictive change of placement is only compulsory when the verb does not introduce some kind of direction (i.e., when it is not a verb like *se tourner/être tourné* 'to turn/be turned').

in Section 2) and prefer, instead, to speak of “prospective” direction (as opposed to “retrospective” or backward oriented directions).

- (28) *Max a couru*  
 Max have.PRS.3SG run-PTCP  
*vers le/dans la direction du/en direction du bois puis*  
 towards the/in the direction of the/in direction of the wood then  
*a tourné à gauche vingt mètres avant (le bois).*  
 have.PRS.3SG turn-PTCP at left twenty meters before (the wood)  
 ‘Max ran towards/in the direction of the wood and then turned left twenty  
 meters before it’
- (29) *Max a marché vers le/en direction du Sud durant*  
 Max have.PRS.3SG walk-PTCP towards the/in direction of the south for  
*plusieurs jours.*  
 several days  
 ‘Max walked towards/in the direction of the south for several days’

The prepositional marking of final displacements differs in two ways from that of initial changes of relation and placement. First, it is a well-known fact that, in French, initial strict motions are expressed by only one preposition – *de* ‘from’ –, in contrast with the wide range of static prepositions that appear in descriptions of final changes of relation and placement (see above).<sup>18</sup> But a second property has to be highlighted, which is almost always ignored: the preposition *de* combined with a verb involving some kind of spatial dynamicity does not, in itself, refer to any motion of the target. Its syntactic-semantic role simply consists in indicating the initial polarity of a change of relation, *which is not systematically a basic locative relation* (cf. Section 2 and Boons 1987). This preposition can thus appear with predicates that neither denote a change of basic locative relation nor a change of placement. In (30)–(31), for instance, the basic locative relation (*être sur* ‘(to be) on’) between the slab and the ground or Max and the seat is not necessarily modified as a result of the process. This is because the relations underlying the verbs are complex (i.e. not basic: *être vissé à* ‘to be screwed on’, *être attaché à* ‘to be fastened to, to be tied to’).

18. In the present study, the prepositions *depuis* ‘since, from’ and *jusque* ‘(up) to, as far as’ are not analyzed because, although they can apply to situations combining a change of relation and a change of placement, they include the notions of measure and distance in their semantic content. From this point of view, the sentence *Max a couru jusqu’à la mairie* ‘Max ran as far as the town hall’ does not imply *Max a couru à la mairie* ‘Max ran to the town hall’. Even when the verb denotes a change of relation and placement, these prepositions seem to underline the additional notion of measure/distance: *Un médecin est venu depuis l’hôpital* ‘A doctor came (all the way) from the hospital’.

- (30) *Max a dévissé la plaque du sol.*  
 Max have.PRS.3SG unscrew-PTCP the slab from the ground  
 ‘Max unscrewed the slab from the ground.’
- (31) *Max s’est détaché du siège.*  
 Max be.PRS.3SG unfasten-PTCP from the seat  
 ‘Max unfastened himself from the seat’

Therefore, *de* indicates the initial polarity of a change of relation whose additional properties depend on the verb with which the preposition goes. Thus, the (initial) change of basic locative relation and change of placement denoted by the sentence *Max est parti de son bureau* ‘Max left his office’ is strictly ascribable to the verb’s semantics, not to the preposition *de* that only introduces the landmark with respect to which the initial change of relation occurs.

Overall, the prepositional system of French considered in the light of the two concepts of change of basic locative relation and change of placement sketches the following picture (summarized in Table 1). First, there is no preposition expressing, on their own, a final change of relation and placement. Rather, static spatial prepositions combined with a strict motion predicate are turned into a final change of relation, to which a concomitant change of placement is possibly added depending on the nature of the prepositional marker. Secondly, some categories of prepositions (e.g. *à travers* ‘through’, imprecise use of *par* ‘through’, *vers* ‘towards’) seem to be based on a simple change of placement (real or fictive), without any change of relation being involved. Finally, only one preposition is available for referring to initial motions (*de* ‘from’) but its function is limited to indicating the (initial) polarity of the change of relation conveyed by the verb, a change of relation which is not always basic and does not necessarily go with a change of placement. In other words, *de* does not itself entail any motion of the target, be it in the *strict sense* (change of basic locative relation and change of placement) or in the *weak sense* (change of placement). More generally, it appears that none of the categories of prepositions previously reviewed include, in their constituent semantic content, both a change of relation and a change of placement, that is to say a strict motion event. Indeed, only medial prepositions that are not dealt with here (path interpretation of *par* ‘by’, *via* ‘via’; cf. Section 2 for a definition of medial polarity), really involve these two concepts in their meaning and thus refer to a true displacement (Aurnague and Stosic 2002; Stosic 2002, 2007).

**Table 1.** Prepositions of French and changes of relation and placement

Preposition(s)	Change of placement	Change of <i>basic locative relation</i> [polarity of the change]
Static prepositions	–	–
Dynamic use of static prepositions	+/– (depending on the preposition)	+ [final]
<i>A travers</i> , “imprecise localization” <i>par</i>	+	–
<i>Vers</i> , <i>dans la/en direction de</i>	+	–
<i>De</i>	–	– [initial change of relation, not necessarily basic]
“Path interpretation” <i>par</i> , <i>via</i>	+	+ [medial]

## 5. Listing and linking the properties

As noted at the beginning of this chapter, most of the recent work on the asymmetry of motion events in language and cognition has focused on the strong tendency to give greater importance to the expression of the “goal” with respect to that of the “source” when describing a displacement process (or in presence of other types of eventualities: change of possession, change of state, etc.): e.g. greater resort to goal markers and constructions, higher precision of lexemes and morphemes referring to the goals. The authors of these studies were thus induced to highlight the “importance of goals” (Lakusta and Landau 2005), the “attention to endpoints” (Regier and Zheng 2007), the “goal (path) bias” (Lakusta and Landau 2005; Stefanowitsch and Rohde 2004), echoing Ikegami’s (1987) “goal-over-source principle”. In contrast, I prefer to speak of asymmetry/dissymmetry of initial and final changes of relation (and placement) because this characterization accounts for observations – such as the systematic possibility of implicit uses for initial but not final changes of relation (cf. Section 3 and below) – that, to my mind, cannot be satisfactorily reduced to the mere idea of predominance of the goal. In order to illustrate the various forms that the asymmetry of initial and final changes of relation takes in French, I now synthesize the main observations I was led to make in this chapter and in previous work (Aurnague 2011). These observations include verbs and prepositions, considered separately or through their interactions. This list – four elements of which go two by two – is not intended to be exhaustive though it probably contains the most significant components of asymmetry of

motion in French. After setting out the various facets of asymmetry, I highlight some of their connections and show the particular role played by one of them (cf. Figure 5).

- a1. As shown in Section 3, the predicates of initial change of relation and placement can systematically appear in *implicit landmark constructions* (without a pronominal marker) whereas only some of the final predicates (those based on deixis, world knowledge and typing or centered on the final change of relation) can give rise to such constructions.
- a2. The second observation (Section 3) is closely related to the first one: while every initial change of relation and placement can combine with a PP having an *opposite polarity* (in the absence of an initial PP), this does not hold true for final changes of relation and placement because only a subset of them licenses this combination (a subset that basically coincides with the final predicates appearing in implicit constructions; cf. a1).
- b1. With regard to prepositions, it was recalled in Section 4 that *static prepositional elements* of French are massively used to introduce a *final change of relation* (and sometimes of placement), be it in presence of a verb of change of relation and placement or in combination with a simple predicate of change of placement (notion of tendentiality; see Section 2 and Aurnague 2011). Beyond French, Creissels (2006) emphasized that this practice, i.e., the use of a static marker for referring to a final change of relation (ablative vs. essive-allative), is very common among languages of the world. In contrast, the opposite strategy that would consist in resorting to the same element(s) for static location and the expression of an initial change of relation (final changes of relation being identified through specific means: allative vs. essive-ablative) is hardly ever attested (see also Pantcheva 2010).
- b2. Compared with the variety of prepositional elements involved in the description of final changes of relation (and placement), virtually a *single marker* is available for expressing *initial changes of relation*, namely the preposition *de* ‘from’ (*depuis* ‘since, from’ does not primarily denote a change of relation and stands mostly outside the scope of this work; see Note 18). And even the “dynamic” use of this preposition is not restricted to the description of motion, as the change of relation it indicates is not always basic and does not systematically go with a change of placement (see Section 4). Thus we are not faced with a true motion preposition – neither a motion in the strict sense nor in the weak sense is involved – but with an element indicating the initial polarity of a change of relation whose real nature depends on the semantic content of the verb (this remark probably applies to many ablative/relative cases or adpositions, at least in other verb-framed languages).



- c. Asymmetry also shows up in the coding of *deixis* or *perspective point*. Final verbs of change of relation and placement such as *venir* ‘to come’, *s’abouler* ‘to come’, *s’amener* ‘to come along’ or *rappliquer* ‘to come, to turn up’ need the motion to be contemplated from the landmark they introduce (Section 3). No such constraint on perspective point applies to initial predicates (cf. Note 11) and the frequent use of verbs such as *partir* or *s’en aller* ‘to go (away), to leave’ in deictic utterances is an indirect consequence of their semantic content (centering on the initial change of relation and placement, possible implicit constructions; cf. Section 3 and Aurnague 2015).
- d. Whereas French has a simple preposition denoting a “prospective” or forward oriented *change of placement* (*vers* ‘towards’), no simple marker is devoted to the introduction of a “retrospective” or backward oriented change of placement. In other words, the direction associated with a motion (change of placement) is often constructed through a prospective procedure, rather than through a retrospective one. Referring to a retrospective direction is not totally excluded but it takes on a more exceptional character and relies on complex/compound prepositions (e.g. *des environs de* ‘from the vicinity of’) or even simple markers that can sporadically play this role (e.g. *de* ‘from’, *depuis* ‘since, from’).<sup>19</sup>
- e. The data analyzed in this study seem to indicate that, in French, the *number of verbs* introducing a *final* change of relation and placement is appreciably higher than the number of predicates referring to an initial change of relation and placement (moreover, final changes of relation with integrated prior motion appear to be the most widespread category of processes; cf. Section 2 and Aurnague 2011). To be exact, I should speak of verbs *and constructions* because this observation includes the structures that associate a verb of change of placement and a PP to describe a final change of relation and placement (notion of tendentiality: whereas the predicates of change of placement in question systematically combine with a final PP, their association with an initial PP is not always possible (Aurnague 2011)).<sup>20</sup> This numerical asymmetry

19. In such cases, it is not uncommon to have simple prepositions selecting direction nouns or entity nouns that contextually identify a direction.

20. Among the 51 verbs that were analyzed (20 changes of placement underlain by tendentiality and 31 changes of relation and placement) and after having removed 11 colloquial variants, we get the following distribution: 10 verbs of initial change of relation and placement, 21 verbs or constructions of final change of relation and placement, 9 verbs of change of placement that combine with both initial and final PPs.

Over and above the number of predicates, the occurrences of the verbs *partir* ‘to go (away), to leave’, *s’échapper* ‘to escape’, *s’enfuir* ‘to run away’, *sortir* ‘to go out’ vs. *aller* + *Prep* ‘to go + Prep’, *venir* ‘to come’, *arriver* ‘to arrive’, *entrer* ‘to go in, to enter’ in the analyzed part of the working corpus for the period 1880–1950 (“passé composé”/perfect; third person singular) display a

is in accordance with the observations made by Creissels (2006) concerning several West-African languages which have a very limited number of verbs (sometimes only one) that are able to assign the role of source to the spatial element they govern.

- f. Last, but not least, the *spatio-temporal structure of processes* of change of relation and placement (Figures 1–4) displays important differences between initial and final motions (cf. Section 2 and Aurnague 2011). Apart from the verbs based on the typing of the landmark (Figure 4), it thus appeared that the predicates that introduce an initial change of relation usually do not incorporate, in their semantic content, a subsequent change of placement, whereas final changes of relation can include a prior change of placement or presuppose it. In a similar and somewhat related way, whereas initial processes are centered on the change of relation and placement they denote (the two changes are concomitant), final processes rarely give rise to such a centering.

This non-exhaustive list suggests the existence of several links between the itemized phenomena. In particular, the property *f* relating to the spatio-temporal structure of processes seems to have a more fundamental status in comparison with several other observations. First, it allows us to explain property *a1* because, as we have seen (Section 3), the centering on the change of relation and placement that characterizes initial processes (cases of typing left aside) is at the root of their systematic implicit uses and of the differences that appear, on this point, with respect to final processes. As regards the combination of a change of relation and placement and a PP with opposed polarities, it closely correlates with the existence of a possible implicit use of the verb (Section 3) so that the asymmetry between initial and final processes pointed out in *a2* indirectly ensues from *f* too.<sup>21</sup>

The spatio-temporal structure of motion processes and, especially, the frequent existence of a change of placement preceding a final change of relation (*f*) – coupled with the lack of a change of placement subsequent to an initial change of relation – have probably played a non-trivial part in the use of static prepositions for describing final changes of relation rather than initial ones (*b1*), as indicated in Section 4 (in synchrony, however, this reinterpretation is deeply rooted in the structures of language).

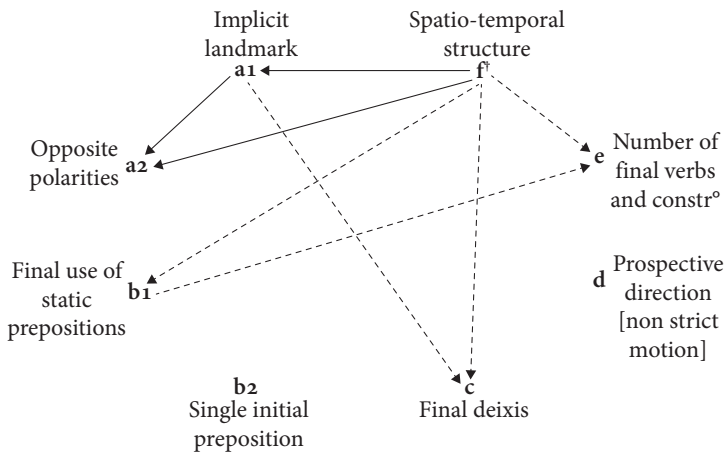
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clear superiority of final verb uses, as shown by the following weights: 31% (initial verbs) vs. 69% (final verbs).

21. The impossibility of using several final changes of relation and placement anaphorically (*a1*) – a final PP has to be present – and the related fact that the constructions associating these predicates with an initial PP are ruled out (*a2*) have a direct outcome: they increase the “weight” of final PPs in motion descriptions (in comparison with initial PPs).

Regarding deixis, the coding of this spatial constraint by some final verbs entails that the (final) landmark from which the motion is contemplated is already known during this prior motion so that these verbs can give rise to an implicit use, as opposed to other final changes of relation with integrated motion (a1; cf. Section 3). In contrast, as initial processes are centered on the (initial) change of relation they denote, their implicit use is always possible (a1) and applies, among others, to deictic situations. So, from the implicitness criterion, it turns out that the spatio-temporal structure of changes of relation and placement makes the final coding of deixis necessary (contrary to its initial coding) and that *c* partly ensues from *f*.

Finally, though the presence of a prior change of placement (*f*) and its role in the dynamic use of static prepositions (*b1*) has to be viewed in a diachronic perspective, it is worth noting that this property of final processes especially applies to the constructions combining a verb of change of placement and a (static) PP (tendency, see above) which, together with other final changes of relation with integrated prior motion, form the main class of motion processes of French. The spatio-temporal structure of processes seems thus to be somehow related to the numerical superiority of final verbs *and constructions* (*e*).



**Figure 5.** Evidence for motion asymmetry and their relations  
 † Dotted arrows indicate partial entailment between properties.

The eight properties previously listed show that the asymmetry between initial and final motions presents a variety of facets that, all together, lead to the quantitative and qualitative pre-eminence of the linguistic means – markers and constructions – involving a final change of relation and placement. As outlined, five of these properties (a1, a2, b1, c, e) seem to partly or totally follow from the spatio-temporal structure of changes of relation and placement (*f*; see Figure 5). With

regard to *b2*, it probably results from specific properties of French (in particular, its characterization as a verb-framed language) and is likely to receive a rather different justification.<sup>22</sup> The property *d* on the prospective nature of the simple preposition *vers* ‘towards’ stands outside the field of pure changes of relation and placement – *vers* introduces a mere change of placement (see Section 4) – and, quite logically, cannot be derived from other items in the list.

Returning to property *f* from which, as I tried to show, most of the facets of asymmetry (listed above) ensue, I already emphasized (Aurnague 2011) that the internal arrangement of changes of relation and placement basically fits the general schema(ta) proposed in order to account for the structure of eventualities (Kamp and Reyle 1993; Moens and Steedman 1988; Smith 1991). In particular, the fact that final changes of relation (and placement) are often preceded by a change of placement – contrary to initial changes of relation (and placement) that do not incorporate a subsequent motion (cf. Section 2) – agrees with the schema of an activity or process followed by a transition/culmination (final transition schema). This observation raises the question of knowing whether the general, and perhaps universal, structure of eventualities does not itself reflect a cognitive and linguistic proclivity towards final transitions.

To sum up, the previous observations and remarks indicate that: (i) several important facets of asymmetry follow from the spatio-temporal structure of changes of relation and placement; (ii) the latter structure basically fits the general schema of eventualities; (iii) this general schema is possibly itself the consequence of a human proclivity towards final transitions or changes of relation. Thus the thorough analysis of French linguistic data leads us to a conclusion which is *convergent* with the assumptions made in (Lakusta and Landau 2005) on the basis of psycholinguistic experiments with *English-speaking* children and adults: the “importance of goals” or “goal (path) bias” seems to be encoded in the very representation/conceptualization of motion events and possibly of eventualities in general.

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22. Without going into details, the existence of a single marker *de* ‘from’ denoting a change of relation (which is not always basic and does not necessarily go with a change of placement: *b2*) arguably results from the typological properties of French, a verb-framed language in which changes of basic locative relation and placement are expressed by verbs, not by prepositional elements, and perhaps from a principle of economy.

## 6. Language, cognition and asymmetry of motion

### 6.1 From language structure to language use

Analyzing the expression of dynamic space in language requires a clear theoretical framework in order to identify and classify the linguistic markers of motion. This chapter therefore opened by recalling the concepts used for the characterization of motion verbs in French – change of basic locative relation and change of placement – and by going through the different categories of processes of strict (autonomous) motion that can be distinguished on that basis (Section 2). After observing the integration of verbs in implicit landmark constructions and their association with a spatial PP of opposite polarity (Section 3), the prepositions appearing in motion descriptions of French were also analyzed in the light of changes of relation and changes of placement (Section 4). The main properties of asymmetry of motion in French were then summed up while trying to determine their possible links (Section 5). The contrasts between initial and final changes of relation and placement in terms of spatio-temporal structure proved to be a fundamental parameter which totally or partly conditions several of the manifestations of asymmetry of motion in French.

Although asymmetry cannot be restricted to the sole importance of goal or goal bias, a significant number of the properties highlighted show that French provides a greater set of linguistic items to refer to final displacements, leading, quite often, to sharper descriptions of final spatial changes compared with initial ones: final use of many static prepositions (see property *b1* in Section 5), final deixis or perspective point (c), prospective direction (d), number of final verbs and constructions (e).

While this quantitative and qualitative pre-eminence of linguistic means available for referring to final changes of relation and placement clearly appeared in the previous observations, I barely touched on the issue of the *number of uses or occurrences* of final markers in French speakers' productions (see Note 20 on verbs in written data). The fact that speakers describe motion events more frequently through final changes of relation has often been highlighted by psycholinguistic studies (Lakusta and Landau 2005; Regier and Zheng 2007) and it is undoubtedly related to the former question of the pre-eminence of final markers in the very structures of language, without it being possible to ascertain in which direction the possible causal link goes.

Moreover, one may wonder what exact role language plays in the emergence of motion asymmetry in general, and in goal bias in particular. *Cross-linguistic evidence* of this phenomenon as well as its anchoring in the general schema of eventualities in language and cognition argue in favor of the ascendancy of the latter (cognition) over the former (language) in this specific domain. However, should

we therefore dismiss any role of language in the emergence of motion asymmetry, if the linguistic properties brought to the fore are the mere reflection of a general cognitive pattern? To conclude this chapter, I put forward a pragmatic principle governing static and dynamic descriptions of space in language which, I believe, is likely to have played a part both in the greater resort to final markers in speakers' productions and in the "co-shaping" of goal bias by language and cognition.

## 6.2 Principle of positive/current localization

In his work on spatial prepositions, Vandeloise regularly used the notions of "search for the target" and "search domain of the target" (e.g. Vandeloise 1987, 1988; see also Langacker 1987). These notions remind us that the prime function of spatial markers – prepositions, postpositions, cases, verbs, etc. – is to make possible the relative localization of a target with respect to a landmark. In a situation in which Marie is asking Max, who is in the lounge, about the location of a target (e.g. Luc, the bag), the latter's answer can be: *Il n'est pas ici/dans le salon* 'He/It is not here/in the lounge'. This negative answer reduces the search domain of the target but it is only "cooperative" if Max is not aware of the current location of the target. If this is not the case (i.e., if Max knows the current location), he would have had to provide Marie with the corresponding "positive" information (e.g., *Il est au grenier* 'He/It is in the attic'). This phenomenon rests on a "principle of (preference for the) positive/current localization of the target"<sup>23</sup> and can be seen as an application to the spatial domain of Grice's (1975) "maxim of quantity" (especially the first submaxim of quantity). This principle is not restricted to static descriptions but also applies to motion eventualities. Thus it leads us to favor the recourse to final changes of relations and placement (e.g. verbs of final change of relation and placement, predicates of change of placement + final PP, initial verbs combined with final PPs) inasmuch as they denote a change to a positive/actual localization, as opposed to initial changes of relation which indicate that a localization is no longer valid (negation of a basic locative relation). Going back to the previous example, a utterance such as *Il est parti/a disparu (du salon)* 'He left/It disappeared (from the lounge)' will be pragmatically less cooperative and informative than the sentence *Il est parti/allé au grenier* 'He left for/went to the attic' (or *Luc l'a monté au grenier* 'Luc carried it up to the attic' when speaking of the bag), assuming of course that Max is aware of Luc's destination.

23. The "positive" nature of the spatial relation is not always sufficient and it is indeed its current/valid character which matters, as the example in the 'imparfait'/imperfect *Il était ici/dans le salon il y a un instant* 'He/It was here/in the lounge a few minutes ago' shows: when Max knows the current location of the target, this answer is as uncooperative as *Il n'est pas ici/dans le salon*.

The concept of “search for the target” and the principle of “(preference for the) positive/current (or future) localization” seem thus to play an important part in the linguistic tendency to describe motions by means of final changes of relation. As indicated, they have the advantage of applying to both dynamic and static descriptions, that is to say to the domain of space as a whole.<sup>24</sup> Moreover, they help us to integrate the interactional and pragmatic dimension of spatial utterances (which is usually missing from psycholinguistic experiments), a dimension that can be articulated with the strict semantic content – geometrical and functional – of spatial markers (Aurnague and Vieu 1993).

In line with the tradition of studies on memory recency (Schiffrin 1973), Regier (1996) proposed a computational model of how children learn spatial terms in which particular attention to the endpoint of a motion is suggested to result from the higher saliency and accessibility of this phase of the (sequentially) perceived “event” and of the corresponding spatial configuration/relation. Lakusta and Landau (2005) emphasize that the memory processing thus highlighted constitutes an argument in favor of a *cognitive* representation of events (not only motion events) that gives greater importance to the coding of “goals”. They also indicate that intentionality and animate entities probably play an important part in the early emergence of this conceptualization of events (this assumption is taken up in (Regier and Zheng 2007) in relation with motion description). The observations made in these different studies are often impressive and seem to partly support the idea of a cognitive and extra-linguistic nature of such a perspective on events and of several important factors having possibly led to it. But does this mean that the influence or the contribution of language to this cognitive structuration of events (notably spatial ones) should be disregarded? Could it not be the case that the proclivity to preferentially encode final changes of relation could result from the combined effect of language and other cognitive (non-linguistic) modalities? To my mind, this possibility has not to be dismissed. That is what I tried to suggest by showing how the concept of search for the target and the principle of (preference for the) positive/current localization can condition the linguistic descriptions of space. This scenario seems all the more plausible since, as we have seen, the asymmetry between initial and final changes of relation (and placement in our case) is deeply rooted in the markers and constructions of language. As a provisional assumption, I would thus say that linguistic means and tools have possibly contributed to strengthen a phenomenon/mechanism initially based on cognitive and non-linguistic factors.

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24. The preference for current or future information is very likely to be a more general phenomenon operating in other domains than space proper (through Grice’s maxim of quantity). However, here the discussion is confined to the spatial domain.

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## Appendix

**Table 2.** Verbs and constructions analyzed in the corpus drawn up from the textual base Frantext (2007–2008 categorized version)

Verbs and constructions	Forms	Main analysis Periods and number of occur- rences (including non-spatial uses)	Additional analysis Periods and number of occur- rences (including non-spatial uses)
<b>✓ Independent initial change of relation</b>			
<i>Partir</i> 'to go away, to leave'	"passé composé"/perfect third person singular	[1880–1910] + [1940–1950] 309 oc.	[1951–1970] 188 oc.
<b>✓ Extended initial change of relation</b>			
<i>S'échapper</i> 'to escape'	"passé composé"/perfect third person singular	[1880–1950] 23 oc.	
<i>S'enfuir</i> 'to run away'	"passé composé"/perfect third person singular	[1880–1950] 42 oc.	

(continued)

Table 2. (continued)

Verbs and constructions	Forms	Main analysis Periods and number of occur- rences (including non-spatial uses)	Additional analysis Periods and number of occur- rences (including non-spatial uses)
✓ Inclusion/containment-type initial change of relation			
<i>Sortir</i> 'to go out'	"passé composé"/perfect third person singular	[1880–1930] 218 oc. [1950–1996] 219 oc.	
✓ Final change of relation with integrated prior motion			
<i>Aller + Prep</i> 'to go + Prep'	"passé composé"/perfect third person singular	[1880–1930] + [1937–1950] 303 oc.	
<i>Venir</i> 'to come'	"passé composé"/perfect third person singular	[1880–1896] + [1943–1950] 625 oc.	
<i>Monter (+ Prep)</i> 'to go up (+ Prep)'	"passé composé"/perfect third person singular	[1880–1950] auxiliary <i>être</i> 'be' 134 oc. [1830–1950] auxiliary <i>avoir</i> 'have' 120 oc.	
<i>Descendre (+ Prep)</i> 'to go down (+ Prep)'	"passé composé"/perfect third person singular	[1880–1950] auxiliary <i>être</i> 'be' 162 oc. [1830–1990] auxiliary <i>avoir</i> 'have' 94 oc.	
<i>(S)avancer (+ Prep)</i> 'to advance, to go forward (+ Prep)'	"passé composé"/perfect third person singular	[1830–1950] aux- iliary <i>être</i> 'be' 49 oc. [1830–1950] auxiliary <i>avoir</i> 'have' 34 oc.	
<i>(Se) reculer (+ Prep)</i> 'to (move) back (+ Prep)'	"passé composé"/perfect third person singular	[1830–1950] aux- iliary <i>être</i> 'be' 80 oc. [1830–1950] auxiliary <i>avoir</i> 'have' 46 oc.	

Table 2. (continued)

Verbs and constructions	Forms	Main analysis Periods and number of occur- rences (including non-spatial uses)	Additional analysis Periods and number of occur- rences (including non-spatial uses)
✓ Final change of relation with presupposed prior motion			
<i>Arriver</i> 'to arrive'	"passé composé"/perfect third person singular	[1880–1905] + [1939–1950] 581 oc.	
<i>Aboutir</i> 'to end up'	auxiliary + <i>abouti</i>		[1880–1950] 287 oc. (partly analyzed)
	any verb form + <i>dans</i>		31 oc.
	any verb form + <i>sur</i>		8 oc.
<i>Accéder</i> 'to reach, to get to'	any verb form		[1880–1950] 436 oc. (partly analyzed)
<i>Parvenir</i> 'to reach, to get to'	auxiliary + <i>parvenu(e)(s)</i>		[1880–1950] 1538 oc. (partly analyzed)
✓ Inclusion/containment-type final change of relation			
<i>Entrer</i> 'to go into, to enter'	"passé composé"/perfect third person singular	[1880–1950] 444 oc.	



# French motion verbs

## Insights into the status of locative PPs

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This chapter deals with the syntactic status of locative constituents combining with motion verbs in French. It aims at answering the following questions: are locative PPs arguments or adjuncts? To which extent does the semantic structure of motion verbs determine the obligatory or optional presence of locative constituent?

In the first part of the chapter, I discuss the general assumption that Manner and Path cannot be encoded in the same verb. This restriction intersects with the two-way typological division between Verb framed languages and Satellite framed languages. As an alternative view of motion description, I present the classification criteria, proposed by Aurnague (2011), which provides new tools to rethink motion beyond the classical opposition between Manner and Path. Relying on a corpus study, I systematically apply a series of syntactic tests to the main classes of motion verbs. I show that locative PPs are tied to the verb to several degrees and that the semantic structure of verbs strongly impacts their syntactic properties.

**Keywords:** motion verbs, argument structure, goal bias, syntax-semantic interface

This paper focuses on the syntax and semantics of French motion verbs expressing autonomous motion events. It addresses the question of the status (obligatory or optional) of the locative constituent (Ground) and aims at understanding how far lexical semantics constrains the syntax of motion events. More specifically, the question raised is whether the status of a locative constituent is impacted by its own polarity (Source, Path, or Goal) in relation to the polarity of the verb it combines with. Do the locative constituents have the same status when they combine with a verb with congruent polarity (as in *sortir*<sub>(source)</sub> *de la boutique*<sub>(source)</sub> ‘come out of the shop’) or with a verb with non-congruent polarity as in *sortir*<sub>(source)</sub> *dans la rue*<sub>(goal)</sub> ‘go out into the street’)?

I will review a full inventory of the factors motivating the presence or the absence of the Ground constituent, from lexico-syntactic to semantic and pragmatic factors.

In Section 1, I first recall the structure of a motion event and the typological framework in which it has been described since the well-known description by Talmy (1972, 1985). In Section 2, I introduce the semantic classification of French motion verbs by Aurnague (2011).<sup>1</sup> This classification relies on the combination of two criteria: ‘change of placement’ and ‘change of locative relation’. In Section 3, I present three classes of French motion verbs, and discuss the Manner/Path complementarity, i.e., the claim that only one component can be lexicalized in the same verb, not both (cf. Rappaport Hovav and Levin 2010; Levin and Rappaport Hovav 2013, 2019; Beavers et al. 2010). Against this claim, I suggest in Section 3.4 that Manner and Path must be conceived of as sets of properties potentially included in the semantics of a verb rather than labels to identify exclusive classes of verbs.

In Section 4, I then propose a series with syntactic tests to evaluate the obligatoriness of the Ground constituent. In Section 5, I present the methodology of a corpus study designed to provide usage-based answers to questions that are difficult to resolve by intuition alone concerning constraints on the presence, the form and the position of the PPs combining with different classes of verbs.

In Sections 6 and 7, I investigate whether these specific constraints are driven by the semantic properties of verbs. I then provide an objective account of preferred combinations between verbs and prepositions, which highlights the respective contribution of each constituent to the global meaning of a motion event.

## 1. Motion event

### 1.1 Path verbs vs. Manner of motion verbs

It is usually assumed that there are two main classes of motion verbs: Path verbs (*partir* ‘leave’, *aller* ‘go’, *entrer* ‘enter’) and Manner of motion verbs (*marcher* ‘walk’, *courir* ‘run’, *voler* ‘fly’). These verbs are generally distinguished on the basis of two sets of closely intertwined properties:

Path verbs are associated with the notion of boundary-crossing (Aske 1989; Slobin and Hoiting 1994; Slobin 1996), of telicity (Dowty 1991; Tenny 1995; Krifka 1998), and of unaccusativity (Levin and Rappaport 1996; Legendre and Sorace 2003). They are conjugated in French with the *be* auxiliary (1a). On the other hand, Manner of motion verbs are associated with translocational motion (Zlatev et al.

1. See also Aurnague’s contribution in this volume.

2010), or translational motion (Talmy 2000b: 35), with non boundary-crossing and atelicity. They are unergative and are consequently conjugated with the *have* auxiliary in French (1b):

- (1) a. *Jean est parti.*  
 John *be.AUX.PRS.3.SG* leave.PTCP  
 'John left'
- b. *John a marché / couru sur la plage.*  
 John *have.AUX.PRS.3SG* walk.PTCP / run.PTCP on the beach  
 'John walked/ran on the beach'

However, some verbs do not fit into one or the other cluster of properties associated with each class of verbs. For instance, a verb such as *sauter* 'jump', expresses manner, is unergative, but describes a punctual event. I present in Section 2.2 and 3.1 a refined verb classification (by Aurnague 2011), which avoids treating such verbs as exceptions.

## 1.2 Semantic components of a motion event

Talmy (1985, 2000b) proposed that a motion event encompasses four semantic components, and two major co-events<sup>2</sup> (Talmy 2000b: 25–26). These components are: (i) The *Figure* (defined as “a moving or conceptually movable object whose path or site is at issue”); (ii) the *Ground* (defined as a reference frame, or a reference object that is stationary within a reference frame, with respect to which the Figure’s path or site is characterized); (iii) the *Path* (defined as the path followed or site occupied by the Figure object with respect to the Ground);<sup>3</sup> (iv) the *Motion* (refers to the presence *per se* of motion (translational motion) or locatedness in the event). The two co-events are: the *Manner* (the manner in which the motion is performed), and the *Cause* (what initiates the motion itself). They are illustrated in (2):

- (2) The toy that the boy pushed slid down the hill.  
*Figure* *Motion Path Ground*  
*Cause* *Manner*

2. “In addition to these internal components, a Motion event can be associated with an external Co-event that most often bears the relation of Manner or of Cause to it” (Talmy 2000b: 26).

3. Path is itself divided into Vector (source, path and goal), Conformation (shape of the Path), and Deixis (motion towards/away from) (Talmy 2000b: 53–57).



### 1.3 Satellite-framed vs. verb-framed languages

For more than thirty years,<sup>4</sup> motion verbs have been studied from the perspective of the typological distinction made between V(erb)-framed languages and S(atellite)-framed languages (cf. Talmy 1985, 2000a, 2000b). In this line of research, French, as a Romance language, belongs to the group of V-framed languages: it typically expresses Path and Motion in the main verb, leaving the expression of Manner optional and peripheral. As a consequence of the Path being expressed in the verb, prepositions heading the nominal Ground constituent are usually static. In *il va à la mer* ‘he is going to the beach’, the preposition *à* ‘at’ is used whereas the directional preposition *to* is used in English. On the other hand, S-framed languages express Path in a satellite<sup>5</sup> as in (3), offering the structural possibility of expressing the Manner component in the main verb as in (4).

(3) John came *out* of his office.

(4) John *ran* out of his office.

Languages of the world are supposed to prefer one or the other of these two patterns, depending on which semantic component is encoded in which syntactic constituent, as illustrated in Table 1.<sup>6</sup>

**Table 1.** Patterns of lexicalization in V-framed and S-framed languages

	Verb framed languages			Satellite framed languages			
Figure	Path	Ground	(Manner)	Figure	Manner	Path	Ground
Subject	Verb	PP	Gerund	Subject	Verb	Satellite	PP/NP

This two-fold division has led to focus on the opposition, at the lexical level, between Manner of motion verbs and Path verbs. It has also raised questions about the definition of what exactly a Satellite is, how distinct it is from a preposition, and what relationship it has with the verb (Croft et al. 2010; Beliën 2008). It has been widely assumed that these two components, Manner and Path, cannot be lexicalized in the same verb, leading to exclusive patterns of lexicalization (Beavers et al. 2010). This claim is part of the more general manner/result complementarity

4. Older works already mention this binary opposition. See for instance Bally (1932/1965), Bergh (1948), Vinay and Darbelnet (1958), Tesnière (1959).

5. A satellite is “the grammatical category of any constituent other than a nominal complement that is in a sister relation to the verb root” (Talmy 1991: 486).

6. For a recent perspective on Motion event description, see also Ibarretxe-Antuñano and Hijazo-Gascón (2015).

(Rappaport Hovav and Levin 2010: 22), which holds that “manner and result meaning components are in complementary distribution: a verb lexicalizes only one”.

We will revisit this claim in Sections 3.4 and 3.5, in the light of the classification of French motion verbs introduced in Sections 3.1.3.

## 2. Spatial criteria for motion event classification

### 2.1 The relational nature of space in motion events

Motion has long been described in terms of boundary-crossing (Aske 1989; Slobin and Hoiting 1994; Slobin 1996) or change of location (Laur 1991). Both of these criteria imply that the description of motion is based on referential attributes of the Ground entity, and on our capacity to conceptualize them as boundaries delimiting one location from another.

By contrast, in the present paper, motion is conceptualized as a *change of locative relation* (Boons 1987; Sarda 1999, 2001; Aurnague 2011): each motion event profiles a positive item of information. For instance, the event expressed by *sortir* ‘go out’ involves the locative relation *being in* at time t1 and negation of this positive information at time t2. In other words, the positive item of information first profiled (be *in*) no longer holds at time t2. There is no need to positively characterize each moment/location of the event. This entails that the aspectuality of the event does not determine the type of verb but rather can be deduced from its spatial properties.

Motion implies moving through space and time. The very nature of motion as a moving event through space and time can be grasped by languages as a relational phenomenon. The nature of space involved in a motion event is no less relational than the nature of time.<sup>7</sup> The moving entity (Figure) is always in a relationship with respect to a frame of reference (Ground). The best characterization of a motion event is therefore to see whether this relationship remains the same or changes at some point.

### 2.2 Classification of French motion verbs: Aurnague’s (2011) criteria

This section presents the main features of the classification of French motion verbs proposed by Aurnague (2011). This classification is based on the relational nature

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7. This relational concept of space has been argued for by Leibniz: “I have said more than once, that I hold space to be something purely relative, as time; an order of coexistences, as time is an order of successions” (cf. Vailati 2014).

of space in a motion event. Aurnague suggests combining two criteria: a change of basic locative relation, as mentioned above in 2.1, and a change of placement (whether the Figure moves along or not). For instance, *entrer* ‘enter’ implies that the relation *be in* changes from false to true. The verb semantics contains nothing more than this change of locative relation (*not be in* → *be in*) concomitant with a change of placement (Motion *per se*).

Combining these two criteria gives rise to four main classes of verbs:

Table 2. Aurnague’s classification of motion events (2011)

	Change of placement	No change of placement
No change of locative relation	<i>courir</i> ‘run’, <i>avancer</i> ‘move forward’, <i>marcher</i> ‘walk’, <i>voler</i> ‘fly’, <i>nager</i> ‘swim’	<i>s’asseoir</i> ‘sit down’, <i>se lever</i> ‘get up’, <i>se blottir</i> ‘huddle’, <i>tressauter</i> ‘twitch’, <i>sursauter</i> ‘jump, flinch’,
Change of locative relation	<i>aller</i> ‘go’, <i>partir</i> ‘leave’, <i>entrer</i> ‘enter’, <i>sortir</i> ‘go out’	<i>se poser</i> ‘alight, land’, <i>sauter</i> ‘jump’, <i>bondir</i> ‘bounce, spring’, <i>se jeter</i> ‘throw oneself’

Verbs such as *s’asseoir* ‘sit down’ correspond to the class of change of posture verbs (no change of placement, no change of relation).<sup>8</sup> They are not addressed here. In the following section, I focus on the other three classes:

- Change of placement verbs, represented by *courir* ‘run’,
- Change of relation verbs, represented by *sauter* ‘jump’,
- Change of relation and change of placement verbs, represented by *aller* ‘go’.

### 3. Semantic structure of French Motion verbs

#### 3.1 Change of placement verbs (*courir* ‘run’)

Verbs of this class express a change of placement and no change of relation. They describe a translational motion of the Figure with respect to a frame of reference (by default a terrestrial frame of reference). They combine easily with PPs headed by the preposition *à travers* ‘through’, which serves as a test to show that the motion is necessarily extended over space (5), contrary to posture verbs (no change of placement – no change of relation), which are incompatible with *à travers* ‘through’ heading a NP referring to a terrestrial ground (6). Aurnague and Stosic (2002) and Stosic (2002, 2007, 2009b) have shown that the preposition *à travers*

8. For commodity, we will from now on speak about “change of relation” instead of “change of basic locative relation”.

'through' implies that the movement of the Figure is extended with respect to the whole Ground ("constraint of minimal extension/coverage").

- (5) Je courais à travers le parc pour chercher ma femme.  
I run.PAST.3SG through the park (to find my wife)  
(A. Maurois, *Climats*, 1928, p. 61)  
'I ran through the park looking for my wife'
- (6) ?/\*J'étais assis à travers le parc.  
I be.AUX.PAST.1SG sit.PTCP through the parc  
'I was sitting through the park'

The verbs grouped in this class show some semantic differences, however. They cluster into two subsets, one indicating some Manner, the other indicating some Directionality (moving forward, backwards, upwards, downwards). Below are non-exhaustive lists of verbs of each type:

The subset expressing some properties of manner contains verbs such as *courir* 'run', *marcher* 'walk', *flotter* 'float', *voler* 'fly', *nager* 'swim', *tituber* 'stagger', *boiter* 'limp', *glisser* 'slide', *se balader* 'stroll', *flâner* 'wander', *vadrouiller* 'roam', *déambuler* 'amble', *vagabonder* 'tramp', *se promener* 'stroll', *errer* 'wander'/'roam', *pédaler* 'cycle', *rouler* 'roll', *rampier* 'crawl', *galoper* 'gallop', *trotter* 'trot', *deriver* 'drift'.

The subset of verbs indicating directionality contains *se déplacer* 'travel', *se mouvoir* 'move', *avancer* 'move forwards', (s')*approcher* 'approach', *progresser* 'progress', *cheminer* 'to wend one's way', *évoluer* 'evolve'/'move', *distancer* 'outrun', *monter* 'move up', *descendre* 'move down', *remonter* 'run up/follow', *grimper* 'climb', *reculer* 'move back'/'retreat', *rétrograder* 'regress', *refluer* 'recede'.

### 3.2 Class of change of relation only (*sauter* 'jump')

Verbs of this class typically express a change of relation which does not last, neither in space (no change of placement), nor in time (except in cases of iterativity). They refer to a sudden event that can be understood as a quick change of relation.

*sauter* 'jump', *bondir* 'bounce'/'spring', *rebondir* 'bounce back', *jaillir* 'spring'/'gush', *surgir* 'pop up', *s'élever* 'rise'/'arise', *s'envoler* 'fly away', *gicler* 'splatter'/'spurt', *rejaillir* 'rebound on', *s'élancer* 'dash/ hurl o.s.', *se jeter* 'throw o.s.', *se poser* 'land', *s'écraser* 'crash'

These verbs can involve different types of locative relations: contact/non contact (*sauter* 'jump', *bondir* 'bounce'/'spring', *rebondir* 'bounce back', *s'envoler* 'fly away', *se poser* 'land'). Some of these verbs describe some sort of appearance (not be here/ be here), focusing on the initial phase of appearance: *jaillir* 'spring'/'gush', *surgir* 'pop up', *s'élever* 'rise'/'arise', *gicler* 'splatter'/'spurt'.

A property shared by these verbs is that they all imply an event of self-dynamicity, involving an internal source of power or energy, a propelling force (or motor pattern, cf. Slobin 2004). This property provides an explanation for their tendency to enter construction (with locative PP) construed as a change of relation and change of placement, as will be shown in 3.4.

### 3.3 Class of change of relation and change of placement (*aller* 'go')

This class contains the largest number of motion verbs. It also shows the greatest variations of different types. Aurnague (2011) defined 8 types, depending on the phases on which the change of relation is centered (on the initial or the final phase), and on information given by the verb semantics about the portion of the event preceding or following this change of relation. I present here six of the eight types, including three types centered on the initial change of relation, and three types centered on the final change of relation:

- i. Independent initial change of relation and change of placement (*partir* 'leave')
- ii. Extended initial change of relation and change of placement (*s'échapper*, *s'enfuir* 'escape')
- iii. Initial inclusion/containment-type change of relation and change of placement (*sortir* 'go out')
- iv. Final change of relation and change of placement with integrated prior motion (*aller à* 'go to', *venir* 'come')
- v. Final change of relation and change of placement with presupposed prior motion (*arriver* 'arrive', *parvenir* 'attain')
- vi. Final inclusion/containment-type change of relation and change of placement: (*entrer* 'come in')

This terminology is not necessarily easy to handle and may require some explanation, but details can be found in Aurnague (2011 and in this volume). Briefly, there are three types centered on an initial change of relation (*partir* 'leave', *s'enfuir* 'run away', *sortir* 'go out').

Aurnague introduced a distinction between *partir*, whose semantics does not involve the subsequent motion following the change of relation, and *s'enfuir*, which, thanks to special semantic properties (speed, intentionality to avoid proximity with the Source), includes the subsequent motion in its semantics. Aurnague offers a test to differentiate the two types. The test shows that the subsequent motion is harder to negate with *s'enfuir* 'escape/ run away', than with *partir* 'leave':

- (7) *Il est parti au village mais n' est jamais arrivé*  
 he be.PRS.3SG leave.PTCP at.the village but NEG be.PRS.3SG never arrive-PTCP  
 'he left for the village but never arrived'
- (8) *# Il s' est enfui au village mais n' est jamais arrivé*  
 he REFL be.PRS.3SG escape.PTCP at.the village but NEG be.PRS.3SG never arrive-PTCP  
 'he ran away to the village but never arrived'

It will be shown in Section 6 that this discrepancy between verbs that integrate (or not) a subsequent motion following the change of relation might have an impact on the status of the locative PP depending on whether the preposition points towards the same phase as the change of relation (initial: *partir de* 'leave from'), or towards the opposite one (final: *partir à* 'leave to'). The question arises whether constituents of opposite polarities (Source and Goal PPs) occupy the same syntactic status with respect to the same verb, or more generally, whether they are equally selected by initial verbs.

As for final verbs, they include three types, represented here by *aller* 'go', *arriver* 'arrive', and *entrer* 'enter'. The latter, *entrer*, is centered on the final change of relation, a relation of inclusion/containment. The other two types are different. They describe, according to Aurnague, a change of placement which precedes the final change of relation. Consequently, their semantic structure focuses on a larger span of the event than the final change of relation, integrating (*aller*) or presupposing (*arriver*) the previous change of placement. The difference between the two is brought out by tests using temporal/aspectual adjuncts: *aller* 'go' can be modified, as an accomplishment, by a temporal PP headed by *en* 'in' (*il est allé à l'université en 1h* 'he went to the university in one hour'). However, if modified by the temporal adverb headed by *à* 'at' (*il est allé à l'université à 8h* / 'he went to the university at 8'), the resulting interpretation is an underspecified sentence, meaning either that he left at eight or that he arrived at eight. This proves that the event structure of *aller* 'go' incorporates the previous motion and that the constraint to conceptualize the event as an achievement triggers the selection of one of its different phases. Similarly, *arriver* can combine with both *en* 'in' and *à* 'at' adverbial modifiers (*il est arrivé au travail en 1h/ à 8h* 'he arrived at work in 1 hour/ at 8'). Contrary to *aller* 'go', the event is, in both cases, centered on the final change of relation, and the previous change of placement is not profiled.

The above classification suggests that initial and final verbs might have preferred arguments corresponding to the phases of the event included in their internal semantic structure.

### 3.4 Path defined as a set of independent features

In this section, I claim that Path is a set of features expressed by different verb classes rather than a class of verbs in itself. Whereas Talmy presented the opposition between V-framed and S-framed languages as a typological trend, scholars after him insisted on the fact that the verb cannot lexicalize Path and Manner simultaneously. Our analysis questions the rigidity of the opposition between V-framed and S-framed languages.

Levin and Rappaport (2019: 24) noted that in English, the S-framed pattern is observed simply when adding a goal PP headed by a goal preposition *to*, to a so-called manner verb. They underscore that there is no French counterpart to the English *to*: *à* is indeed a static preposition, and its exact counterpart is *at*.<sup>9</sup> Levin and Rappaport (2019) conclude that in French “the relevant S-framed construction is precluded”, and that instead, Path verbs are used in a V-framed construction. However, this claim needs to be qualified. There is, in French, the well-known possibility of expressing a change of relation and change of placement event (‘directed motion event’)<sup>10</sup> with a change of placement (9) or a change of relation (10) encoded in the main verb:

- (9) [*Rentré chez lui, il entendit la même voix qui l’appelait*].  
 Il courut dehors de nouveau, mais ne trouva  
 he run.PST.3SG outside of again but NEG find.PST.3SG  
 personne. (Michel Tournier, *Le roi des aulnes*, 1970, p. 7)  
 nobody  
 ‘When back home, he heard the same voice calling him. He again ran  
 outside, but did not find anybody’

9. Whether the French preposition *à* ‘at’ has a static or dynamic meaning has been widely discussed. The French modern form *à* comes from the Latin prepositions *ad*, *ab*, *apud* which have had both dynamic and static uses. The three prepositions fused into a unique form *a*, which had undergone a pervasive semantic erosion through the different phases of its evolution. According to Goyens, Lamiroy and Melis (2002: 303), the preposition *à* ‘at’ fundamentally has a static meaning with respect to its spatial uses (see also Vandeloise 1987, Blinkenberg 1960).

10. The label ‘directed motion’ has been used in the literature to denote telic motion events. However, this term is misleading, because a direction does not imply, in itself, any telicity. I use it, in some cases, to help the reader establish the link between this familiar terminology and the one I use in this paper, which is borrowed from Aurnague (2011).

- (10) *Puis, sans prévenir, elle sauta sur le marche-pied.*  
 then without warning she jump.PST.3SG on the running-board  
 (J. Vautrin, *Billy-Ze-Kick*, 1974, p. 159–160)  
 ‘Then, without warning, she jumped onto the running-board’

This shift in meaning has been fully discussed (Laur 1993; Asher and Sablayrolles 1996; Borillo 1998; Bonami 1999; Fong and Poulain 1998; Kopecka 2009; Aurnague 2016). In (9), the combination *courir dehors* ‘run outside’, must unambiguously be construed as a change of relation and a change of placement, because it presupposes that the Figure was previously *inside*. The sentence describes an event of ‘running from inside to outside’. But the adverb *dehors* ‘outside’ does not in itself convey any Path meaning (as in *they were sitting outside*). Similarly, in (10) the verb *sauter* combines with the preposition *sur* ‘on’, which by itself does not convey any Path meaning either. Yet, this pattern [ $V_{\text{non Path}} + \text{Prep} / \text{Adv}_{\text{non Path}}$ ] can yield a change of relation and change of placement interpretation of the event [ $e$ ]<sub>Path</sub>. I suggest calling it a pseudo-S-framed pattern. This pattern is different from the S-framed pattern, because the Path component is not conveyed by a satellite/preposition. The specificity of the French pattern is that this interpretation of the event cannot be attributed to prepositions, which are most often static (*à* ‘at’, *dans* ‘in’, *sur* ‘on’).<sup>11</sup> When neither the verb nor the preposition/adverb convey a Path meaning, the question arises: where does this Path meaning of the event come from?

Three non-exclusive answers can be suggested: the resulting change of relation might derive from (i) some semantic properties of the verb, (ii) the construction itself [ $V + \text{PP}$ ], or (iii) the context.

Aurnague (2011) suggested an explanation rooted in the verb semantics. He put forward the notion of a ‘goal oriented trend’ (tendentiality), which is expressed by four properties organized in a family resemblance:

- i. Speed (*courir* ‘run’),
- ii. (Intentional) opposition to a force or resistance against gravity (*ramper* ‘crawl’, *grimper* ‘climb’),
- iii. Directionality (*descendre* ‘go down’; *monter* ‘go up’),
- iv. Motion driven by a force (*couler* ‘flow’, *glisser* ‘slide’)

These semantic features could be conceived of as Path properties that can be conveyed by change of placement verbs (*courir* ‘run’) or by change of relation verbs

11. Besides static prepositions, the directional preposition *vers* ‘towards’ can be used, but it does not trigger a change of locative relation. The specific preposition *jusque* ‘up to / as far as’ can also be used, but this does not prove the possibility of an S-framed pattern in French as *jusque* can combine with any type of verb. The preposition *jusque* is special because it indicates a measurement rather than a direction.



(*sauter* ‘jump’). When present, these features seem to strongly impact the capacity of a verb to express, in a certain construction, a change of relation associated with a change a placement. For instance, (11) contrasts with (12):

(11) *il a couru à la plage.*  
 he have.AUX.PRS.3SG run.PTCP at the beach  
 ‘He ran on/ to the beach’

(12) *il a marché à la plage.*  
 he have.AUX.PRS.3SG walk.PTCP at the beach  
 ‘he walked (on/??to) the beach’

In (11), *courir* ‘run’ easily prompts a change of relation and change of placement thanks to the fact that it expresses speed. However, example (11) is ambiguous: two interpretations (*on* vs. *to*) sound equally good, and in this case the context of use indicates one of them. Conversely, *marcher* does not convey any of the four properties. In (12), *marcher à* does not lead to a change of relation and change of placement interpretation: (12) is unambiguously understood as a change of placement only (he was on the beach and walked there).

The organization of the four properties in a family resemblance means that a predicate can incorporate one or more of these properties. The verb *grimper* ‘climb’ contains the features ‘opposition to a force’ and ‘directionality’; it means, in French, moving upwards against some difficulties, using one’s feet and hands. Verbs such as *débouler* ‘belt out’, *dégringoler* ‘tumble down’, *dévaler* ‘hurtle down’ combine directionality and speed (and driven by a force). The more a verb incorporates such properties, the more unambiguously it can express a change of relation associated with a change of placement (‘directed motion’ event) when combining with PPs headed by static prepositions.

This analysis challenges the rigidity with which the opposition between V-framed and S-framed languages has been dealt with after Talmy, who himself only presented it as a typological trend. In French, the construction [change of placement verb + locative preposition] can lead to the change of relation and change of placement. While this construction is constrained, it is far from being infrequent. Kopecka (2009) showed that 37% of change of placement verbs are associated with a change of relation, and 43% when they combine with the preposition *sur* (cf. Kopecka 2009: 60).

### 3.5 Manner defined as a set of independent features

The last issue in this Section 3 concerns the status of manner. In the field of motion studies, manner has long been confined to a semantic component of verbs that

excludes the Path component, leading (as shown in Section 1.1) to the opposition between Manner of motion verbs and Directed motion verbs (or Manner verbs vs. Path verbs).

French data suggests, however, that the expression of Manner is distributed across all classes of verbs.<sup>12</sup> Stosic (2009a: 111) proposed a cluster of properties characterizing manner in a more precise way. These properties are: speed (*courir* ‘run’), general appearance (*tituber* ‘stagger’), force<sup>13</sup> (*jaillir* ‘spring’), absence of locative goal (*errer* ‘wander’), shape (of the Path) (*zigzaguer* ‘zigzag’), means (*chevaucher* ‘ride’), degree of effort (*gravir* ‘climb up’), environment (*nager* ‘swim’), Path extension (*arpenter* ‘stride along’), and stealth or furtiveness (*se dérober* ‘sneak’) (see also Stosic’s chapter in this volume).

Along with these parameters, it is possible to find a manner corresponding to almost each of the verbal classes introduced previously as illustrated in Table 3. Examples in Table 3 provide a counter-argument against the principle that the verb lexicalizes either Manner or Path, but not both (Beavers et al. 2010; Levin and Rappaport Hovav 2019).

Table 3. Distribution of manner over different classes of verbs

	–Manner	+Manner	Manner features
Change of placement	<i>se déplacer</i> ‘move’	<i>courir</i> ‘run’	speed
Change of relation	<i>se poser</i> ‘land’	<i>s’écraiser</i> ‘crash’	force
Change of relation and change of placement	<i>partir</i> ‘leave’	<i>filer</i> ‘steal away’	speed, furtive
	<i>s’enfuir</i> ‘run away’	<i>se barrer</i> ‘clear off’	speed, force
	<i>arriver</i> ‘arrive’	<i>débouler</i> ‘belt out’	speed, force, unexpected
	<i>aller</i> ‘go’	<i>rappliquer</i> ‘show/ turn up’	unannounced
	<i>entrer</i> ‘enter’	<i>s’infiltrer</i> ‘infiltrate’	shape, furtive

Table 3 clearly shows that manner can be co-lexicalized with the expression of the Path component, for instance with initial or final verbs of change of relation and change of placement such as *filer* ‘steal away’, *se barrer* ‘clear off’, *débouler* ‘belt out’. The English translations may not always express the same nuances as the French

12. Not to mention that Manner can also be distributed around the verb thanks to adverbials that are merged to different degrees with the verb: *aller à pied* ‘go by foot’ is lexicalized, whereas *marcher avec peine* ‘walk with difficulty’, *courir comme un diable* ‘run like a devil’ are non lexicalized associations.

13. It is noteworthy that the features ‘speed’ and ‘force’ belong at the same time to the set of Path features and to the set of Manner features. They intrinsically have to do with these two dimensions of Manner and Path.

verbs. *Filer*, for instance, means leave quietly or surreptitiously, evoking the shape of a *fil* ‘thread’. *Débouler* means roll quickly down a slope (like a ball – a *boule* in French) and acquired the meaning ‘arrive hastily and unexpectedly’.<sup>14</sup>

In this section, I presented the semantic classification of French motion verbs based on two criteria: change of placement and change of relation. The analysis borrowed from Aurnague (2011) highlighted subtle nuances between verbs, depending on their semantic content, which can be centered on the change of relation only, or can incorporate some previous or subsequent change of placement. On the basis of these criteria, the so-called Manner verbs are not all clustered together, allowing to conceive of motion events outside the traditional systematic contrast between Manner and Path verbs. Rather, it has been shown that various features of Manner can be co-lexicalized with some change of relation and change of placement verbs and that some features of Path can be co-lexicalized with some change of placement verbs. The construal of the event relies on the lexical properties encoded by verbs as proved by the contrast between *courir* ‘run’, which is prompt to express a change of relation and change of placement event, and *marcher* ‘walk’ which, on the contrary, remains reluctant to trigger such a shift in meaning.

In the following, I focus on the analysis of the syntactic status of locative PPs combining with motion verb classes. In Section 4, I present syntactic criteria used to distinguish arguments from adjuncts. Then, I expose the methodology in Section 5. And lastly, I show how the afore-mentioned syntactic criteria apply and interact with the semantic structure of the different types of motion verbs. I successively define the interaction between the semantic and syntactic status of the locative PP with motion verbs expressing change of relation and change of placement (Section 6) and with motion verbs expressing a change of placement (Section 7). This analysis relies on previous work by Carlier (2005), Carlier and Sarda (2010), *forthc.*

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14. It is noteworthy that the verb *débouler* first indicated a source event (centered on the initial change of relation). The TLFi dictionary dates the meaning « partir brutalement, déguerpir » (‘leave hastily, run off’) to 1793. Later, the verb acquired the meaning ‘roll down’, and ‘go down quickly’, and switches to a goal meaning *se précipiter sur* (rush at someone/sth) and finally, in a colloquial register, it now means ‘arrive hastily’. This meaning path diachronically illustrates the influence of goal bias, or how a source verb becomes a goal verb.

## 4. Argument/adjunct distinction in French: How locative PPs are special

### 4.1 Syntactic criteria

In French, the verb generally constrains (i) the presence (ii) the form and (iii) the position of its arguments (cf. Lazard 1994: 70). In (13), the presence of the argument is obligatory. In (14), the form of the argument is constrained: the verb *penser* ‘think’ can combine with a PP headed by *à* ‘at’ but not by *sur* ‘on’. Example (15) shows that the position of argument is constrained. Because it is VP-internal, the argument cannot be moved to the front position. There is a strong correlation between position and syntactic function.

- (13) a. *Pierre a rencontré Paul.*  
 b. \**Pierre a rencontré.*  
 ‘Peter met (Paul)’
- (14) a. *Pierre pense à quelque chose.*  
 b. \**Pierre pense sur quelque chose.*  
 ‘Peter is thinking about something’ (lit. at vs \*on)
- (15) ?*A quelque chose, Pierre pense.*  
 ‘About something, Peter is thinking’

However, the status of locative ‘constituents’ in the domain of motion events remains a fuzzy area with respect to the argument/ adjunct distinction. The VP-internal status of locative constituents can be highlighted by an additional test, the ‘VP anaphora’ test (Lakoff and Ross 1976): since *do so* is a VP anaphora, it includes the arguments of the verb. In (16a), *faire de même* ‘do so’ refers to the whole VP ‘goes to the bakery’ and not only to the verb ‘goes’, and for this reason (16b) is ruled out.

- (16) a. *Pierre va à la boulangerie et Marie fait de même.*  
 ‘Peter is going to the bakery and so does Mary.’  
 b. ?*Pierre va à la boulangerie et Marie fait de même à la pharmacie.*  
 ‘Peter is going to the bakery and so does Mary to the drugstore.’

The head-marking vs. dependent-marking distinction (Nichols 1986) provides an additional test for argumenthood, it indicates whether the marking of syntactic function is carried by the verbal head or by the nominal dependents.

Head-marking is possible in French only for arguments (17), not for adjuncts (18).

- (17) *De ce livre, il en parle beaucoup.*  
of this book he.PRO.3.SG.M of.it.PRO speak.PRS.3SG a.lot  
‘He talks a lot about this book’
- (18) a. \**De la fenêtre, il en jette des cailloux.*  
from the window he of.it.PRO throw.PRS.3SG DET.PL pebbles  
b. *De la fenêtre, il jette des cailloux.*  
from the window he throw.PRS.3SG DET.PL pebbles  
‘From the window, he is throwing pebbles’

A major difficulty arises from the fact that all constituents do not behave the same way with respect to the different criteria presented above. Lazard defined three types of arguments: (i) arguments that are *required and governed*: in this case, the verb constrains both the presence and the form of the complement (e.g. *rencontrer* ‘meet’). (ii) arguments that are *only governed*: complements are optional but their form is constrained (*penser* or *penser à* ‘think or think about’). (iii) arguments that are *only required*: their presence is obligatory but their form is not constrained. For instance, *habiter* requires the presence of a locative constituent (19b), and this spatial constituent is VP-internal (19c). However, its form is not constrained (19a and 19d). Moreover, several locative constituents can co-occur without coordination or juxtaposition (19e), showing that there is no unique structural position for the locative argument.

- (19) a. *Pierre habite chez sa grand-mère.*  
Peter live.PRS.3SG at.home.of her grand-mother  
b. \**Pierre habite.*  
Peter live.PRS.3SG  
c. \**Chez sa grand-mère Pierre habite.*  
at.home.of her grand-mother Peter live.PRS.3SG  
d. *Pierre habite à la campagne.*  
Peter live.PRS.3SG at the countryside  
e. *Pierre habite à la campagne chez sa grand-mère.*  
‘Peter lives in the countryside at his grand-mother’s place  
*dans une ferme*  
in a farm’

Lastly, Lazard defines adjuncts as *neither required nor governed* (he gets up at 6 am).

## 4.2 Syntactic tests and pragmatic constraints

The constraint of presence can be in conflict with pragmatic factors (Lazard 1994: 81–82). The obligatory presence of an adjunct can be found as in the passive construction (*This house was built in 1970* (Goldberg and Ackerman 2001)), as well as the absence of a supposedly required argument (*She went closer to the shop and came in*).

The omission of the argument is referred to as null instantiation. Fillmore (1986) and Fillmore and Kay (1995) distinguish two types of null instantiation: definite null instantiation and indefinite null instantiation. Indefinite Null Instantiation refers to an argument that is not expressed and whose referent remains totally unknown, unspecified or irrelevant in the context. Indefinite null instantiation narrows down a class of objects without pointing to a specific one: eatable object of *eat*, breakable objects of *break*, etc. (cf. Lambrecht and Lemoine 2005). On the contrary, Definite Null Instantiation refers to an argument that can be recovered *via* deixis or anaphora. The omission of a Goal locative argument in (*She went closer to the shop and came in*) corresponds to a case of definite null instantiation. The locative argument is recovered by anaphora, implying that she came into the shop.

## 5. Methodology

The use of syntactic tests about the presence, form and position of locative PPs in the domain of motion is a difficult task when relying on intuition. In order to overcome this limitation, I conducted a corpus study to evaluate the behavior of locative PPs in a usage-based perspective.

I used the categorized Frantext database (<http://www.frantext.fr/>), in which a set of 323 novels has been selected, from 1920 to 1980, amounting to 25 757 527 words. Occurrences of representative verbs have been extracted. These verbs belong to the following classes: (i) Verbs of final change of relation and change of placement, (*aller* ‘go’, *arriver* ‘arrive’), (ii) Verbs of initial change of relation and change of placement (*partir* ‘leave’, *s’enfuir* ‘run away’), (iii) Verbs of inclusion/containment type of change of relation and change of placement (*sortir* ‘go out’, *entrer* ‘go in’). (iv) Verbs of change of placement (*marcher* ‘walk’, *courir* ‘run’, *voler* ‘fly’).

The occurrences of these verbs have been extracted in three different contexts: first, contexts where the verb is followed by a preposition; second, contexts where the verb is not followed by a preposition; third, contexts where the verb is preceded by a left-detached locative PP. The sub-corpus includes a random selection of a hundred occurrences of each verb with and without a PP. It totalizes 1193 utterances.

## 6. Argument structure of motion verbs and usage-based exploration of preferred constructions

This section provides a usage-based account of motion constructions in discourse. It gives an account of syntactic constraints on the locative PP combined with (i) final verbs of change of relation and change of placement (or goal-oriented verbs): *aller* ‘go’ and *arriver* ‘arrive’ (Section 6.1); (ii) initial verbs of relation and change of placement (or Source-oriented verbs): *partir* ‘leave’ and *s’enfuir* ‘run away’ (§6.2); and (iii) verbs *entrer* ‘enter’ and *sortir* ‘exit’ expressing a relation of inclusion/containment. Verbs expressing only change of placement will be considered in Section 7.

### 6.1 Final change of relation and change of placement verbs

#### 6.1.1 *Final change of relation and change of placement verb with integrated prior motion: The case of aller ‘go’*

*Aller* ‘go’ is characterized in French grammars as having an argument position for a Goal PP whose presence is assumed to be strictly required. A sentence such as *Pierre va* ‘Peter goes’ (20b) lacks obligatory information. Moreover, the locative constituent is VP-internal: fronting is impossible (20c), and the ‘VP anaphora’ test equally shows that *à la boulangerie* belongs to the VP ((16) repeated in (20d)). On the other hand, the form of *aller*’s complement is not constrained, and its structural position is not unique (20e): the verb can combine with several PPs without any marking of coordination or juxtaposition:

- (20) a. *Pierre va à l’école.*  
 Peter go.PRS.3SG to DET.SG school
- b. ?*Pierre va.*  
 Peter go.PRS.3SG
- c. \**A l’école, Pierre va.*  
 to school Peter go.PRS.3SG
- d. ?*Pierre va à la boulangerie et Marie fait de même à la pharmacie.*  
 Peter go.PRS.3SG to the bakery and so does Mary to the drugstore
- e. *Pierre va chez Marie à la campagne*  
 Peter go.PRS.3SG at-home-of Mary at the countryside  
 ‘Peter is going to Mary’s place in the country’

As for the criterion of head-marking, the locative PP must be cross-referenced by a pronominal affix on the verb (*Au cinéma, Pierre y va souvent* ‘Peter [there] often

goes to the cinema' vs. ?*Au cinéma, Pierre va souvent*. 'To the cinema, Peter often goes'). This necessity provides evidence of its argumenthood.<sup>15</sup> In sum, from a theoretical point of view, the locative constituent combined with *aller* is required, non governed and VP-internal. It behaves as an argument.

The corpus study shows that *aller* 'go' combines with 14 different prepositions. The preposition *à* (lit. 'at') is however preferred (34%), before *vers* 'towards' (16%), *dans* 'in/into' (13%), *de-à* 'from-to' (10%). The occurrence rate of the other prepositions is below 6%.

This large choice of prepositions combining with *aller* confirms that the locative constituent is not governed, but highlights a clear preference for PPs headed by the preposition *à*. This preference reveals a semantic affinity between the verb and the preposition. From a semantic point of view, it is noteworthy that the locative constituent headed by *à* (lit. 'at') is always construed as a Goal PP (i.e. 'to'). By contrast, *aller* refuses a Source PP alone (\**Il va de l'école* 'He goes from school'), but accepts a Source PP when combined with a Goal PP (*Il va de l'école au conservatoire* 'He goes from school to the music academy').

Corpus data, however, raise the question whether the presence of the Goal PP is always obligatory. A search for the occurrences of the verb *aller* not followed by a PP shows that in 55% of cases, there is indeed a Goal PP pronominalized by *y*, which is an indication of its argument status. However, against all odds, the verb does occur without a Goal PP in 45% of cases, and in 14% of them, there is no other complement (absolute or bare uses). These bare usages mostly correspond to imperative forms (*allons* 'let's go') or to progressive forms as in (21):

- (21) *Et j' allais, un peu plus content tous les jours (...)*  
 and I go.PST.1SG a bit more happy all the.PL day.PL  
 (M. Genevoix, *Raboliot*, 1925, p. 346–347)  
 'And I forged on, a bit happier every day,'

In this Example (21), the verb is used without complementation (cf. Melis 1983: 25). This construction seems to be licensed by the verb's semantic structure, and can be considered as a case of indefinite null instantiation (Fillmore and Kay 1995). The Goal PP is not expressed and remains vague and unspecified (go somewhere). The example in (22) illustrates another use of *aller* 'go' in the future tense. The expected pronoun *y* is systematically dropped in the future tense, probably because of the phonetic identity between the locative clitic and the initial vowel of the lexeme (\**j'y irai* [ziikε] 'I will go'). The locative argument can usually be identified from

15. This criterion is however not fully reliable with the locative pronoun *y*, which can refer to an argument as well as to an adjunct as in *Pierre y a rencontré Mary, à ma fête* 'Peter [there] met Mary [at my party].'



the context, however. In (22), the speaker will go and see the other character at her place. This is a case of definite null instantiation.

- (22) [*elle n'avait plus rien à me dire ; elle m'en voulait un peu d'être venu*].  
*J'irai; [peut-être qu'elle refusera de me recevoir].*

I go.FUT.1SG

(J.-P. Sartre. *La nausée*, 1938, p. 84–85. Translation Hayden Carruth)

'She had nothing more to tell me; she was even a little irritated that I had come. *I'll go*; she may refuse to see me'

Lastly, I investigated contexts where the Goal PP appears in left detached position. This configuration is rare, accounting for less than 10 occurrences out of 300 examples analyzed.

- (23) *Et il est allé sur le plateau. Sur le plateau, on n'y va pas souvent et jamais volontiers.*  
 and he be.AUX.PRS.3SG go.PTCP on the platea. on the plateau one NEG  
 there.PRO go.PRS3.SG NEG often and never gladly

(J. Giono, *Regain*, 1930, p. 60–62)

'And he went up to the plateau. To the plateau, we don't often go, and never gladly'

- (24) *Dans la rue, il allait rasant les boutiques et fixant d'un regard ébloui les lumières.*  
 in the street he go.PST.3SG shave.GERUND the.PL shops and fix.GERUND  
 of a glance bedazzled.ADJ the.PL lights

(F. Carco, *L'homme traqué*, 1922, p. 198–200)

'In the street, he hugged the shopfronts, staring at the lights in the windows, bedazzled'

In (23), the left-detached argument is cross-referenced by the clitic *y*, which indicates, again, its argument status. Less expected is Example (24), where the detached PP is not pronominalized on the verbal head. In this example, the detached locative is a scene-setting frame rather than a Goal. The event is centered not on the final change of relation but on the previous change of placement. The imperfective tense and participial phrases associated with the verb are both converging clues for this interpretation. The locative constituent *dans la rue* thus remains external to the VP. It nevertheless remains distinct from an absolute construction (?? *Dans la rue, il allait*). The combination of *aller* + gerund is a different construction, which has become

less frequent than in an earlier state of French.<sup>16</sup> These examples show that the verb *aller* can lose its directional argument and be used as a change of placement verb.

In conclusion, syntactic tests show that *aller* ‘go’ has a goal argument, which is required, non governed and VP-internal. However, corpus data have shown that *aller* can also be used without a goal argument. This observation is in line with the semantic analysis of the verb *aller* suggested by Aurnague, who distinguished two phases in its semantic structure: a change of placement and a subsequent final change of relation. When the Goal PP is omitted, only the previous change of placement is focused on. The Goal is left unspecified as in an indefinite null instantiation. In all other cases, except for the future tense, the locative is overtly expressed either as a full NP or as a pronoun.

### 6.1.2 *Final change of relation and change of placement verb with presupposed prior motion: The case of arriver ‘arrive’*

*Arriver* ‘arrive’ has been semantically described as different from *aller* ‘go’ in that the change of placement preceding the change of relation is only presupposed and not integrated into the verb semantics. The event is centered on the final change of relation. These semantic properties are reflected in syntax by the fact that the locative PP can easily be omitted.

- (25) *Un remorqueur arriva.*  
 a towing-truck arrive.PST.3SG (M. Duras, *Moderato Cantabile*, 1958, p. 40–42)

‘A towing truck arrived’

The constraint of presence does not apply to the locative constituent of *arriver*. The verb *arriver* appears in absolute construction in 58% of occurrences, whereas *aller* appears in such a construction in only 14%. The verb *arriver* also appears with a time constituent in 35% of occurrences, and with a manner constituent in 7% of occurrences.

When the locative constituent can be omitted, it thus corresponds to a definite null instantiation of the Goal argument. It is always recoverable from context, by deixis and anaphora. My claim is that the locative can be omitted if it is salient enough to remain unexpressed and is overtly expressed only if it conveys rhematic information in discourse.

16. Here is an illustration of this construction [*aller* + gerund] in poetry:

*Et l' âne allait geignant et l' ânier blasphémant*  
 and the donkey go.PST.3SG groan.GERUND and the donkey.driver swear.GERUND  
 (V. Hugo, *La légende des siècles*, Le crapaud, 1859, p. 737)  
 ‘the donkey groaned, and the donkey-driver swore, his way along’

This claim is supported by the fact that the pronominalization of the locative is optional, which means that the presence of the pronoun is not dictated by the grammar (as is the case with *aller*) but by the discourse saliency of locatives. In (26) and (27), the goal is evoked in the previous discourse (*Paris* and the *restaurant rue Compans*, respectively), but only in (26) is this goal pronominalized on the verb *arriver*. If, as seems to be the case, the grammar licenses the omission of the pronoun, it could be because the information conveyed is redundant, either because it has already been mentioned or because it is already encoded in the verb, which has, to some extent, its own semantic autonomy.

- (26) *Albertine, cette fois, rentrait à Paris plus tôt que de coutume.*  
 Albertine this time come.back.PST.3SG at Paris earlier than of custom  
*D'ordinaire elle n' y arrivait qu' au printemps.*  
 generally she NEG there.PRO arrive.PST.3SG only in springtime  
 (M. Proust, *La Recherche du temps perdu*– *Le côté de Guermantes*, 1921, p. 351)

'Albertine, this time, came back to Paris earlier than usual. Generally, she [there] arrived only in springtime'

- (27) [*Ils trinquèrent debout, avant de prendre le chemin du restaurant, rue Compans, où ils avaient leurs habitudes.*]  
*Flippe y était déjà quand ils arrivèrent.*  
 Flippe there.PRO be.PST.3SG already when they arrive.PST.3PL  
 (F. Carco, *L'équipe : Roman des fortifs*, 1925, p. 152)

'They had a drink at the bar then walked to the restaurant in rue Compans, where they were regulars. *Flippe was already there when they arrived*'

In (28a), it is impossible that the covert argument of *arriver* refers to a Source constituent. The Source interpretation is triggered only by the presence of the clitic *en* 'from there' as in (28b).

- (28) a. *Il était à Lyon, il arrive.*  
 he be.PST.3SG at Lyon he arrive.PRS.3SG  
 'he was in Lyon, (lit. 'he is arriving') he is on his way'  
 b. *Il était à Lyon, il en arrive.*  
 he be.PST.3SG at Lyon he from.there.PRO arrive.PRS.3SG  
 'he was in Lyon, he comes from there'

Let us consider now constraints on the form of overtly expressed locative PPs. *Arriver* does not govern the locative constituent insofar as it does not impose any formal constraint. Fifteen different prepositions can be used, the most frequent being *à* 'at' (34%), followed by *dans* 'in/ into' (15%), and *devant* 'in front of' (13%). The other twelve prepositions have occurrences below 10%. The locative

constituent is clearly not governed. It ensues that the different PPs can be cumulated without any marking of coordination or juxtaposition (29).

- (29) *Les gens arrivaient de partout par les sentiers.*  
 the people arrive.PST.3PL from everywhere by the.PL trails  
 (H. Vincenot, *Le pape des escargots*, 1972, p. 199)  
 ‘People were arriving from everywhere through the pathways’

It is noteworthy that, in contrast with *aller*, the combination of Source PP and Goal PP appears to be odd. Example (30) is unnatural and no example of this pattern was found in our corpus.

- (30) \**Elle est arrivée de Barcelone à Paris.*  
 she be.AUX.PRS.3SG arrive.PTCP from Barcelone at Paris  
 ‘She arrived from Barcelona to Paris’<sup>17</sup>

The locative constituent corresponding to the Goal has a privileged status with respect to argumenthood. However, other syntactic tests show that locative constituents referring to the Source or the Path are not simply adjuncts. The VP anaphora test shows that they are VP-internal. Not only the goal PP (31), but also path (32) and source (33) are all enclosed in the VP. It is noteworthy, however, that (32) sounds less bad than (31) and (33).

- (31) \**Jean est arrivé au marché et Marie aussi à la maison.*  
 ‘John arrived at the market and so did Mary at home’
- (32) ?*Jean est arrivé par l’A71 et Marie aussi par l’A6.*  
 ‘John arrived by the M71 and so did Mary by the M6’
- (33) \**Jean est arrivé de Barcelone et Marie aussi de Budapest.*  
 ‘John arrived from Barcelona and so did Mary from Budapest’

Moreover, as I mentioned before, the pronominalization of the locative constituent is possible, but not always necessary, depending on the context. The Goal (34) as well as the Source (35) can be pronominalized respectively by *y* and by *en*. There is no clitic referring to path locatives in French.<sup>18</sup>

17. A better translation would be ‘She arrived from Barcelona *in* Paris’, which is fine in English but does not account for the French restrictions.

18. The only device is to use a locative adverb headed by a path preposition (*il est arrivé par là* ‘he arrived through there’). It is in no way a test for argumenthood.

- (34) *Pour une fois, j' ai de la chance et quelqu'un sort*  
 for one time I have.PRS.1SG some the.F luck and someone exit.PRS.3SG  
*de la salle de douche au moment où j'y arrive.*  
 from the bathroom at.the moment where I there.PRO arrive  
 (J.-L. Benoziglio, *Cabinet Portrait*, 1980, p. 194)  
 'For once I'm in luck and someone comes out of the bathroom just as I get there'
- (35) - *J' ai été là-bas, tu sais?*  
 'I was overthere, you know'  
 - *Non ? Quand ça?*  
 'No? When?'  
 - *J' en arrive.* (Colette, *Sido*, 1929, p. 145)  
 I from-there.PRO arrive.PRS.1SG  
 'I'm just arriving from there'

Finally, a last argument showing that all locative constituents are VP-internal is that they do not allow fronting. Fronting of the locative PP remains very exceptional with *arriver*: only 4% of detached constituents are locative PPs and among them Source (38), Goal (37) and Path (36) PPs were found. In all these examples, the postverbal position is always filled either by a locative PP with a different polarity as in (36), or by a manner phrase (37) or a predicative adjective (38). The verb alone is never found, as if the reason for the fronting was to leave the argument slot free in order to host rhematic information in this position.

- (36) *Par un escalier de marbre, ils arrivèrent au premier étage*  
 by a stairway of marble they arrive.PST.3PL at-the first floor  
*devant la porte du cabinet de travail présidentiel, gardée par trois*  
 in-front-of the door of-the office of work presidential guarded by three  
*géants.* (M. Deon, *La carotte et le bâton*. 1960, p. 121–122)  
 giants  
 'Up a marble stairway, they arrived on the first floor in front of the door of the president's office, guarded by three giants'
- (37) *Sur ce plateau, le brouillard arrivait par bouffées cardées, déchirées,*  
 on this plateau the fog arrive.PST.3SG by gust carded torn  
*poussées de biais dans une bise qui gelait les os...*  
 pushed of biais in a wind that froze.PST.3SG the.PL bones  
 (H. Pourrat, *Le château des sept portes ou les enfances de gaspard*. 1922,  
 p. 132–134)  
 'On this plateau, the fog arrived in tufts and shreds, driven across by an icy wind that froze you to the bone'

- (38) *De Londres et de Vichy, les nouvelles arrivaient, toujours*  
 from London and from Vichy the.PL news arrive.PST.3PL always  
*contradictaires.* (B. Clavel, *Le Coeur Des Vivants*. 1964 p. 90–91)  
 conflicting  
 ‘Conflicting news was coming from London and Vichy’

To sum up, *arriver* includes a Goal argument which does not need to be overtly expressed. In contrast, the Source and Path PPs do not correspond to prominent roles related to the lexical semantics of the verb, and when they are not expressed, they cannot be analyzed as cases of definite null instantiation. I suggest that these PPs are arguments, not of the lexical verb, but of the construction. The combination observed in discourse results from the interaction between the verb semantics, and the intention of a speaker to profile different phases of the motion event.

## 6.2 Independent vs. extended initial change of relation and change of placement verbs: *partir* ‘leave’ vs. *s’enfuir* ‘run away’

The semantic structure of *partir* ‘leave’ and *s’enfuir* ‘run away’ involves a change of relation centered on the initial phase of the event. Whereas for *partir* the focus is exclusively on the initial phase, *s’enfuir* also implies the subsequent motion. In Aurnague’s terminology (2011), this difference corresponds to an *independent* initial change of relation (*partir* ‘leave’) vs. an *extended* initial change of relation (*s’enfuir* ‘run away’).

As for the constraint of presence, neither *partir* ‘leave’ nor *s’enfuir* ‘run away’ strictly require the presence of a locative constituent, as illustrated in Examples (39) and (40):

- (39) *nous allons regarder un tableau, un seul, et nous partirons;*  
 we go.PRS.1PL look.at a picture one only and we leave.FUT.1PL  
 (J. Chardonne, *L’épithalame*. 1921, p. 89–90)  
 ‘we are going to look at a painting, only one, and we will leave’
- (40) *puis j’ éclatai en sanglots et m’ enfuis.*  
 then I burst in tears and REFL run.away.PST.1SG  
 (R. Gary, *La promesse de l’aube*, 1960, p. 20–21)  
 ‘then I burst into tears and ran away’

In the sub-corpus of verbs without PPs, bare constructions are found in 59% of cases for *partir* and 89% for *s’enfuir*. Sentences in (39) and (40) seem to imply a definite null instantiation of a source argument. Again, it seems that this argument is overtly expressed only to add specific information. I thus suggest that *s’enfuir* and *partir* have an argument which is assigned with the role of Source.

The pronominalization test highlights that the verb *s'enfuir* refuses both Goal and Source pronouns: *s'y enfuir* never occurs in the corpus, and *s'en enfuir* is excluded for morphological reasons.<sup>19</sup> As for *partir* 'leave', the pronominalization test shows that a Source PP can be cliticized on the verb (41) – although it is very infrequent – and a goal as well (42):

- (41) *Parfois des étrangers au secteur, (...) s'enquerraient de son gîte.*  
 sometimes DET foreigners at.the zone REFL ask.PST.3PL of his hostel  
*Quand ils en partaient, (...), leurs visages (...)*  
 when they from.there.PRO leave.PST.3PL their faces  
 (R. Giraud, *La coupure*, 1966, p. 77)  
 'Sometimes foreigners asked about his hostel. When they left, their faces  
 (would light up with the sweet colors of hope)'
- (42) *(...) nous apprîmes qu' Yves était blessé et dans un hôpital à Amiens. Papa,*  
 we learn.PST.1PL that Yves was injured and in a hospital in Amiens Dad  
*maman et moi y partîmes.*  
 Mum and I to-there.PRO left.PST.1PL  
 (Drieu La Rochelle, *Rêveuse bourgeoise*, 1937, p. 328)  
 '(One day, in November), we heard that Yves was injured and in a hospital in  
 Amiens. Dad, Mum and I left'

If the covert argument of *partir* 'leave' and *s'enfuir* 'run away' is readily assigned with the role of Source, a Goal locative can occur. But the Source involves a definite null instantiation, whereas the Goal is construed as an indefinite null instantiation.

Concerning the constraints on the form, locative constituents combining with *partir* or *s'enfuir* are non governed, since the two verbs occur with about fifteen different prepositions. *S'enfuir* preferentially occurs with *dans* 'in/into' (24%), then with *de* 'from' (22%), *vers* 'towards' (15%), *à* 'at.to' (10%). *Partir* preferentially occurs with *pour* 'for' (30%), then with *à* 'at.to' (18%) and *de* 'from' (13%). Despite the initial change of relation profiled by these verbs, the first preferred preposition is of opposite polarity (goal oriented), in 54% of cases for *s'enfuir*, and in 69% of cases for *partir*. The reason of this preference for Goal is related to the general question of the source/goal asymmetry (cf. Ikegami 1984; Bourdin 1997; Lakusta and Landau 2005; Regier and Zheng 2007; Kopecka and Ishibashi 2011). When an initial verb combines with a goal PP, the goal constitutes new information that cannot be omitted in the context, and the motivation for mentioning it is

19. *S'enfuir* is morphologically composed of the verb *fuir* 'flee' and the prefix *en-*. LITTRÉ criticized the use where the source location could be cliticized by *en*: "d'aucune façon on ne dira « ils s'en sont enfuis »; c'est une grosse faute". 'One cannot say: they from.it-PRO be.PRS.3PL ran-away.PTCP'; this is a big mistake.'

higher than the Source that is semantically involved. At the constructional level, this semantic link may reinforce the integration of the Goal PP into the argument structure of the construction.

Concerning the constraint on the position, locative constituents occurring with *partir* and *s'enfuir* can be considered to be VP-internal because they never or rarely appear in fronting position. The VP anaphora also argues in favor of this analysis, as illustrated in (43)–(46):

(43) \**Pierre est parti de l'école et Marie a fait de même de la maison.*  
'Pierre left from school and so did Mary from home'

(44) \**Pierre est parti à la forêt et Marie a fait de même à la piscine.*  
'Pierre left for the forest and so did Mary for the pool'

(45) \**Jean s'est enfui de l'école et Marie aussi de la maison.*  
'Pierre ran away from school and so did Mary from home'

(46) \**Pierre s'est enfui dans la forêt et Marie a fait de même à la piscine.*  
'Pierre ran away into the forest and so did Mary to the pool'

In conclusion, I claim that, *s'enfuir* 'run away' and *partir* 'leave' have a Source locative constituent involved in their argument structure. They also have a strong semantic affinity with Goal locative constituents which are analysed as arguments of the construction. This semantic affinity is motivated by a more general factor known as the Goal bias.

### 6.3 Initial vs. final verbs of inclusion/containment type with change of relation and change of placement: *sortir* 'exit' vs. *entrer* 'enter'

Locative constituents combining with *sortir* 'exit' and *entrer* 'enter' are not required, not fully governed, and nevertheless VP internal. *Entrer* and *sortir* respectively occur in bare constructions in 53% and 76% of cases. However, the relatively high proportion of pronominalizations (16% for *entrer* and 27% for *sortir*) is evidence for the argumenthood of the Source complement of *sortir* and of the Goal complement of *entrer* as illustrated in (47) and (48):

(47) [*J'ai peur des villes.*]  
*Mais il ne faut pas en sortir.*  
 but PRO.IMP.3SG NEG must NEG from-them.PRO exit  
 (J.-P. Sartre. *La Nausée*, 1938, p. 196)  
 'I am afraid of cities. But we must not leave them'



(48) [*J'avise une vague lueur dans une ruelle avoisinante.*]

*Une sorte d'épicerie. J'y entre.*

a sort of grocery-store I in-it.PRO enter.PRS.1SG

(M. Tournier, *Les Météores*. 1975, p. 374–375)

'I see a glimmer in a nearby street. A sort of grocery store. I enter it'

The pronoun is, however, not always required, as shown in (49) and (50):

(49) *Il aperçoit de la lumière derrière les rideaux rouges de la maison rouge. Il entre.*

he spot.PRS.3SG some the light behind the.DET.PL curtains red of the house red he enter.PRS.3SG

(R. Vailland, *Drôle de jeu*, 1945, p. 245)

'He spots some light behind the red curtains of the red house. He enters'

(50) *Il était moins d'une heure, lorsque Antoine se retrouva devant la fondation Thibault. M. Faïme sortait.*

the Foundation Thibault Mr Faïme come-out.PST.3SG

(R. Martin Du Gard, *Les Thibault. Le Cahier Gris*, 1922, p. 701)

'It was before one o'clock when Antoine found himself in front of the Thibault Foundation. Mr Faïme was coming out'

In these cases, there is a definite null instantiation: a location can be retrieved from the context (he enters the red house / he came out of the Thibault Foundation). However, the use of the pronoun would have been inappropriate. This shows that the use of the clitics seems to be driven by discourse-pragmatic constraints rather than by syntactico-semantic constraints: to be cliticized on the motion verbs, the previously mentioned location must be the focus. This is the case in (47) and (48), where both locative NPs are indefinite and profiled as rhematic information, but this is not the case in (49)–(50) where locative NPs are definite. These observations on pronominalization reveal some interesting semantic restrictions. For instance, the pronominalization of a complement of opposite polarity is precluded: no source complement can be cliticized on *entrer* (*\*en entrer* [from.there.PRO enter]), probably because no Source PP can combine with *entrer* (*?? Il est entré du jardin* 'he entered from the garden'). More surprisingly, no goal complement can be cliticized on *sortir* (*\*y sortir* [to.there.PRO exit]) even though Goal PPs can combine with *sortir* (*il est sorti dans le jardin* 'he went out into the garden').

As for the constraint on the form, complements of *entrer* and *sortir* are not governed. However, compared to other verbs, they show a very high preference for one preposition: *sortir* selects *de* 'from' in 93% of cases, and *entrer* selects *dans* 'in' in 84% of cases. This indicates the strong affinity between verbs and a complement of congruent polarity and, at the same time, highlights a strong dispreference

for a complement of opposite polarity. The combination [*entrer de* ‘enter from’] is not acceptable and was not found in the corpus. The strong preference for one particular preposition argues in favor of argumenthood for the complement with congruent polarity: Source for *sortir* and Goal for *entrer*.

#### 6.4 First conclusion

Whether there is a hierarchy between the used criteria is a moot point. Lazard (1994: 70) suggested that government is a more robust criterion for argumenthood than obligatory presence: governed arguments that are not obligatorily expressed (*il pense* ‘he thinks’) correspond to a unique argument position and cannot be cumulated without coordination or juxtaposition (*\*Il pense à Jean à Marie* ‘he thinks of John of Mary’), whereas ungoverned arguments that are obligatorily expressed can be cumulated without coordination or juxtaposition (*Il va à Paris, à la bibliothèque de l’ENS* ‘he goes to Paris, to the ENS library’) and are similar in this respect to adjuncts.

Table 4 gives a summary of the tests used in this analysis of change of relation and change of placement verbs.

**Table 4.** Summary of tests assessing the status of locatives of change of relation and change of placement

	Required	Governed	Pronominalization		VP anaphora includes PP	Argument of the	
			Source ( <i>en</i> )	Goal ( <i>y</i> )		Verb	Constr.
<i>aller</i>	+	–	–	+	+	Goal	Source Path
<i>arriver</i>	(–)	–	+	+	+	Goal	Source Path
<i>partir</i>	(–)	–	+	+	+	Source	Goal Path
<i>s’enfuir</i>	(–)	–	(–)	–	+	Source	Goal Path
<i>entrer</i>	(–)	– (+)	–	+	+	Goal	Path
<i>sortir</i>	(–)	– (+)	+	–	+	Source	Goal Path

Table 4 shows that depending on the syntactic criterion, two levels of argumenthood can be distinguished:

- i. *Argument of the lexical verb*: it is required (*aller*) or latent,<sup>20</sup> not governed<sup>21</sup> but VP internal.

20. Brackets in the “required” column signal that, although not required, the Locative can be omitted, precisely because it is part of the verb semantics.

21. Locative PP dependents of verbs *entrer* and *sortir* are considered to be almost governed because they show a strong preference for one preposition over the others. This is signalled by brackets in the “Governed” column.

A covert argument does not need to be realized, since it can provide a (good enough) default interpretation when it is not overtly expressed. For instance, the utterance *Il entre* 'He enters \_' is understood without context as 'he enters some containment space bearing the role of Goal'. Most of the time, the context makes it possible to recover a definite argument: e.g. *Il arrive devant la maison et entre* 'He arrives in front of the house and enters' (Goal argument recoverable from context: he enters the house)

- ii. *Arguments of the construction* (cf. Goldberg 1995, 2005): it is not required (nor covert), not governed but VP internal (included in the VP anaphora). These complements are selected in discourse according to communicative goals. They bear complementary or alternative roles to the one(s) selected by the verb, and increase the salience of different phases of the motion event (e.g. *Il est parti à Paris* 'he left for Paris'; *Il s'est enfui par la fenêtre* 'he escaped through the window'). The Goal PP of *partir* is not involved in its lexical meaning, nor is the Path PP of *s'enfuir*.

It has been shown that *aller* is special with respect to the other change of relation and change of placement verbs. It is semantically weak and needs a Goal complement. The omission of the goal complement does not lead to postulating the existence of a latent goal complement; rather, it leads to a shift in meaning resulting in a change of placement verb (*il va chantant* 'he goes singing'). Such a shift in meaning never occurs with the other verbs of change of relation and change of placement when the locative PP is omitted.

I also showed above that there are precluded combinatories. *Aller* 'go' or *entrer* 'enter', for instance, call for a Goal PP, and preclude the Source (*\*il va de Paris* 'he goes from Paris'; *\*il entre du jardin* 'he enters from the garden'). The thematic roles associated with a verb can be ranked according to the verb semantics. In this respect, Path locatives are less fully integrated into the verb argument structure than Source and Goal. Besides, there is no syntactic device to pronominalize them. The VP anaphora test shows that they are nevertheless VP internal. For this reason, I consider them not as arguments of the verb but as arguments of the construction.

The analysis of change of relation and change of placement verbs has shown that locatives are to some extent integrated with the verb. Arguments are selected according to their thematic role as Source or Goal to fit into the verb semantics. Adjustments that cannot be made at the lexico-semantic level can however occur in discourse, and are accounted for by the notion of argument of the construction.

## 7. Change of placement verbs

The class of change of placement verbs is illustrated here by the study of three verbs: *marcher* ‘walk’, *courir* ‘run’, and *voler* ‘fly’.

As for the constraint of presence, the three verbs appear without a prepositional phrase in 56% of cases. When not followed by a PP, they are distributed between two main constructions. They mainly appear without any complementation (*courir* 63% and *voler* 74%), or with a manner modifier (*marcher* 52%).<sup>22</sup>

Concerning the constraint of position, Locative PPs in fronting position are not very frequent: there are 5% with *courir* ‘run’, 22% with *marcher* ‘walk’ and none with *voler* ‘fly’. Fronting locatives occurring with *courir* map with Scene-setting (51),<sup>23</sup> Location<sup>24</sup> (52) or Source roles (53), but never with Goal.

- (51) *A la maison, Berthe courut dans sa chambre.*  
 at the home Berthe run.PST.3SG in her room  
 (J. Chardonne, *L'épithalame*, 1921, p. 37–38)  
 ‘Once home [lit. at home], Berthe ran to her room’
- (52) *Sur le pavé sombre, une forme courait légèrement.*  
 on the cobbles dark a shape run.PST.3SG lightly  
 (A. Camus, *La Peste*, 1947, p. 1441–1443)  
 ‘On the dark cobbles, a shape flitted past [lit. ran lightly]’
- (53) *De l'hôpital, j'avais couru à la prévôté stimuler  
 le zèle des gendarmes.* (R. VerceI, *Capitaine Conan*, 1934, p. 111)  
 from the hospital I have.AUX.PST.1SG run.PTCP to the constabulary spur.INF  
 the zeal of-the police  
 ‘From the hospital I had run to the constabulary to spur the police into  
 action’

Fronting locatives occurring with *marcher* map with Scene-setting<sup>25</sup> in (54), Location in (55) but never with Goal nor Source.

22. For a fine-grained analysis of the verb *marcher* see Moline and Stosic (2016: 150).

23. These locative frames easily take on a temporal meaning, as in (51) *once home* (cf. Huumo 2014).

24. The Location is the role associated with the whole reference frame where the motion event takes place.

25. As in (51), it could be interpreted with a temporal meaning ‘once on the path, she walked faster’.

- (54) *Dans le chemin, elle marchait plus vite.*  
 in the path she walk.PST.3SG more fast  
 (H. Pourrat, *Les Vaillantes. Tour Du Levant*, 1931, p. 21–22)  
 ‘On the path, she walked faster’
- (55) *Dans le champ derrière nous, des hommes marchent.*  
 in the field behind us some men walk.PRS.3PL  
 (M. Genevoix, *Ceux de 14*, 1950, p. 98–99)  
 ‘In the field behind us, some men are walking’

VP anaphora does not seem to exclude the locative PP from the VP, which is thus considered VP internal:

- (56) \**Pierre a marché dans la forêt et Marie aussi dans la ville.*  
 ‘Peter walked in the forest and so did Mary in town’
- (57) \**Pierre a couru dans la forêt et Marie aussi dans le parc.*  
 ‘Peter ran in the forest and so did Mary in the park’
- (58) \**Pierre a volé au dessus de l’océan et Marie aussi au dessus des Alpes*  
 ‘Peter flew above the ocean and so did Mary above the Alps’

Locative pronouns occurring with *marcher* mostly correspond to a Location (59). With *courir*, the pronoun *y* mostly refers to a Goal as in (60), and only occasionally (7%) refers to a Location as in (61). *Voler* is never found with a locative clitic.

- (59) *il y aurait un grand jardin, tout autour, et nous*  
 it.IMP.PRO PROFORM have.COND.3SG a big garden all around and we  
*pourrions y marcher jusqu’au matin, (...)*  
 could there.PRO walk.INF until at-the morning  
 (J.M.G., *Le procès-verbal*, 1963, p. 296)  
 ‘there would be a big garden all around, and we could [there.pro] walk until the morning, (in the night)’
- (60) *Un indic m’ apprit son apparition à Locarno. J’y courus.*  
 a snitch to.me tell his apparition at Locarno I there.PRO run.PST.1SG  
 Trop tard!  
 too late  
 (G. Perec, *La disparition*, 1969, p. 191)  
 ‘A snitch told me he turned up in Locarno. I ran at. Too late’
- (61) *Le terrain vague a été coupé en trois pour faire trois*  
 the wasteland have.AUX.PST.3SG be.PTCP split.PTCP in three to make three  
*tennis, des gens en blanc y courent, (...).*  
 tennis-courts some people in white there.PRO run.PRS.3PL  
 (L. Aragon, *Les beaux quartiers*, 1936, p. 331)

‘The wasteland had been split into three three parts to make three tennis courts, some people in white [there.pro] run, (...)’

The pronominalization test highlights a difference between *marcher* and *courir*, to which I will return after having examined the behavior of verbs with respect to the last constraint of form.

Locative PPs of change of placement verbs are not governed. In the corpus, 27 different prepositions were found. *Courir* ‘run’ preferentially occurs with *à* ‘at’ (29%), followed by *sur* ‘on’ (17%) and *vers* ‘towards’ (14%). *Marcher* ‘walk’ preferentially occurs with *dans* ‘in’ (27%), then *vers* ‘towards’ (21%) and *sur* ‘on’ (13%). Lastly, *voler* ‘fly’ preferentially occurs with *dans* ‘in’ (22%), then *à* ‘at’ (18%), and *sur* ‘on’ (18%). Locative constituents combining with change of placement verbs mostly refer to Location rather than to motion roles (Source, Path or Goal). However, the resulting motion event also describes a change of relation and change of placement (cf. 3.4).<sup>26</sup> While *marcher* almost never yields a change of relation (except when combining with *jusque*), *courir* and *voler* lead to change of relation in 37% and 22% of cases, respectively.

This interpretation is associated with a pattern which does not perfectly correspond to the S-framed pattern, since the change of relation (i.e. Path component) is not brought about by the preposition, which is static, nor by the change of placement verb alone. I therefore suggested in 3.4 calling this pattern a *pseudo S-framed pattern*.

Several factors play a role in this change of relation construal. (i) Verbs must lexically convey at least one of the properties of the “goal oriented trend” family resemblance. However, this condition is not sufficient, since these verbs can simply describe a change of placement. (ii) The perfective aspect marked by tenses seems to be one of the factors impacting the resulting construal as a change of relation. The French *passé simple* (aoristic past) is widely associated with this reading. (iii) A parallelism might exist between constructions of change of placement verbs and constructions of change of relation verbs: both combine with the same set of prepositions. It is likely, therefore, that the conventionalization of the association *aller à* ‘go to’ has extended to *courir à* ‘run to’, or *se précipiter sur* ‘rush onto’ has extended to *voler sur* ‘fly onto’ etc., but this is not a sufficient condition since *marcher à* does not admit a change of relation construal. Finally, (iv) there are pragmatic factors, including the animacy of the Figure, its intentionality and

26. We set aside cases where verbs combine with the preposition *jusque* ‘up to/ as far as’, which does not act as a goal preposition but systematically establishes a boundary to the event by measuring the distance between the Figure and the Ground. Whatever the verb, *jusque* always leads to a bounded interpretation: *elle a chanté jusque’à la plage*, ‘she sang all the way to the beach/ until she reached the beach’ (cf. note 11).

purposeful reasons for moving, and the nature of the Ground, i.e. to what extent it can be construed as a goal to be reached. In this respect, *courir à la plage* ‘run to the beach’ is more ambiguous than *courir à la boulangerie* ‘run to the bakery’. The beach is a location where it is possible to run without any other purpose than taking exercise, whereas jogging in the bakery is much less expected. In contrast, going to the bakery to buy some bread before it closes might be a good motivation for running to it. In (62) the motivation of *courir à la cuisine* ‘running [lit. at] to the kitchen’ might be for instance to have coffee after a bad night. And the bird, in (63), flies into the cherry tree ([lit. on] *sur le cerisier*) with the intention of eating cherries. In Example (64), the Figures denote non-animate, non-intentional entities such as pieces of furniture. The change of relation arises from the construal of the Ground as a Path ‘through the windows’. As an entity without spatial extent, the window triggers the construal as a change of relation (from inside to outside). This forms part of the whole scenario of a removal event.

- (62) *Le lendemain, Juju qui avait mal dormi courut à la cuisine.*  
 the day after Juju who have.PST.3SG badly sleep.PTCP run.PST.3SG at the kitchen  
 (R. Fallet, *La Grande Ceinture*, 1956, p. 55–56)  
 ‘The day after, Juju who had had a bad night ran to the kitchen’
- (63) *Le loriot éclatant vole sur le cerisier.*  
 the oriole golden fly.PRS3.SG on the cherry-tree  
 (M. Genevoix, *Rrou*, 1931, p. 98–99)  
 ‘The golden oriole flies [lit. on] into the cherry tree’
- (64) *[On déménage en bas. (...) puis [ils] commencèrent à descendre par l’escalier de fer le mobilier maigre, mais la besogne les ennuya vite :] tables, chaises, et même une petite armoire de sapin volèrent à travers les fenêtres par-dessus le barbelé.*  
 tables chairs and even a little cupboard of pinewood fly.PST.3PL through the windows over the barbed-wire  
 (J. Gracq, *Un Balcon En Forêt*, 1958, p. 202)  
 ‘They removed the downstairs furniture first. (...) then they began to carry the meager furniture down the iron staircase but quickly tired of the task: tables, chairs, and even a little pinewood cupboard flew through the windows over the barbed wire’

When the change of relation arises from the combination of a change of placement verb with a static preposition, the locative PP is VP internal, it cannot occur in the left-detached position.

- (65) \* *A la cuisine, Juju qui avait mal dormi courut.*  
 ‘To the kitchen, Juju who had had a bad night ran’
- (66) \* *Sur le cerisier, le loriot éclatant vole.*  
 ‘Into the cherry tree, the golden oriole flies’
- (67) \* *A travers les fenêtres par-dessus le barbelé, tables, chaises, et même une petite armoire de sapin volèrent.*  
 ‘Through the windows over the barbed wire, tables, chairs and a little pinewood cupboard flew’

I demonstrated in this section that locative constituents combining with change of placement verbs are not required by the verb itself, and that if they are omitted, the change of relation meaning cannot arise. I thus argue that they are arguments of the construction. It is only in the compounding process that the change of relation construal emerges.

Some interesting cases observed in the corpus corroborate this analysis. Certain change of placement verbs (*courir* ‘run’, *grimper* ‘climb’, *dégringoler* ‘tumble down’, *monter* ‘go up’, *descender* ‘go down’) and also *sauter* ‘jump’ (a change of relation verb) were found with the ‘be’ auxiliary (*être*), whereas they are in general conjugated with *avoir* (have). The contexts in which they were found with *être* ‘be’, instead of *avoir* ‘have’ always describe a change of relation and change of placement event. The split auxiliary is rather infrequent in Contemporary French. It overtly reveals the shift from a change of placement to a change of relation as can be seen in the following examples:

- (68) *Il est grimpé sur le sommet!*  
 he be.PRS.3SG climb.PTCP ON the summit  
 (L.-F. Celine, *Mort A Credit*, 1936, p. 537)  
 ‘He climbed onto the summit’
- (69) *Georges est sauté au bas du cabriolet pour s’évader.*  
 Georges be.PRS.3SG jump.PTCP at-the bottom-of-the gig for REFL  
 évader. (C. Mauriac, *La Marquise sortit à cinq heures*, 1961, p. 243)  
 escape.INF  
 ‘George jumped out of the gig to escape’
- (70) *Grimpée dans un mûrier pour en déguster les fruits, elle en était dégringolée.*  
 climbed in a mulberry-tree to of.it.PRO taste.INF the fruit she  
 from.it.PRO be.PST.3SG plummet.PTCP (R. Grenier, *Andrélie*, 2005, p. 159)  
 ‘Having climbed into a mulberry tree to eat the fruit, she then fell out of it’



## Conclusion

In the first part of this paper (Sections 1 to 3), I mainly discussed the general assumption that Manner and Path cannot be encoded in the same verb. This restriction in the domain of motion corresponds to a more general claim that Manner and Result cannot be encoded in the same grammatical constituent. It intersects with the two-way typological division between Verb framed languages and Satellite framed languages. As an alternative view of motion description, I presented the classification criteria proposed by Aurnague (2011): the combination of the notion of “change of placement” and of “change of relation”. These criteria act as tools to precisely define classes of verbs that do not have to fit into one or the other class of manner verbs and path verbs (cf. 3.3). I underscored the fact that on the basis of these criteria, there is no need to systematically consider Manner and Path as mutually exclusive, and I demonstrated that part of the lexicon in French encodes both. For instance, verbs such as *filer* or *débouler* express both the manner and a change of relation and change of placement. They respectively mean ‘leave’ with the manner of being discreet, and ‘arrive’ with the manner of being uninvited, unannounced, intrusive and possibly noisy. Conversely, I also showed that some properties associated with change of relation or path can be conveyed to some extent by change of placement verbs. These properties, described by Aurnague 2011 as a “goal oriented trend”, are speed, directionality, being constrained by a force or being moved by a force. They are conceptualized as a family resemblance. The more a verb cumulates these properties, the more it will express a change of relation. This first part of the paper thus offers new tools to rethink motion beyond the classical opposition between manner and path. It allows a fine-grained analysis of the lexicon, besides general typological trends.

In the last section, I investigated the relation between motion verbs and locative constituents. My aim was to determine how far the semantic content of verbs determines their argument structure and argument realization. I showed, through a series of syntactic tests (constraints on the presence, the form and the position), that locative constituents can alternatively be argument of the verb or of the verbal construction.

First, I assumed that it is the semantic structure of verbs, as defined in Aurnague (2011) and presented in Section 3, that governs the choice of arguments with specific thematic roles. A verb can establish a hierarchy between its arguments. If the verb describes a change of placement, it selects by default a Location PP (frame of reference). If it describes a final change of relation, it selects a Goal. In this case, the prior motion (change of placement) can be integrated into its semantics; it can thus also select a locative PP referring to this prior phase of the event.

Second, I assumed that some resulting meanings cannot totally derive from the semantics of verbs or prepositions but are instead built at the level of the construction. I claim, however, that this resulting meaning, realized at the constructional level, nonetheless arises from the presence in the verb semantics of some properties or features able to trigger a shift in the verb behavior. For instance, I have shown that a change of placement verb such as *courir* ‘run’ can lead to a change of relation and change of placement because it conveys the property of speed. And, conversely, *aller* can behave as a change of placement verb (*aller chantant*) when its goal argument is omitted. This is made possible because this verb involves a change of placement preceding the final change of relation. Previous work has abundantly discussed these types of shift in meaning in aspectual terms. Here, I have provided a tentative explanation in spatial terms.

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# From *il s'envole hors* to *il sort du nid*

## A typological change in French motion expressions

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In this chapter, I describe the evolution from Latin to French, focusing on a specific typological change: that from a Satellite-framed to a Verb-framed language, in the (much debated) dichotomy established by Talmy (1985). The goal of the paper is to describe in detail the loss, between Medieval and Modern French, of one important feature of Satellite-framed languages: Satellites. In order to do this, I rely on a quantitative and qualitative diachronic corpus study of a series of adverbs with particle uses in Medieval French, following their decline throughout the diachrony of French. I describe the uses of these adverbs and their gradual disappearance, which has left room for other spatial grams, mainly adpositions.

**Keywords:** particles, adpositions, typology, diachrony, corpus, spatial grams

### 1. Introduction

Starting at least with stylistic considerations on differences between French and German (e.g. Bally 1932), scholars have long noticed that languages differ in the way they encode motion. Talmy (1985, 2000) has summed this up neatly with his verb-framed vs satellite-framed (henceforth VF/SF) typology, later taken up by Slobin (1996, 2004), among many others. In the wake of a large body of research on space in language, this VF/SF typology has been the focus of many studies in the last twenty or thirty years. It is now commonly assumed, for instance, that Germanic and Slavic languages tend to be SF, and Romance languages VF. Indeed, many studies have highlighted the specificities of Romance languages, esp. vis-à-vis Germanic languages (see already Aske 1989).

However, there seems to be a good deal of within-type differentiation, and even closely related languages can behave quite differently with respect to the Talmian



typology (Fagard et al. 2013, 2017). Indeed, the limits of a simple VF/SF typology for Romance languages have been shown on multiple occasions, especially for Italian and Italian dialects (from Gsell 1982 to Iacobini 2009). Perhaps the most interesting fact concerning the VF/SF typology in Romance languages is that Romance languages, which are globally VF, derive from Latin, which is clearly an SF language, with a productive use of dynamic spatial verb prefixes (Iacobini and Fagard 2011). From this point of view, French is one of the Romance languages which has gone furthest in the shift from SF to VF. More exciting yet, this shift can be clearly tracked and documented, since Old French is still structurally SF (Kopecka 2006, 2009, in press; Schøsler 2008), while Modern French is among the most typically VF of Romance languages.

The question I address in this paper is precisely *how* this shift was brought about. More specifically, I focus on dynamic spatial adverbs, which have been shown to function like particles in Medieval French (Buridant 2000: 544ff., Burnett and Tremblay 2012),<sup>1</sup> with an aim to understand exactly when and how they disappeared. My main question in this regard is whether, when and to what extent French has gotten rid of these particles. In order to do this, I first show that there has indeed been a *very clear* drop in the use of these particles, with a waning paradigm of grams (i.e. grammatical morphemes, see Svorou 1994) which are less and less used as such. This is shown on the basis of a large diachronic corpus study of over 25 particles, which allows me to establish the rate and extent of this drop, from Old to Modern French. In Section 2, I describe the results of previous research on the subject, from SF features in Latin to particles in Old French. In Section 3, I present my methodology and corpus. Section 4 is devoted to the results of the study, which are further discussed in Section 5, before my conclusion in Section 6.

## 2. State of the art: Motion event descriptions in Latin and Medieval French

In Classical Latin, the use of satellites is similar to that found in Modern Germanic languages, especially in the case of motion event descriptions (Iacobini and Corona 2016). The diachronic shift from SF Latin (and Old French) to VF Modern French entails a series of changes in the expression of motion events, including of course a

1. Particles are polyfunctional grams, with uses as adverb, particle and adposition, which act as what Talmy (1991: 486) calls *satellites*, i.e. elements which are “in a sister relation to the verb root”. Interestingly, the existence of such particles in French has been spotted only recently, cf. Marchello-Nizia (to appear).

shift in the description of the path component, from verb prefix and/or particle to verb and adpositional phrase, as illustrated by Examples (1a–b).

(1) (Latin)

- a. *Auximo Caesar progressus omnem agrum Picenum percurrit.*  
 (Caesar, *De Bello Civili*, 1.15, Renatus du Pontet (ed), Perseus database)  
 ‘Caesar, having moved forward from Auximum, traversed [lit. *across-ran*] the whole country of Picenum.’  
 (*The Works of Julius Caesar*, translated by W.A. McDevitte and  
 W.S. Bohn, 1869)

(French)

- b. *D’Auximum, César a avancé à travers la campagne de Picenum*  
 (my translation – one possible translation among others)  
 ‘Caesar has moved forward across the country around Picenum’

The Path component could also be separated from the verb, with (2a) or without (2b) coexpression in the verb prefix; adpositional phrases could also contain Path-related information, as illustrated by *de arbore* ‘down from the tree’ in (2b).

(2) (Latin)

- a. *eorum sectam sequuntur multi mortales / multi alii e Troia strenui viri / ubi foras cum auro illic exhibant*  
 ‘Many people followed their band out of Troy, many other stalwart men, as they were going away (lit. *out.going outside*) from there with gold’  
 (Virgil, *Aeneid*, II, vv. 795–797) (transl.: J. D. Reed, 2007, *Virgil’s Gaze: Nation and Poetry in the Aeneid*. Princeton University Press: Princeton & Oxford, p. 97)
- b. *ubi ille abiit, ego me deorsum duco de arbore, ecfodio aulam auri plenam.*  
 ‘as he goes away [lit. *went away*; i.e. after hiding his treasure], I climb down [lit. *lead myself down*] the tree, and dig up the pot, full of gold’  
 (Plautus, *Aulularia*, 3rd c. B.C., vv. 708–709, my translation)

Most Modern Romance languages display verb-particle constructions<sup>2</sup> similar to those found in Latin, such as *me deorsum duco* in (2b), in which the meaning of the verb phrase can be compositional or opaque. Various patterns are found, a few of which I illustrate in (3) for different Romance languages (see for instance Masini 2006, Iacobini and Masini 2007 for Italian, Mateu and Rigau 2010 for Catalan).

2. Following Goldberg (1995) and others, I understand a construction as an abstract linguistic pattern with a specific, non-predictable form and/or function, which “imposes a meaning, and under the right implicit circumstances ‘coerces’ interpretations” (Traugott 2008: 223).

## (3) (Italian)

*venire giù* ‘come down’, *saltare giù* ‘jump down’, *portare via* ‘take away’,  
*mettere sotto* ‘put under’

## (Catalan)

*anar avall* ‘go down’, *tirar fora* ‘pull out’, *tirar amunt* ‘pull up’, *tornar enrere* ‘go  
 back (lit. ‘go.back back’)’

## (Spanish)

*ir abajo* ‘go down’, *echar fuera* ‘throw out’, *echar arriba* ‘throw down’, *volver  
 atrás* ‘go back (lit. ‘go.back back’)’

## (Portuguese)

*ir abaixo* ‘go down’, *deitar fora* ‘throw out’, *voltar atrás* ‘go back (lit. ‘go.back  
 back’)’

## (Romanian)

*a veni jos* ‘go down’, *a sări jos* ‘jump down’, *a se întoarce (înapoi)* ‘go back (lit.  
 ‘go.back back’)’

From this point of view, French is an exception:<sup>3</sup> not only because verb-particle constructions are virtually absent, but also because they are replaced in context by other devices. As illustrated in (4a), when telling a child to come down a slide, for instance, an Italian-speaking parent would typically use a verb-particle construction, while a French-speaking one wouldn’t (4b).

## (4) (Modern Italian)

a. *Salta giù! Andiamo via!*

‘Jump down! We’re going! (lit. away)’

(Modern French)

b. *Descend de là! On y va!*

‘Get down (lit. from there)! We’re leaving! (lit. there going)’<sup>4</sup>

The same cannot be said of Medieval French (i.e. Old French and Middle French, see Table 1), which still displays typical features of SF languages: besides prepositional phrases (5a) still found in Modern French, it also uses verb prefixes (5b) and

3. The “French exception” in Romance is not restricted to this typology; French is indeed known to stand out among Romance languages, for instance from the point of view of analyticity, or of grammaticalization. Indeed, similar accounts can be given for a series of features (see e.g. Lamiroy 1999, 2011; Böhme-Eckert 2004; Carlier 2007; De Mulder & Lamiroy 2012; Fagard et al. 2016).

4. It could be contended that *y aller* “go there” is a satellite construction. However, the tendency of French-speaking children to analyze it as a simple verb – as illustrated by the formation of the past tense, e.g. *on est yallés* “we are there.gone” instead of *on y est allés* – seems to go against this hypothesis. The same applies to *s’en aller* “go away (lit. go oneself from here)”, with occurrences such as *on s’est pas enallés* “we haven’t gone away” for on *s’en est pas allés*.

particles such as *avant* 'forward', *aval* 'down(hill)' and *fors* 'outside' (cf. Marchello-Nizia 2002: 214; Buridant 2000: 544) (5c):

- (5) (Old French)
- a. *Vait s'en Brandan vers le grant mer*  
(*Le Voyage de Saint Brendan*, 1112, v. 157)  
'Brendan goes away **towards** the high sea'
  - b. *si s'entrecomencierent a resgarder mout honteusement*  
(*Queste del saint Graal*, 1225–1230, p. 211)  
'so they started looking at each other (lit. *through-looking each other*) full of shame'
  - c. *sanz faille nos istrons demain fors et leur corrons sus*  
(*La mort le roi Artu*, 1230)  
'without failing we will go out tomorrow (lit. *exit out*) and assail them (lit. *run them up*)'

This leaves us with a series of questions as to how this process was brought about, including the links to more global language changes in the shift from Latin to Romance.

### 3. Theoretical framework and methodology

My approach is bottom-up, corpus-based, and relies both on grammaticalization theory (Meillet 1912; Kuryłowicz 1965; Hopper and Traugott 2003) and construction grammar (Goldberg 1995), specifically following Traugott's (2008: 236) proposal. In Sections (3.1–3.4), I describe my corpus (3.1), the individual spatial grams I focus on (3.2), how I dealt with noise identification (3.3) and how I coded the data (3.4).

#### 3.1 Corpus

The corpus is made up of two databases, the BFM database and Frantext (see the Reference section, and the introductory chapter). It covers the whole period for which there are available texts in French, i.e. from the 10th c. to the 21st c. Following general practice in studies on the diachrony of French, I cut up this vast time span of nearly 12 centuries into different periods: Old French, Middle French, Classical French and Modern French. Following Combettes and Marchello-Nizia (2010), I also distinguished Preclassical French, as shown in Table 1.

As is generally the case in diachronic corpora, the corpus is hardly well-balanced, with a much larger corpus for later periods. However, this does not

**Table 1.** The corpus, with texts from the BFM and frantext databases

Period	Dates	Texts	Word count
Old French	900–1350	196	7,070,087
Middle French	1351–1550	349	11,624,693
Preclassical French	1551–1650	337	13,224,564
Classical French	1651–1800	564	22,742,599
Modern French	1801–2013	3,618	196,808,083
<b>Total</b>	<b>900–2013</b>	<b>5,064</b>	<b>244,399,939</b>

seem problematic, since the phenomenon under study is actually more frequent in earlier texts: Buridant (2000: 546), for instance, links their disappearance to the shift in word order (see e.g. Combettes 1988; Marchello-Nizia 1995). He notes that the decline starts in the 15th c. and steepens during the 16th c., leaving only residual, literary and/or dialectal uses from the 17th c. onwards. This scenario seems confirmed by the data presented in Burnett et al. (2010).

In this respect, the evolution of grammatical descriptions of French is telling (Marchello-Nizia, to appear). The absence of particles as a functioning and productive paradigm as early as the 16th c. is shown by the fact that they are not mentioned (as such) in the first grammars of French (e.g. Palsgrave 1530). This also explains why it took grammarians so long to acknowledge their existence – they are still absent from descriptions of the diachrony of French in the early 20th c. (for instance Brunot 1905 or Sneyders de Vogel 1919), and were described first in Wagner (1946) and Buridant (1987a, 1987b, 1995).

Even modern grammars of Preclassical and Classical French (Gougenheim 1984; Fournier 1998) mention verb-particle constructions either hardly or not at all; at best, they list a few examples, which are given more as lexical oddities, see for instance Gougenheim (Fournier 1998: 188), thereby providing an indirect confirmation that the construction is no longer productive:

*Sus*, an adverb meaning ‘on’, is used most of all to build verb phrases: *Car quel profit en sent-il, si neantmoins il donne à son ennemy moyen de se remettre sus* ‘for where is his profit, if he lets his enemy pull himself back together? (lit. *put himself up*)’ (Montaigne, *Essais*, I, 47; t. I, 2, p. 102; my translation)

For that reason, I limited my investigations to a subset of particles for later periods.

An important part of my study was to distinguish, first, particle uses from noise. This turned out to be a trickier process than expected, both because of the enormous amount of occurrences and because of the ambiguous status of quite a few examples. This issue is addressed in detail in Section 3.3.

### 3.2 Particles

In order to study the evolution of the verb-particle construction from Old to Modern French, I extracted from the corpus all occurrences of a series of particles which could partake of this construction. The choice of these particles was based on lists found in both modern (Buridant 2000; Marchello-Nizia 1979) and ancient grammars (*Manière de langage* 1415), and papers devoted to the question of particles in Medieval French (Burnett et al. 2010; Burnett and Tremblay, op. cit.; Marchello-Nizia 2002). That these particles were perceived as being part of the same paradigm by (at least some) speakers is shown by the list found in the 1415 *Manière de langage*:

*Sus, jus; avant, arriere; en costé, au bort; en hault, en bas; ciens, liens; dedens, dehors; deça, de illeques, de la; loing, pres; ycy, illeques; la, ça; par ça, par la, par cy; sus, soubz; desus, desoubz; par desus, par desoubz; oultre, parmy; jusques, auques; autour, tout environ, aileurs* (*Manière de langage*, 1415, p. 52)

The few papers on the subject focus on a small set of particles. For instance, Burnett et al. (2010) address the same issue in a similar spirit, with interesting findings; however, they analyze only a pair of adverbs, namely *avant* 'forward' and *arrière* 'back'; as we have seen, this constitutes only a small subset of the constructions found in French at that time. For my part, I included almost all particles mentioned by the *Manière de langage*. It is true that the most studied ones may have a special status, given that the nine most frequent ones (*sus* 'up', *hors* 'out', *jus* 'down', *ens* 'in', *avant* 'forward', *devant* 'forward, in front', *dedans* 'inside', *encontre* 'against', *aval* 'down(hill)') make up for more than two thirds of the occurrences I retrieved in Old French; the six most frequent ones in Middle French (*sus* 'up', *hors* 'out', *dedans* 'in', *en haut* 'up', *jus* 'down', *ensemble* 'together'). However, including the others made it possible to show that there is a global decline and that it would probably be more accurate to describe the system as a series of constructions than as a single one, or, more specifically, a series of microconstructions underlying the verb-particle mesoconstruction (see Section 3.4).

In this paper, without trying to be exhaustive, I therefore tried to gather data on a larger paradigm of particles. I thus retrieved from the corpus all instances of the following list of particles, including possible graphic variations (in all cases for which a first qualitative survey showed that the verb-particle construction was found):<sup>5</sup>

5. In some cases, particularly in the later periods, the satellite construction seems either nonexistent or so marginal it did not seem relevant to extract the data; see Table 4.

Table 2. Grams included in the corpus study

Particle and gloss	Variants found in the corpus
<i>amont</i> ‘up(hill)’	<i>amont, amunt, amúnt</i>
<i>arrière</i> ‘back’	<i>arriere, arrière, arrieres, detriés*</i>
<i>aval</i> ‘down(hill)’	<i>aval</i>
<i>avant</i> ‘forward’	<i>avant, devant</i>
<i>avec</i> ‘with’	<i>avec, avecques, aveuc, avoec, ovoc, ovoec, ovoeqes</i>
<i>bas</i> ‘down’	<i>bas</i>
<i>contre</i> ‘against’	<i>contre, cuntre, encontre, encuntre</i>
<i>contremont</i> ‘up(hill)’	<i>contremont, contremunt, cuntremunt, encontremont, encontremunt, encuntremunt</i>
<i>contreval</i> ‘down(hill)’	<i>contreval, cuntreval</i>
<i>ensemble</i> ‘together’	<i>ensemble, ansamble, ansamble, ensamble, ensamble, ensanle, ensamble</i>
<i>entor</i> ‘around’	<i>entor, entour, entur, antor</i>
<i>environ</i> ‘nearby’	<i>environ, environs, envirun, anviron</i>
<i>ens</i> ‘in(to)’	<i>ens, enz, anz, ceans, céans, dedans, dedanz, dedens, dedenz</i>
<i>fors</i> ‘out’	<i>fors, hors, forz, horz</i>
<i>haut</i> ‘up’	<i>hault, haut</i>
<i>jus</i> ‘down’	<i>jus, juz</i>
<i>loin</i> ‘far’	<i>loign, loin, loing, luign, luin</i>
<i>parmi</i> ‘through, among’	<i>parmi, parmy</i>
<i>près</i> ‘near’	<i>pres, prés, près, prez, préz</i>
<i>sur</i> ‘on’	<i>sur, seure, sor, sore, deseur, deseure, desor, desore, desseure, dessor, desur</i>
<i>sus</i> ‘up’	<i>sus, suz, dessus, dessuz, desus, desuz, ensus, laissus, laissus, lassus, lasus, leissus, lessus</i>

\* The form *detriés*, unlike the others in this series, is etymologically attached to Latin *trans* ‘beyond’, though its meaning has drifted, as in Ibero-Romance, to ‘behind’ (e.g. Portuguese *atrás* ‘behind’).

These variants are not necessarily of equal status, as shown in Rainsford (to appear): for instance, I did not expect *enz*, *ceanz* and *dedenz* to have the same distributional or semantic properties. The list is not exhaustive, as I included *ceans* ‘herein’ and *lassus* ‘up there (lit. there.up)’ but not *laienz* ‘therein’; I tried to cover as many combinations as possible, but remaining gaps will have to be filled in future studies. This search yielded the working corpus detailed in Table 3.

**Table 3.** Occurrences of the particles under study in the corpus

Particle	OF	MF	CF	ModF	Total
<i>amont</i>	578	250	41	552	1,421
<i>arriere</i>	907	871	699	18,899	21,376
<i>aval</i>	568	344	57	511	1,480
<i>avant</i>	11,142	19,090	19,791	246,041	296,064
<i>avec</i>	3,605	15,160	68,977	760,633	848,375
<i>bas</i>	408	1,621	5,767	66,793	74,589
<i>contre</i>	4,677	10,105	21,198	131,196	167,176
<i>contremont</i>	163	93	69	6	331
<i>contreval</i>	182	50	0	3	235
<i>ensemble</i>	2,378	4,362	6,764	49,315	62,819
<i>entor</i>	1,352	958	777	635	3,722
<i>environ</i>	730	5,217	1,804	16,693	24,444
<i>ens</i>	5,617	8,623	7,496	6,880	28,616
<i>fors</i>	6,176	10,127	561	23,943	40,807
<i>hault</i>	1,930	3,577	6,395	55,385	67,287
<i>jus</i>	1,003	750	448	2,244	4,445
<i>loin</i>	798	303	6,092	79,245	86,438
<i>parmi</i>	1,208	1,422	6,635	43,682	52,947
<i>pres</i>	2,588	4,956	6,634	88,229	102,407
<i>sur</i>	9,018	21,857	63,701	925,285	1,019,861
<i>sus</i>	1,785	15,604	12,298	64,903	94,590
<i>defors</i>	347	221	0 (+ 1,994 <i>dehors</i> )	0 (+ 28,574 <i>dehors</i> )	568
<b>Total</b>	<b>57,160</b>	<b>125,561</b>	<b>236,204</b>	<b>2,581,073</b>	<b>2,999,998</b>

### 3.3 Noise

Of course, on account of both homonymy and polyfunctionality, not all occurrences were particle uses of the particles under study – far from it. After gathering all occurrences of the graphic forms indicated in Table 2, I sorted them out – all occurrences for Old and Middle French, and a subset only for Classical and Modern French.

I thus excluded first all cases of homonymy, such as *prez* ‘field(s)’ or *jus* ‘juice’ (6a–b), which should obviously be counted as noise.



## (6) (Old French)

- a. *Par tuz les prez or se dorment li Franc.*

(*La Chanson de Roland*, c. 1125, p. 188, v. 2521)

‘throughout the fields the Franks are now sleeping’

(Middle French)

- b. *Et puis y metez du jus de la fueille dou peschier, meslé avec chaus vive, jusques atant qu’il soit gari.* (Gaston Phébus, *Livre de chasse*, 1387, p. 123)  
 ‘and put on it [the wound] some juice from the leaf of a peach tree, mixed with quicklime, until it has healed’

I then did the same with all prepositional uses: despite their close connection to the corresponding adverbs, and Pottier’s (1962: 195–197) contention that adverbial and prepositional (as well as conjunctive) uses actually belong to the same morpheme, it is quite clear that they appear in different constructions, and with only partly overlapping semantics. The syntactic difference is quite obvious in the following examples: in (a), the preposition *sus* ‘on’ governs a noun phrase, *le planchier*, and the resulting prepositional phrase is a complement of the verb *cheoir* ‘fall’. In (b), the noun phrase *le blasme* is a complement of the verb phrase *met sus* ‘blame (lit. ‘put on’)’. Thus, despite a surface similarity with the same form *sus* followed by a noun phrase, the function of *sus* in (7a) and (7b) is quite different, and its semantics as well.

## (7) (Old French)

- a. *pasmee chiet sus le planchier* (*Roman de Thèbes*, 1150, p. 185)  
 ‘fainting, she drops down to the floor’

- b. *La mer ancorpe et si la blasme, / Mes a tort li met sus le blasme, / Car la mers n’i a rien forfet.* (Chrétien de Troyes, *Cligès*, 1176, p. 56b)  
 ‘she accuses and blames the sea, but wrongly does she throw the blame (lit. it<sub>DATIVE</sub> she puts up), for the sea has not done any wrong’

I also excluded all static locative uses of the grams, i.e. contexts in which the gram indicates the situation of an element or anything else than the end-point of its path. I analyze as such both cases in which the verb is static, for instance (8a), and occurrences with a dynamic verb but in which the gram seems to indicate the position of a static element, as in (8b): in this case, for instance, *en haut* ‘up(stairs)’ is more likely to be relevant for the noun phrase *une sale* than for the verb *monter* ‘climb (up)’. In some cases, even with a dynamic spatial meaning and a relative syntactic proximity between verb and gram, the syntax is clearly different, and I excluded occurrences as in (8c) in which the gram is the complement of a preposition: *meu [vers [en haut]]*.

## (8) (Middle French)

- a. *se sui encore cy et il est ens* (Ysaïe le Triste, 1400, p. 73)  
 ‘if I am still here and he is **inside**’
- b. *si le menerent en une sale en haut ou il trova la dame de laienez qui estoit bele et juene...* (Queste del saint Graal, 1225–1230, p. 200)  
 ‘they led him to a room upstairs in which he found the lady of the castle, who was young and beautiful’
- c. *aussi comme le feu est meu vers en haut*  
 (Nicole Oresme, *Le Livre du ciel et du monde*, 14th c.)  
 ‘just as fire moves up (lit. *towards the top*)’

However, I analyzed differently cases in which the preposition is *en* ‘in’, considering that this constitutes a new form of the particle, because the meaning of *en* is clearly bleached. In (9a), for instance, I believe that *en bas* ‘down’ (lit. ‘in low’) should be analyzed as a complex particle [*en bas*], rather than as a prepositional phrase [*en [bas]*], because it alternates with the simple adverb with no (easily discernible) semantic difference (9b).

## (9) (Middle French)

- a. *ne le feu ne se puet acoustumer a descendre en bas, ne quelconque autre chose ne se puet acoustumer au contraire de ce que elle a de sa nature.*  
 (Nicole Oresme, *Le Livre de Ethiques d’Aristote*, 1370, p. 146)  
 ‘nor can fire **move down** (lit. *descend down*), or anything else get accustomed to what is the opposite of its nature’
- b. *l’un va bas et l’autre haut.*  
 (Nicole Oresme, *Le Livre du ciel et du monde*, 1377, p. 548)  
 ‘one goes down and the other up’

Finally, as one could expect, quite a few cases remain ambiguous, namely occurrences in which the gram seems to function both as a particle and as a preposition, as in (10a–e).

## (10) (Old French)

- a. *Elle les maine amont la tor / enz el palais empereor.*  
 (Le roman d’Eneas, 12th c.)  
 ‘she leads them up the tower into the imperial palace’
- b. *luy donne parmy le chief grandismes cops de l’espee, si qu’il li fait le sang rayer aval la face*  
 (La suite du Roman de Merlin, 13th c.)  
 ‘he hits him on the head with great swings of the sword, so hard it makes the blood run down his face’

- c. *Gaidons li preus fist forment a proisier, Sa cloche sone si saut hors del mostier* (Moniage Guillaume, 12th c.)  
 ‘the valiant Gaidons acted valiantly, he sounds his trumpet and jumps out of the church’
- d. *Li quens Guillaumes saut jus del palefroi* (Moniage Guillaume, 12th c.)  
 ‘Count William jumps down from the palfrey’  
 (Middle French)
- e. *Lors fit li Maures sonner la trompette et se mist a monter sus au chastel ou toute sa gent.* (Chronique de Morée, 1322, p. 369–370)  
 ‘Then the Moor sounded his trumpet and started climbing up to the castel with all his people’

These examples are not unlike English verb-particle constructions such as *go up the ladder*.<sup>6</sup> For instance, in (11a), a syntactic analysis could be (i) [*mist ju*] [*del mullet*] or (ii) [*mist*] [*ju del mullet*]. For a modern language, one can ask a native speaker to judge the acceptability of alternate phrasings such as (11b) and (11c) in order to decide which is the best syntactic analysis: the possibility of uttering (11b) would point to analysis (i), and (11c) to analysis (ii).

- (11) a. *et la mist ju del mullet*  
 b. *²et del mullet la mist jus*  
 c. *²et jus del mullet la mist*  
 ‘and (s)he put her down from the mule’

Real particle uses could also be checked with the help of various tests (taken from Iacobini 2015: 631), for instance the impossibility of repeating the particle in coordination (12a), while adpositions must be repeated (12b):

- (12) (Italian)  
 (particle uses)
- a. *Irene porta su il tavolo e Anita (\*su) le sedie*  
 ‘Irene brings up the table and Anita (\*up) the chairs’  
*John drinks up his soup and Peter (\*up) his whiskey*  
 (non-particle uses)
- b. *Irene mangia sul tavolo tondo e Anita \*(su) quello quadrato*  
 ‘Irene eats on the round table and Anita on the square one’  
*John goes up the stairs and Peter \*(up) the ladder*

However, for a language with no living native speakers, it is harder to find a definitive answer; as Buridant (2000: 540–541) observes, it is not always possible to make a clear distinction between adverbial, adpositional and particle use of a

6. For a different analysis of this type of problem, see e.g. Svenonius (2010).

given gram: the distinction cannot be a radical one, and there are ambiguous cases (Buridant 2000). I can only rely on the observations made in the corpus, which contains examples close to both (11b) and (11c).

In sentences (10a-e), the noun phrase or prepositional phrase following *amont* 'up(hill)', *aval* 'down(hill)', etc. could probably be omitted, since these items – *amont* 'up(hill)', *aval* 'down(hill)', *hors* 'out', *jus* 'down' – can function as particles. They could, therefore, be analyzed as such in those contexts, too. However, the possibility to omit the gram itself is harder to assess: sequences such as *?mener la tor* 'lead [up] the tower' or *?rayer la face* 'glide [down] (someone's) face' are not to be found in the corpus, and *sauter de* 'jump from' isn't expected either, though it crops up occasionally, as in (13):

- (13) (Old French)  
*Governal saut de sen agait* (Beroul, *Tristan*, v. 1708, 12th c.)  
 'Governal jumps out from his hiding-place'

Another element tends to confirm that these uses are not exactly adpositional, i.e. that the PP [*de* + NP] 'from NP' is not governed by *jus* 'down' or *hors* 'out': in quite a few occurrences, the PP appears in front of the gram, as in (14a), or is separated from it by another element, as in (14b).

- (14) (Old French)  
 a. *La lance baisse, et fiert le conte / Que du cheval jus le desmonte*  
 (Renaut, *Galeran de Bretagne*, v. 6031, 13th c.)  
 'he lowers his spear and hits the count [so hard] he throws him down from the horse'  
 b. *Et quant il andui furent sus leueit del somme, si raconterent a soi entrechaniablement ce ke il auoient ueut*  
 (*Vie de saint Benoit*, p. 88, 12th c.)  
 'and when they had both gotten up from sleeping, each one told the other what he had seen'

For this study, I decided to exclude unclear cases such as (14a-b), although they could be considered as instances of the verb-particle construction, in order to keep only those cases which are unambiguous. This naturally left a significantly lower number of (potentially) particle uses of the grams, as shown in Table 4.

**Table 4.** Particle (or particle-like) uses of grams in the corpus ('ø' stands for an empty cell, i.e. no occurrences were found, while '\*' stands for non-analyzed cases, i.e. cells for which I knew in advance, given my pilot study, that I would probably find no particle-like uses)

Particle	OF	MF	CIF	ModF	Total
<i>sus, dessus, lassus</i>	863	923	1,484	*	3,270
<i>ens, dedens, çaiens</i>	501	807	753	*	2,061
<i>avant, devant</i>	607	469	44	612	1,732
<i>hors</i>	568	647	159	23	1,397
<i>jus</i>	431	318	16	ø	765
<i>amont, contremont</i>	313	130	43	23	509
<i>haut</i>	11	355	88	41	495
<i>contre, encontre</i>	305	106	*	*	411
<i>ensemble</i>	107	298	*	*	405
<i>aval, contrevail</i>	249	111	10	18	388
<i>arrière, derrière</i>	90	26	7	110	253
<i>loin</i>	114	46	*	*	160
<i>sor, dessus</i>	102	48	*	*	150
<i>bas</i>	ø	29	51	58	138
<i>entor</i>	115	12	*	*	127
<i>après</i>	119	7	*	*	126
<i>environ</i>	92	11	*	*	103
<i>parmi</i>	42	18	*	*	60
<i>près</i>	55	4	*	*	59
<i>avec</i>	46	5	*	*	51
<i>tres</i>	2	ø	*	*	2
<i>dessous</i>	1	ø	ø	*	1
<i>en</i>	1	*	*	*	1
<b>Total</b>	<b>4,734</b>	<b>4,370</b>	<b>2,655</b>	<b>905</b>	<b>12,664</b>

### 3.4 Semantics and morpho-syntax

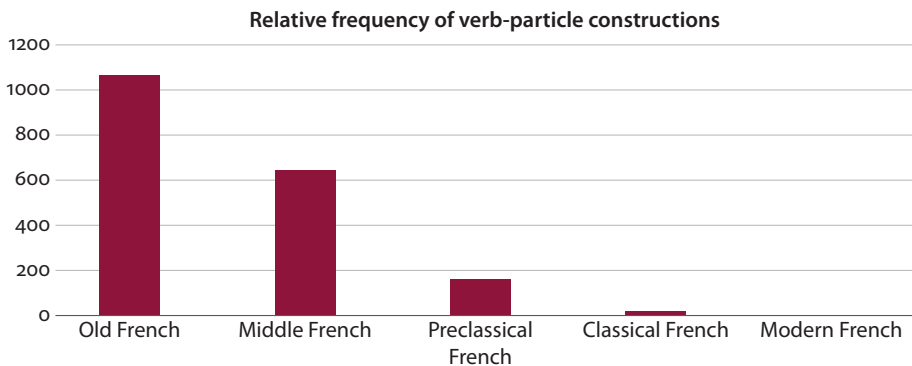
Once I had identified a subset of particle-like occurrences of grams, I systematically coded a series of lexical, semantic and morpho-syntactic features. These included mainly the type of gram, the meaning of the verb, that of the particle and of the resulting construction, the type of construction and the distance between verb and particle (see Appendix).

Following Traugott (2008), I distinguished between macro-, meso- and microconstructions, with an additional layer of constructs for “empirically attested tokens, which are the locus of change” (Traugott 2008: 236). I analyzed verb-particle constructions as a mesoconstruction, i.e. “[a set] of similarly-behaving specific constructions”, and identified 5 subtypes, which I call microconstructions, i.e. “individual construction-types” (Traugott 2008): these microconstructions involve “caused motion” (e.g. *bouter fors* ‘shove out’), “path” (e.g. *issir fors* ‘exit out’), “manner” (e.g. *courir fors* ‘run out’), “deixis” (e.g. *aler fors* ‘go out’) and “satellite” (e.g. *or sus!* ‘let’s go! (lit. now on!)’); I describe them in Section 4.3.

## 4. Results

### 4.1 Global evolution

The results of my study are quite clear. As expected, there is a striking decrease of particle constructions, as illustrated in Graph 1.

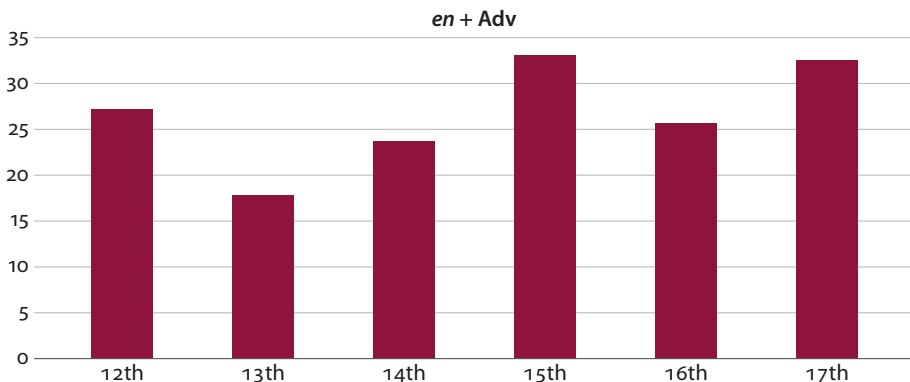


**Graph 1.** Relative frequency of verb-particle constructions in the corpus, in number of occurrences per million words, for the following historical periods: Old French (900–1350), Middle French (1351–1550), Preclassical French (1551–1650), Classical French (1651–1800), Modern French (1801–2013)

The tendency is obvious, with a very high relative frequency in the first texts of the corpus: more than 3,000 occurrences per million words in the 10th–11th century (but relative frequency should be handled with caution for the older periods, for which I have very small corpora), still around 1,000 in the 12th century, but almost down to zero in the last period (20th–21st centuries). This confirms Buridant’s (2000) claim that verb-particle constructions have more or less disappeared by the end of the 16th century.

It also fits in nicely with Burnett et al.'s (2010: 127) hypothesis that these constructions disappeared one after the other, rather than all at once: observing a lag between the decline of *avant* 'forward' (15th–16th c.) and that of *arrière* 'back' (already in the 14th c.), these authors argue that the disappearance of particles “results from the diffusion of a lexical change, affecting verb-particle constructions one after the other” (my translation).

If we take a closer look, indeed, the global tendency becomes blurred: there are variations along the way, with minute reversals of the tendency at various periods for specific subtypes, for instance an increase in frequency of constructions with *en* 'in' from the 13th to the 15th c. and again in the 17th c. (Graph 2). Still, it seems clear that these do not constitute a full-blown renewal of the particle constructions, as this reversal is very limited: it does not extend to other subtypes, does not go beyond a few centuries, and the relative frequency remains quite low.

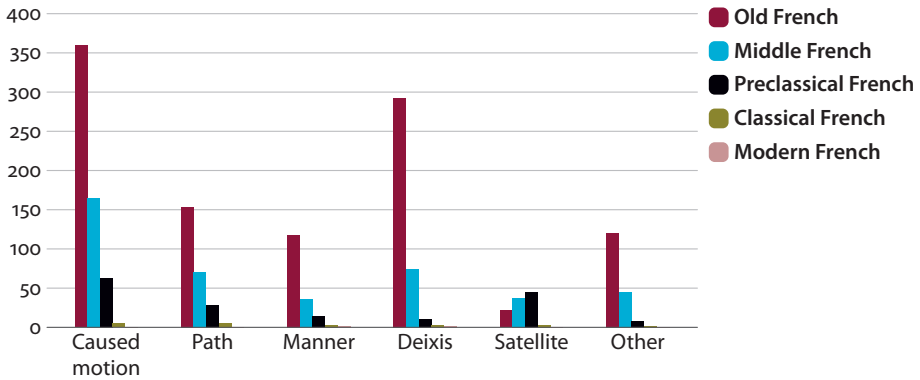


**Graph 2.** Relative frequency of [*en* 'in' + Adverb] in verb-particle constructions, per century, in the corpus (occ. per million words)

Furthermore, the rate of the decline is not the same for the different microconstructions identified in Section 3.4, as illustrated in Graph 3; for instance, the “satellite” microconstruction actually gains frequency.

The main evolution we can reconstruct on the basis of the corpus study is thus that from a full-fledged construction, quite frequent, with many possible realizations and some evidence of entrenchment (e.g. semantic bleaching), to something which is similar on the surface, but can no longer be analyzed as a construction: it is limited to a few possible realizations, and does not display the same morpho-syntactic or semantic features.

Though this evolution is partly gradual, it can be broken up roughly in three main steps. The first one covers Medieval French (950–1550). In Old French (950–1350), step 1a, there is a full-fledged, productive and high-frequency system of particles. In Middle French (1351–1550), step 1b, the system is still



**Graph 3.** Relative frequency of different verb-particle microconstructions in the corpus (in occ. per million words)

productive and frequent, but there is a steady decline of most subtypes, with the near-disappearance of a series of particles. In Preclassical French (1551–1650), step 2a, the construction is still present, but much less frequent, with only a few remaining subtypes; in Classical French, step 2b, the frequency is still lower. Finally, in Modern French (1801–2013), there are only few lexicalized remains of the construction, which no longer exists as such. Syntactic sequences which could seem at first glance analyzable as a similar construction can easily be shown to be something quite different, from both semantic and functional points of view. Table 5 shows the main steps of this evolution, concentrating on the first three (Old to Classical French), since the last one would only show a series of negatives.

**Table 5.** Main steps in the evolution of Particle-like grams in the diachrony of French

Features of verb-particle constructions	Step 1		Step 2		Step 3
	Old French	Middle French	Preclassical French	Classical French	Modern French
Overall frequency (per million words)	> 1000	> 600	≈ 150	≈ 20	< 5
particles	31	27	14	10	7
verbs	241	231	112	61	35
frequent particles (> 20 occ. per million)	21	8	3	0	0
frequent verbs (> 10 occ. per million)	19	9	1	0	0

In the next subsection, I describe these three steps in greater detail, including the specificities of the verb-particle construction in each time period.



## 4.2 Step by step: From Old French to Modern French

### 4.2.1 Old French (950–1350)

In Old French, some thirty particles and a few hundred verbs can appear in verb-particle constructions. Their overall relative frequency, i.e. that of the mesoconstruction, is high (more than 1,000 occ. per million, by my count). The semantics of verbs and particles both are quite varied, with all microconstructions well-represented (except for the “satellite” microconstruction), including lexicalized subtypes which are semantically opaque, such as *mettre sus* ‘accuse [lit. *put on*]’ – see e.g. (7b), and Section 5.3 for a discussion of semantic bleaching.

Among the microconstructions I identified in Section 3.4, “caused motion” is the most frequent one in this part of the corpus, with verbs expressing caused motion such as *throw*, *send* and particles describing path, with or without boundary crossing, as in *jeter fors* ‘throw out’, *bouter aval* ‘shove down’, *mander arriere* ‘send back’, etc. The second most frequent one is DEIXIS, in which all particles combine with the verbs *aler* ‘go’ and *venir* ‘come’, as in *venir avant* ‘come forward’, *venir aval* ‘come down’, *venir ça* ‘come hither’.

Another frequent microconstruction for this time period is “path”, in which both the verb and the particle describe the path, with either semantic redundancy (cf. Buridant, 2000: 543) as in *issir fors* ‘exit out’, or complementarity as in *issir arriere* ‘exit back’. The “manner” microconstruction is not very frequent, even in the Old French section of the corpus; however, there are a few occurrences (slightly under a hundred) of Manner verbs such as *courir sus* ‘run over/upon’, *courir avant* ‘run forward’, *courir fors* ‘run out’, etc.

**Table 6.** Main verb-particle constructions in Medieval French

Most frequent verbs	<i>aller</i> ( <i>avant, encontre, fors, arriere</i> ) <i>mettre</i> ( <i>fors, avant, ens, sus, arriere</i> ) <i>traire</i> ( <i>fors, arriere, avant, sus</i> ) <i>venir</i> ( <i>avant, ça, arriere, sus, ens, amont, encontre</i> )
Most frequent particles	( <i>aller, issir, jeter, mettre, traire</i> ) <i>fors</i> ( <i>aller, mettre, passer, traire</i> ) <i>avant</i> ( <i>aller, mettre, torner, traire, venir</i> ) <i>arriere</i> ( <i>aller, venir</i> ) <i>encontre</i> ( <i>amener, envoyer, venir</i> ) <i>ça</i> ( <i>lever, mettre, monter, saillir, sauter, traire, venir</i> ) <i>sus</i> ( <i>mettre, venir</i> ) <i>ens</i>
Other particles	<i>amont</i> (25 verbs) <i>aval</i> (26 verbs) <i>desoz</i> (10 verbs)

Beyond microconstructions, there are a few extremely frequent constructs, i.e. combinations of a given verb and particle, for instance *issir fors* ‘exit out’ (103 occ.), *aller avant* ‘go forward’ (98 occ.), *venir avant* ‘come forward’ (62 occ.), and *venir ça* ‘come hither’ (50 occ.). But more generally, there is a very large combinability of verbs and particles: quite a few particles can combine with many verbs, and quite a few verbs can combine with many particles, as illustrated in Table 6.

#### 4.2.2 Middle French (1351–1550)

In Middle French, as shown in Table 5, only about half as many particles are frequently found in this construction. Some have been steadily declining, such as *amont* and *aval* ‘up(hill)’ and ‘down(hill)’; they are partly replaced by (almost completely) new ones such as *en haut* and *en bas* ‘up’ and ‘down’. A new subtype of the construction seems to be on the rise, [Verb + [*en* + Adv]] (see Graph 2). Though it does not make up for the decline of the old one, it could account for Burnett et al.’s (2010) comment on the surprising rise in frequency of *avant* ‘forward’ in the 14th c.

Despite its global decline, the construction is still quite frequent (c. 600 occ. per million) and the number of verbs remains high. Most microconstructions are still found in Middle French, with less disparities in frequency than in Old French; “caused motion” is still the most frequent one (approx. 150 occ. per million), followed by “deixis” and “path” (about half as frequent), and finally “satellite” and “manner” (again about half as frequent). The verbs and particles found in the Middle French section are globally the same, with some renewal, which shows the vivacity of the mesoconstruction. For instance, in the “caused motion” microconstruction, though *mettre* ‘put’ is still the most frequent, *bouter* ‘shove’ and *jeter* ‘throw’ gain frequency, and *ruer* ‘throw with force’, almost absent from the Old French section of the corpus, has become one of the most frequent verbs. The microconstruction thus seems to be shifting semantically towards a more marked type of caused motion. The same can be said of particles, for all verb-particle constructions alike: *amont* ‘up(hill)’, *aval* ‘down(hill)’, *contremont* ‘up(hill)’ and *contreval* ‘down(hill)’ tend to disappear, while *en haut* ‘up’ and *en bas* ‘down’ have become proportionally much more frequent. Similarly, in the “path” microconstruction, some verbs are gradually replaced by others: *avaler* ‘go down(hill)’ and *devaler* ‘go down(hill)’ by *descendre* ‘go down’, *choir* ‘fall’ by *tomber* ‘fall’, and, in the “manner” microconstruction, *poindre* ‘rush, hurry’ by *se ruer* ‘rush, hurl oneself’, etc. This replacement takes place over a few centuries, and is only partly completed in Middle French; by Preclassical French, however, the older forms have almost completely disappeared.

Overall, for both Old and Middle French, we have a complex paradigm of particles, some of which have a high relative frequency and appear with a variety

of verbs. Their frequency is highly uneven, with a few very frequent items (*hors* ‘out’, *avant* ‘forward’, *jus* ‘down’, *sus* ‘up’, *arrière* ‘back’: over 50 occ. per million), a mid-frequency group (*ça* ‘hither’, *haut* ‘up’, *enz* ‘in’: 30 occ. per million in average), a low-frequency group (*amont* ‘up(hill)’, *aval* ‘down(hill)’, *bas* ‘down’, *dessus* ‘up, above’, *encontre* ‘against’: between 10 and 20 occ. per million) and two items with very low frequency (*desoz* ‘down, beneath’, *tres* ‘through’: less than 10 occ. per million). At this period, only a few constructions can combine with *en* ‘in(to)’: mostly *haut* ‘up’ and *bas* ‘down’, but also *avant* ‘forward’, *sus* ‘up’, *ça* ‘hither’.

#### 4.2.3 Preclassical and Classical French (1551–1800)

In Preclassical and Classical French, the situation is intriguing: the construction seems to have survived, with a wide variety of verb-particle constructions, or at least of syntactic [Verb+Adverb] combinations, but its frequency plummets to less than 200 occ. per million words in Preclassical French, and around 20 occurrences per million words in Classical French – c. 50 times less than in Old French. By the end of the 17th c., quite a few particles have either completely or virtually disappeared, for instance *amont* ‘up(hill)’ and *aval* ‘down(hill)’, but also *loin* ‘far, away’, *entor* ‘around’, *arrière* ‘back’; some of them have altogether disappeared from the language, for instance *ens* ‘inside’. Only one microconstruction remains fairly frequent: the “satellite” microconstruction, i.e. the use of a particle alone, without a verb, with some 30 occ. per million words. Other microconstructions have virtually disappeared, and are found only with their most typical instances. For instance, the “manner” microconstruction is found frequently (i.e. over ten occurrences per million) only with two verbs, *marcher* ‘walk’ and *courir* ‘run’.

Despite this evolution – which clearly shows a loss of productivity of the construction –, even late in the diachrony of French, there seems to be a semantic equivalence between verb-particle constructions and simple verbs, as illustrated in Example (14):

(14) (Classical French)

*Semblables on peut voir les deux fortes armées / De desirs ennemis à la charge animées, / Tantost aller avant et tantost reculer*

(Antoine de Montchrestien, *Hector*, 17th c.)

‘Similar, the two strong armies can be seen, driven to the attack by enemy desires, one moment going forward and the next going back’

#### 4.2.4 Modern French (1801–2013)

In Contemporary and Modern French, there are of course many possible combinations of verbs and adverbs, which seem quite similar to the medieval construction. However, they are both much less frequent (less than 10 occ. per million words)

and functionally quite different, with little or no evidence of semantic opacity, for instance; besides, the combinations are much more restricted, with much less semantic complementarity: generally, in Modern French, the verb and adverb appearing in such constructions have similar semantics, as in *monter en haut* ‘ascend up [or upstairs]’, *descendre en bas* ‘descend down [or downstairs]’, *sortir dehors* ‘exit out [or outside]’ and the like. Thus, only a subset of the initial constructions have remained – and they should no longer be analyzed as a construction, or at least, not as a verb-particle construction. In these contexts, *en bas*, *en haut* and *dehors* seem to be locatives, rather than particles, as shown by (15):

- (15) *il est sorti dehors / il est monté en haut et il y est toujours*  
 ‘he went outside / he went upstairs and he’s still there’<sup>7</sup>

Another element which shows that the construction is no longer productive is the fact that, for instance, in the “caused motion” subtype, the verb *bouter* ‘throw’ is the most frequent one, always with the particle *hors* ‘out’ – though *bouter* is much less frequent in Modern French, and no longer seems to be productively used (around 15 occ. per million words at this period, in Frantext, vs. a relative frequency of some 150 occ. per million in Old and Middle French). This is thus clearly an instance of archaism, in which the construction *bouter hors* ‘expel’ (or its equivalent *bouter fors*) is taken as a whole. Another clue to its lexicalized status is the fact that the corpus contains a few occurrences in which the construction has been reanalyzed as a noun, as in (16).<sup>8</sup>

- (16) *Les voiles, frappées de côté par le vent, fazèièrent alors si brusquement, qu’il vint à masquer en grand; les boute-hors se rompirent, et il fut complètement démané.*  
 ‘the sails, with the wind hitting them from the side, started flapping so abruptly that the wind took them from the front; the *boute-hors* [fire-booms] broke down and it [the boat] stopped completely’  
 (Honoré de Balzac, *La Femme de trente ans*, 1842, p. 1183)

In fact, the verb-particle construction left behind a series of lexicalized remains of this type: *boute-feu* or *boutefeue* ‘lighting stick for cannons’, *boute-en-train* ‘a funny and animated person’, etc.

7. My thanks to Tom Rainsford (p.c.) for pointing this out.

8. This noun has been in turn reanalyzed as *bout-dehors* (lit. ‘far end’); this is a further indication of the construction’s opacity.

### 4.3 Microconstructions

Among the many verb-particle constructs, the relative importance of some microconstructions thus varies over time. This is not really the case for the most frequent microconstruction, “caused motion”, however. Over the whole period, it involves roughly the same caused motion verbs: mainly *mettre* ‘put’, *jeter*, *bouter* ‘shove’, *traire*, *traîner* ‘pull’, and *lever* ‘raise’ (c. 80% of all occurrences of the construction), generally in combination with *hors* ‘out’, *(de(s))sus* ‘up’, *(ded)ens* ‘in’, *jus* ‘down’ (c. 75% of all occurrences of the construction). Though both verbs and particles partaking of this construction evolved over time, some becoming more frequent and others disappearing, and the construction underwent a slight semantic change, it remains the most frequent until Classical French – i.e. as long as the verb-particle construction exists as such.

The “satellite” microconstruction is the only one to gain frequency from Old French to Middle French and on to Preclassical French; it more than doubles, from 22 to 45 occ. per million words. However, as we will see in Section 5.1, this could be interpreted as part of the decline of the verb-particle construction.

For all other microconstructions, there is a quick and important decline. They lose in relative frequency, and do not change much save for the already mentioned lexical replacements: frequent “path” subtypes all over the corpus are *issir/sortir* ‘exit out’, *entrer ens* ‘enter in’, *passer parmi* ‘pass through’, *monter sus* ‘ascend up’, *avalér/descendre jus* ‘descend down’, with few verbal variants but a series of equivalents for the pair of particles *sus* / *jus*: *(en) haut*, *amont*, *contremont* / *(en) bas*, *aval*, *contreval*. Similarly, frequent “manner” subtypes involve generally the same manner of motion verbs, mainly *courir* ‘run’, *saillir* ‘jump’, *sauter* ‘jump’,

Table 7. Verb-particle microconstructions in the corpus

Microconstruction	Most frequent verbs / particles
“caused motion”	<i>mettre</i> ‘put’, <i>jeter</i> ‘throw’, <i>bouter</i> ‘shove’, <i>traire</i> , <i>traîner</i> ‘pull’, <i>lever</i> ‘raise’ <i>hors</i> ‘out’, <i>(de(s))sus</i> ‘up’, <i>(ded)ens</i> ‘in’, <i>jus</i> ‘down’
“path”	<i>issir/sortir</i> ‘exit out’ <i>entrer ens</i> ‘enter in’ <i>passer parmi</i> ‘pass through’ <i>monter sus</i> ‘ascend up’ <i>avalér/descendre jus</i> ‘descend down’
“manner”	<i>courir</i> ‘run’, <i>saillir</i> , <i>sauter</i> ‘jump’, <i>sus</i> ‘up’, <i>avant</i> ‘forth’ <i>marcher</i> ‘walk’, <i>voler</i> ‘fly’
“deixis”	<i>aller</i> ‘go’, <i>venir</i> ‘come’ <i>avant</i> , <i>devant</i> ‘forth’
“satellite”	∅ <i>sus</i> ‘up’

*marcher* ‘walk’, *voler* ‘fly’ (almost 95% of all occurrences), often in combination with *sus* ‘up’ or *avant* ‘forth’ (more than 60% of all occurrences).

Table 7 sums up the main features of the microconstructions I identified in the corpus.

## 5. Discussion: A global replacement of spatial grams?

My results provide an illustration of the shift from SF to VF in Medieval French in line with previous findings. One important (if provisional) result of my study is that it confirms and further details Burnett et al.’s (2010) hypothesis of a gradual decline: as could be expected, the verb-particle construction does not disappear all at once, but gradually thins out, one subtype after the other. One subtype even gains frequency – the “satellite” microconstruction –, but it should probably not be put in the same category at all periods. I discuss this issue in Section 5.1. Another important issue is how lexicalized subtypes should be analyzed: there is a growing divide between semantically opaque, lexicalized constructions and semantically transparent ones; I discuss this point in Section 5.2, devoted to their analysis as the result of a grammaticalization process, and in Section 5.3, which addresses more specifically the issue of lexicalization and productivity.

### 5.1 The “satellite” microconstruction

In Old French, the “satellite” microconstruction is very marginal, amounting to roughly 2% of all verb-particle constructions, with various realizations including not only the absence of a verb but also modal verbs such as *pooir* ‘be able to’, and various particles (*sus* ‘up’, *hors* ‘out’, *contreval* ‘down’, *jus* ‘down’, etc.). In Preclassical French, it amounts to more than one fourth of all occurrences, and is almost completely restricted to the adverb *sus* (over 96% of all occurrences) occurring without a verb. As always, it is quite impossible to pinpoint the exact spot in the corpus in which *sus* without a verb ceases to function as a verb-particle construction. Another way to analyze this evolution would be that the particle gradually becomes autonomous, or rather regains its syntactic autonomy. *Sus* in (17), for instance, is no longer part of a verb-particle construction, and should rather be analyzed as a discourse marker: this is indicated by its repetition, a typical feature of discourse markers, which tend to cluster together (see e.g. Schiffrin 1987: 323, 328).

(17) *Sus, sus, sus, enfans, diligentement.*

(François Rabelais, *Le Quart Livre*, 1552, p. 1009)

‘go on, go on, go on [lit. *up, up, up*], children, promptly’

## 5.2 Semantic bleaching and grammaticalization

The issue of lexicalized subtypes is crucial in the evolution of the construction as a whole. For one thing, despite the global decline of the verb-particle construction, the lexicalized subtype *mettre sus* ‘blame [lit. *put on*]’ (see (7b)) is almost stable from Old French to Preclassical French, with a relative frequency of 10 to 15 occ. per million words; it thus mechanically comes to constitute an ever larger part of the verb-particle constructions present in the corpus, from 1.5% (in Old French) to more than 6% (in Preclassical French) of all occurrences. The same can be said of other lexicalized subtypes: for instance, *corir sus* ‘attack [lit. *run up*]’ (18) goes up from 1.9% to 4.4% of all occurrences in the same period.

- (18) *Lors li corent li autre sus de parole et dient...*  
 ‘then the others shout at her [lit. *run at her with words*] and say...’ (*La mort le roi Artu*, 1230, p. 174; quoted in Burnett and Tremblay 2012: 222, my translation)

Rather than a clear divide between opaque and compositional subtypes, there is a gradient of opacity, with some constructions more opaque than others. There are quite a number of examples in the corpus which seem to be intermediate as far as semantic bleaching is concerned, e.g. (19a–c) which should be understood metaphorically, but are not completely opaque:

- (19) (Old French)
- a. Ne plourez plus, **mettez aval** Ce dueil, biau sire.  
 (*Miracle de saint Guillaume du desert*, 1347)  
 ‘stop crying, and put an end to your mourning [lit. *put down this mourning*], dear sire’
  - b. Et au retour que il fist, si vint par Malevesie ; et **print la cité aval** par force d’armes  
 (*Chronique de Morée*, 1322)  
 ‘And as he came back, he came through Malevesie; and he overtook the city [lit. *took the city down*] with his military power’
  - c. David Qui les armes **mist jus** jadis  
 (G. de Digulleville, *Le Pèlerinage de vie humaine*, 1330)  
 ‘David, who has laid down his weapons long ago’

Other examples may not seem opaque at all on the face of their English translation, but that is only because for instance *go back* and *talk forth* follow the same (opaque) pattern. Others yet are obviously opaque even for English speakers: examples in (20) show that the interpretation of the adverb is sometimes lexicalized and unpredictable, as *fors* ‘out’ corresponds in these cases to English *up*:

- (20) **boire fors, manger fors, paier fors** (Buridant 2000: 544)  
 ‘drink up, eat up, pay up [lit. *drink out, eat out, pay out*]’

In such examples, the particles take on an aspectual meaning. Burnett and Tremblay (2012: 223), after Burnett et al. (2005), claim that the development of an aspectual meaning for some particles cannot be explained as a result of a grammaticalization phenomenon, because the spatial meaning of particles appears exclusively with verbs taking a locative argument, including motion verbs, whereas their aspectual meaning appears only with other types of verbs. However, by definition, grammaticalization phenomena entail an increase in contexts of use: as it grammaticalizes, an item comes to be used in contexts in which it could not have appeared before. Thus, verb particles undergo partial semantic bleaching with motion verbs (18), and the aspectual meaning they take on with non-spatial verbs (19) constitutes the end-point of their grammaticalization process; or rather, as pointed out in most grammaticalization studies, it constitutes *one step* in this process – the development of discourse marker uses, for instance, being a further step in their grammaticalization.

### 5.3 Lexicalization and productivity

Another important issue is the relative frequency of these lexicalized subtypes among verb-particle constructions in general. In Old French, most instances of the verb-particle construction are not semantically opaque (Burnett et al. 2010: 126), and seem to be productively formed in syntax. But in Preclassical French, the relative weight of these lexical subtypes is much more important: for *metre sus* and *corir sus* alone, the share goes up from 3.4% to more than 10%; if we count out “satellite” microconstructions, this change becomes yet more obvious, from 3.5% to 14.6% of all occurrences.

This means that, in Preclassical French, verb-particle constructions not only have become less productive (as shown by the fact that the number of verbs and particles with possible combinations has gone down) but also seem quite fossilized, with two subtypes making up almost 15% of occurrences.

## 6. Conclusion

Verb-particle constructions gradually evolve, in the diachrony of French, from a frequent and productive construction in Old and Middle French to a few lexicalized remains in Classical and Modern French. The data I present confirm that this construction has disappeared by the end of the 16th c. (Buridant 2000), and that



the decline of the construction is very gradual (Burnett et al. 2010). By taking into account an important paradigm of particles, I show that the evolution within the construction is actually quite complex. It involves lexical renewal of both verbs and particles (e.g. from *issir* to *sortir* ‘exit’, from *choir* to *tomber* ‘fall’, from *aval* to *en bas* ‘down’). I also show that there is internal semantic evolution within subtypes or “microconstructions” (e.g. the “caused motion” microconstruction, which evolves towards more clearly marked manner). Finally, there is a clear but gradual fossilization of a few lexicalized subtypes, which in the end have left only individual lexical entries such as *boute-en-train* ‘joker, clown’.

A question I have left for further research is the reason for this decline. Though some possible factors have been identified, such as the change in word order (Buridant, op.cit.) or a semantic shift in the lexicalization of Path (Dufresne et al. 2003, Tremblay et al. 2004; Burnett and Tremblay 2009), none of them seems completely satisfactory, and it would certainly be interesting to have a more definite answer.

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## Databases

- BFM2016* – Base de Français Médiéval. Lyon, ENS de Lyon, IHRIM Laboratory, 2016, <txm.bfm-corpus.org>.
- Frantext* Database. ATILF – CNRS & Université de Lorraine, <www.frantext.fr>.

## Appendix. Coding scheme

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<b>type of gram</b>	<p>simple gram (e.g. <i>enz, fors</i>)</p> <p>deictic gram + <u>dynamic gram</u> (e.g. <i>ça enz, là sus</i>)</p> <p>adposition + <u>gram</u> (e.g. <i>en bas, en haut</i>)</p> <p>other constructions (e.g. <i>en amont de</i>)</p>
<b>meaning of the verb</b>	<p>manner of motion (e.g. <i>courir</i> ‘run’)</p> <p>caused motion (e.g. <i>bouter</i> ‘shove’, <i>mettre</i> ‘put’)</p> <p>path (e.g. <i>issir</i> ‘exit’, <i>entrer</i> ‘enter’)</p> <p>geocentric motion (e.g. <i>avalier</i> ‘descend’, <i>monter</i> ‘ascend’)</p> <p>other (<i>joindre</i> ‘join’)</p>
<b>meaning of the gram</b>	<p>geocentric (up/down)</p> <p>longitudinal (forward/backward)</p> <p>other</p>
<b>semantic bleaching</b>	<p>semantically opaque</p> <p>semantically transparent</p> <p>no verb</p>
<b>construction analysis</b>	<p>mesoconstruction (i.e. verb-particle construction: yes/no)</p> <p>microconstruction (“caused motion”, “path”, “deixis”, “manner”, “satellite”, “other”, see Sections 3.4 and 4.3)</p> <p>construct (e.g. <i>bouter lassus</i> ‘shove there.up’)</p>
<b>distance between verb and particle</b>	<p>contiguous</p> <p>separated by clitics only</p> <p>separated by only one NP or PP</p> <p>separated by more than one NP or PP</p>

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PART II

## Manner of motion and fictive motion



# Manner as a cluster concept

## What does lexical coding of manner of motion tell us about manner?

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The chapter deals with the lexical coding of manner of motion in French. A two-fold aim is pursued: to provide a better understanding of what manner is from the semantic point of view and to determine what makes some motion verbs express manner and others not. First, I show that there are five types of linguistic devices involved in the expression of manner: lexical, syntactic, morphological, grammatical and prosodic ones. Next, I propose a more comprehensive definition of the concept of manner, arguing that it is compositional by nature and by no means monolithic. Finally, adopting Levin and Rappaport Hovav's lexical decomposition approach, I report an in-depth semantic analysis of 562 manner of motion verbs in French and show that manner interpretation in their meaning is generated by a small set of more basic, non-idiosyncratic semantic features which fill a modifier position and whose role consists in diversifying, and thereby in modifying, the root predicate.

**Keywords:** manner, motion verbs, manner of motion verbs, French

Manner is one of the main semantic and conceptual categories. As such, manner is a notion that is by no means specific to the domain of motion; rather, it structures almost all conceptual domains. This fact has led many scholars to include manner in a small set of ontological categories, and put it on the same level as HUMAN, THING, PLACE, ACTION, QUANTITY, REASON, and so on (see Jackendoff 1983; Heine et al. 1991; Haspelmath 1997; Le Goffic 2002). Since Talmy's work on lexicalization patterns (see Talmy 1985, 2000), arguing that manner is one of the five core semantic components in motion event descriptions, the expression of manner of motion across languages has been extensively studied, in linguistics as well as in psychology and psycholinguistics. What is apparent, however, in this research is that this notion is always used on an intuitive basis and no serious attempt has



been made to outline a genuine definition of manner. Although the notion of manner might intuitively seem to be clear, it is very hard to define it precisely in theoretical terms. On an intuitive basis, one could consider manner as a specific way of performing an action (e.g. *walking* vs. *walking slowly*). Such a definition embraces a large variety of values and manner is thus often considered to be a very heterogeneous notion (see Guimier 1996; Mani and Pustejovsky 2012), which cannot and should not be defined more closely.

In this paper, I assume that a stronger semantic definition of manner is needed in order to study more deeply and more accurately linguistic phenomena linked to this concept. My aim is both to propose a more fine-grained definition of manner and to bring to the fore which basic features manner interpretation is based on in the case of motion verbs in French, my main language of demonstration. Note that the primary focus of this paper is semantic in nature, rather than syntactic.

The paper is structured in three main sections. In the first, I discuss the ways in which the concept of manner is expressed in language, with a specific emphasis on French, in an attempt to show that there are five main types of linguistic means involved. In the second section, I explain the principal mechanisms of how manner interpretation is processed in utterances and I also propose a more accurate definition of this semantic concept. The third section deals with the lexical encoding of manner in French by providing a detailed analysis of what is commonly called “manner of motion verbs” (e.g. *courir* ‘run’, *voler* ‘fly’, *sauter* ‘jump’). My hypothesis is that manner interpretation in the meaning of these verbs is generated by a small set of more basic semantic features that I highlight by exploring a large set of 960 motion verbs in French.

## 1. Five ways to express manner in French

There is extensive academic research on expressing manner in French, as well as in many other languages. Several in-depth studies have been carried out, focusing mainly on two types of linguistic devices involved in the expression of this semantic value, namely syntactic (1) and lexical (2) ones:

- (1) *The young man looked at his father warily/ in a confused way.*
- (2) *Mary was nibbling some chocolate/ running/ shouting in the garden.*

Although the syntactic and lexical encoding of manner are widespread in speech and writing, three other encoding strategies must be taken into account because the same notion can also be expressed by some morphological (e.g. *wrong-ly*, *frog-wise*), grammatical (e.g. *how*) and prosodic means (e.g. by using intonation)

(Stosic 2011: 131–132; Stosic 2013; Moline and Stosic 2016). French uses all five types of linguistic elements in expressing manner.

### 1.1 Syntactic encoding of manner

According to very extensive investigations conducted in French linguistics in the second half of the twentieth century, using “manner adjuncts” or “manner adverbs” is the most common way of expressing manner in French (see, among others, Gross 1990; Nøjgaard 1992–1995; Molinier and Lévrier 2000). Since the general tendency has been to reduce the encoding of manner to the sole category of adverbs (see Gary-Prieur 1982), this type of syntactic element has received considerable attention in the literature at the expense of others. Despite this limitation, this research has helped to establish a list of different kinds of syntactic units and constructions involved in the expression of manner when combined with verbs, adjectives, or other adverbs (see Guimier 1996: 25; Patri 1998; Moline 2011; Stosic 2013; Moline and Stosic 2016). The main units are:

– Adverbs

- (3) *Le bateau s'est éloigné lentement du quai.*  
 the boat be.PRS.3SG move.away-PTCP slowly from.the dock  
 ‘The boat moved slowly away from the dock’

– Invariable adjectives

- (4) *Roulez collectif.*  
 move.IMP.2PL collective.ADJ  
 ‘Travel collectively’

– Prepositional phrases

- (5) *Il les regardait d' un air farceur.*  
 he them watch.IMPREF.3SG from a air mischievous  
 ‘He was watching them with a mischievous air’

– Finite subordinate clauses

- (6) *On préparait le repas du soir comme on pouvait.*  
 we/one prepare.IMPREF.3SG the meal of.the evening as we/one  
 pouvait.  
 can.IMPREF.3SG  
 ‘We were preparing dinner as well as we could’

– Infinitival clauses

- (7) *Elle sort sans dire un mot.*  
 she exit.PRS.3SG without say a word  
 ‘She goes out without saying a word’

## – Gerunds

- (8) *Elle a répondu en souriant.*  
 she have.PRS.3SG answer.PTCP in smiling  
 ‘She answered with a smile’

## – Absolute constructions

- (9) *Un jeune homme était assis au bord de la route la tête baissée.*  
 a young man be.IMPRES.3SG sit.PTCP on the edge of the road the head  
 lower.PTCP  
 ‘A young man was sitting by the roadside with his head bent’

In all these examples, various syntactic constituents are combined on the syntagmatic level with verbs, adjectives, or other adverbs to indicate a specific way that a process, state or quality is realized. Manner adjuncts thus always appear as related to and depending on another element whose value is to be modified.

## 1.2 Lexical encoding of manner

In addition to syntactic means of expressing manner, French has a very large lexicon of verbs (10), simple adverbs (11), and nouns (12) whose lexical meaning involves a manner component:

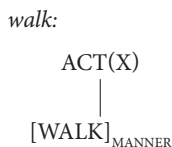
- (10) *marcher* ‘to walk’, *courir* ‘to run’, *voler* ‘to fly’, *hurler* ‘to shout’, *bavarder* ‘to chat’, *délirer* ‘to babble incoherently’, *grignoter* ‘to snack, to nibble’, *dévorer* ‘to devour, to eat up’...
- (11) *ainsi* ‘thus, so’, *bien* ‘well’, *mal* ‘bad, badly’, *vite* ‘fast, quickly’
- (12) *mode* ‘way, mode’, *manière* ‘manner, way’, *façon* ‘manner, way’, *méthode* ‘method’, *tactique* ‘tactic(s)’, *désinvolture* ‘casualness’...

When manner is lexicalized in a word’s meaning, it remains constant in all the uses of the word, that is, in whatever context it is employed. Thus, one can talk about lexicalization when “a particular meaning component [or a set of meaning components, bearing particular relations to each other] is found to be in regular association with a particular morpheme” (Talmy 2000, vol. II: 24).

Lexicalization of manner has been extensively studied over the last few decades from many different approaches in lexical semantics, particularly in the verbal domain. Three of them are worth mentioning here because they give some key clues to further advancing our understanding of the lexical encoding of manner.

### 1.2.1 Predicate decomposition approaches

First, there is very extensive research on “Lexical Conceptual Structure” and similar notions, which all involve some type of predicate decomposition (see Levin and Rappaport Hovav 2011 for an overview of this literature) and which are designed to capture those facets of meaning which determine the grammatical behavior of the verb. Manner appears as part of them. More specifically, in this type of approach, a verb’s meaning is basically seen as combining one or more “primitive predicates” (e.g. ACT, BECOME, CAUSE, and so on) with one or more “constants” (e.g. THING, PLACE, MANNER, STATE, and so on), both of which are limited in number.<sup>1</sup> According to Levin and Rappaport Hovav (1998: 251), the constants are of two types: they can either fill argument positions associated with predicates or act as modifiers to the predicates. As for the manner component, its role is to modify primitive predicates. This is illustrated by the authors by using the example of the manner of motion verb *walk*:



**Figure 1.** Levin and Rappaport Hovav’s model of lexical decomposition of manner of motion verbs (cf. Levin and Rappaport Hovav 1998: 251)

Levin and Rappaport Hovav (1998: 254) further explain that:

the constant WALK represents the essence of walking; the vertical line connecting this constant to a predicate indicates that the constant modifies the predicate, and the subscript on the square brackets around the constant specifies the constant’s ontological type: it is a manner constant.

All manner of motion verbs (e.g. *jog*, *run*, *trot*, *fly*, and the like) share this lexical semantic template. What makes each of them different from the rest is the “particular constant” (namely, WALK), which must be viewed as an idiosyncratic part of their meaning. Levin and Rappaport Hovav’s model of decomposition of manner of motion verbs thus postulates that there are as many particular manner constants as there are manner of motion verbs.

The authors also stress that, in addition to primitive predicates, the presence or not of some constants in decompositions may be relevant to the verb’s grammatical behavior. Thus, the presence of a manner modifier in a lexical representation of verbs has significant consequences for their syntactic realizations, and this is what

1. For further discussion of constants relevant to lexical decomposition, see Pinker (1989), Jackendoff (1983, 1996).

distinguishes the sub-class of manner of motion verbs from such motion verbs as *go*, *come*, *arrive* and the like, that do not match a manner specification (cf. Levin and Rappaport Hovav 1995, 1998: 254). However, the particular constant, that is the particular value instantiating the manner constant itself, is not relevant to the linguistic behavior of lexical items:

The content of the constant is, by hypothesis, opaque to the grammar (Grimshaw 1990; Jackendoff 1990; Pinker 1989). For example, the existence of a manner modifier (...) in a verb's LCS may affect its syntactic behavior, but its syntactic behavior will not be sensitive to the particular instantiation of the modifier.

(Levin and Rappaport Hovav 1998: 254)

Decomposing the lexical meaning of verbs by combining a limited set of primitive predicates with a limited set of constants under the rules of the model claimed to provide a fixed set of lexical semantic templates that allows for the description of all possible verb meanings in a language.

### 1.2.2 *Lexicalization of manner in Talmy's typological approach*

Secondly, the lexicalization of manner in motion event descriptions has been extensively studied in cognitive linguistics and cognitive psychology, based on Talmy's typology (cf. Talmy 2000). In his broad project of exploring meaning-surface relations across languages within a universal cognitive domain, namely in the expression of motion (and location), Talmy describes a basic "Motion event" as including four elements: Figure (the moving or located entity), Ground (the reference object),<sup>2</sup> Path ("the path followed or site occupied by the Figure object with respect to the Ground object", Talmy 2000: 25) and Motion ("the presence per se of motion or locatedness in the event", *idem*, p. 25).

- (13) a. *A rabbit is in the forest.*  
 b. *A rabbit went into the forest.*

This basic schema can be extended by two external components called "co-events", which consist of Manner or Cause, as in Examples (14) and (15):

- (14) a. *A rabbit was lying in the forest.*  
 b. *A rabbit hopped into the forest.*
- (15) a. *The magician put the rabbit into the hat.*  
 b. *He kicked the ball into the stands.*

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2. The located entity is also called "target" (Vandeloise 1986, 1991) or "trajector" (Langacker 1987), whereas the locating or reference entity is also called "landmark" (Langacker 1987; Vandeloise 1991). I adopt Talmy's terminology here.

Two main lexicalization patterns were proposed by Talmy on the basis of what kinds of lexical and syntactic means languages tend to use for expressing two of these components, namely path and manner, and how they are combined in a single clause. Thus, most languages fall into one of the two main typological groups, namely *Verb-framed languages* (VfL) or *Satellite-framed languages* (SfL), depending on where the core information (i.e. the path) is coded.<sup>3</sup> In VfL (e.g. French, Turkish, Japanese, Basque, Hebrew), the “path of motion” is characteristically encoded by the verb so that the manner generally appears as optional information expressed by marginal, adverbial elements (see 16). In SfL (e.g. Slavic, English, Dutch, Finnish, Hungarian), the path component is preferably encoded by various particles or “satellites” associated with the verb, such as prepositions, prefixes, postpositions, etc., which makes it possible to express manner in the verb itself (see 17):

(16) *Jean est entré dans la maison en courant.* (French, VfL)

‘John entered the house running.’

(17) *John ran into the house.* (English, SfL)

According to this approach, due to such a division of labor, in SfL the manner component is naturally expressed by the verb (for instance *run (in)*, *fly (away)*). In VfL, on the contrary, the verb is not available because it must encode the path, so that the manner of motion is generally optional information (see the French sentence in (16)). This is why Slobin (2003, 2006) argued that, since in SfL the manner is encoded in the core element of a sentence, it is linguistically and cognitively much more salient in this type than in Verb-framed languages. This observation is also supported by the claim that SfL have generally a very large vocabulary of manner of motion verbs and that speakers of this group of languages use manner verbs more frequently when describing motion events, contrary to VfL where manner of motion verbs are less common both in the lexicon and in use (cf. Slobin 1996, 2004; Ozcaliskan and Slobin 1999). It has thus been proposed to distinguish, in the expression of motion, *high-manner-salient* and *low-manner-salient* languages (cf. Slobin 2003, 2006). French, it is argued, belongs to low-manner-salient languages.

Scholars drawing on this approach made inventories of manner of motion verbs in many languages of the world, and they also pointed out a wide variety of options for encoding manner in the motion domain. They thus stressed that the lexical encoding of manner is widespread across languages.

3. Talmy also predicted that some languages could present constructions pertaining to another type, thereby displaying a mixed typological profile.

### 1.2.3 *Manner as a structural lexical relation*

The frequency of the lexical encoding of manner in English was particularly highlighted by the creators of the *WordNet* lexical database, G. Miller and C. Fellbaum, who developed the third key approach to the lexicalization of manner (see Miller and Fellbaum 1992; Fellbaum 2002; Fellbaum (ed.) 1998). The aim of their approach was to establish lexical relations that structure the lexicon of English by carving it up into semantically coherent sub-wholes, called “synsets”. Each synset is a “set of cognitive synonyms” and expresses a distinct concept. Synsets are inter-linked by means of conceptual-semantic and lexical relations. Miller and Fellbaum (1992: 217) argue that, regarding English verbs, they are mainly organized in terms of “troponymy”, which is a hierarchical “manner” relation:

most lexicalized verb concepts refer to an action or event that constitutes a manner elaboration of another activity or event.

Thus, troponymy links verbs like *to walk*, *to run*, *to jump*, *to fly* to the more general, superordinate motion verb *to move*. According to (Fellbaum 2002: 24), “the subordinate concept contains the superordinate, but adds some additional semantic specification of its own”. For instance, the verb *walk*, as a troponym of *move*, means ‘move at a regular pace by lifting and setting down each foot in turn’ (*WordReference*). Following the principle of hierarchical organization, the troponym *walk* can be considered itself as superordinate term compared to *stumble*, which means ‘walk unsteadily’ (*WordReference*). According to what has been proposed for defining other lexical relations,<sup>4</sup> troponymy can be defined as follows: a lexical item X (e.g. *walk*) is the troponym of Y (e.g. *move*) if and only if X contains in its lexical meaning the feature MANNER OF Y plus some of the features of Y.

The main originality of this approach is that, firstly, it is not limited to the motion domain, and secondly, it shows how widespread and important the lexicalization of manner is in all semantic domains.

What clearly follows from these three different approaches to the lexicalization of manner in language is that manner may be regarded as one of the main semantic concepts that structure both our linguistic knowledge and cognition.

## 1.3 Morphological encoding of manner

There are languages in which morphology contributes considerably to the expression of manner. Morphological encoding of manner concerns two main word classes: adverbs and verbs. As for adverbs, it is well known that manner

4. See among others the definition of meronymy proposed by Bierwisch (1970) or those proposed by Murphy (2003) for other lexical relations.

adverbs are formed in many languages by different morphological processes, as shown in (18):

- (18) a. *brief-ly, wrong-ly, slow-ly, frog-wise, prayer-wise...*  
 b. *lente-ment* ‘slowly’, *quotidienne-ment* ‘daily’, *avide-ment* ‘avidly’...

In the verbal domain, a number of manner senses are widely expressed by different morphological means. Although morphological means of expressing manner are rarely discussed in the literature, this possibility is mentioned, for instance, by Foley and Van Valin (1984: 39–47), who report some data from Lakhota<sup>5</sup> language, where some prefixes describe the way in which actions happen:

- (19) Lakhota  
*ya-blečha* ‘break or cut with the teeth’  
*na-blečha* ‘break by kicking or stepping on’

Comrie (1985: 344) also showed that many derivative verbs in Zulu<sup>6</sup> (20) and in Russian (21) indicate the manner in which an event occurs:

- (20) Zulu  
*buza* ‘to ask’ > *buz-isisa* ‘to ask insistently’  
*thanda* ‘to love’ > *thand-isisa* ‘to love exceedingly’
- (21) Russian  
*nažat’* ‘to press’ > *pri-nažat’* ‘to press lightly’

As for French, Amiot and Stosic (2011) and Stosic and Amiot (2011) have shown that French verbal derivatives such as those in (22) express a specific way of performing the action indicated by the verb stem:

- (22) *sautiller* ‘to hop (around)’ (<*sauter* ‘to jump’),  
*boitiller* ‘to limp slightly’ (<*boiter* ‘to limp’),  
*marchotter* ‘to walk with difficulty, to walk taking small steps, to walk unsteadily’ (<*marcher* ‘to walk’),  
*voleter* ‘to flutter’ (<*voler* ‘to fly’),

All these verbs are formed by a particular kind of suffixation, which belongs to what is referred to as “evaluative morphology” and/or “pluractionality”. As for the former, lexical items and constructions are traditionally considered to be evaluative if they express some deviation from the “norm” or “standard” fixed by the basis (e.g. *dog*>*doggy*). They carry values such as big, small, good, bad, that is decrease, increase,

5. Lakhota language is spoken in North Central USA and in Canada.

6. Zulu is spoken in South Africa by about 10 million native speakers.



endearment, contempt, etc. (see Stump 1993; Dressler and Merlini-Barbaresi 1994; Grandi 2009; Fradin 2003; Grandi and Montermini 2005; Fradin and Montermini 2009; Amiot and Stosic 2015). As for pluractionality, it indicates that: “the event denoted by the verb is, in some sense, pluralized: repeated in time, distributed in various locations, holds of many participants, etc.” (Greenberg 2010: 119) (see Newman 1990, 2012; Cusic 1981; Yu 2003; van Geenhoven 2004; Laca 2006; Wood 2007; Greenberg 2010; Tovená and Kihm 2008). Evaluation and pluractionality are two distinct phenomena that are not mutually exclusive and that only partially overlap (Amiot and Stosic 2015). Very often, the same set of means or elements is used to express both of them across languages (affixes, apophony, reduplication, etc.).

As Examples (20)–(22) show, evaluative and pluractional markers generally suggest a substantial modification in the realization of events described by the verb stems, especially in their internal structure (see among others Cusic 1981; Newman 1990; van Geenhoven 2004; Grandi 2009; Greenberg 2010; Tovená 2010a, b; Amiot and Stosic 2011). Due to this modification, the action is conceptualized as occurring in a specific way, and hence as not being in conformity with its prototypical representation. Stosic and Amiot (2011) argue that this deviation from the norm is what generates a manner interpretation of the morphologically complex verbs at issue (see also Stosic and Amiot’s contribution in this volume).

The importance of morphological devices for encoding manner varies cross-linguistically depending on whether a given language makes more or less extensive use of evaluative and/or pluractional verbs for describing actions that are performed in a non-canonical way.

#### 1.4 Grammatical encoding of manner

Languages generally possess a small set of grammatical terms expressing a few basic conceptual categories such as person, object, activity, space, time, quality and manner. Since manner represents one of the few domains of conceptualization that are crucial for structuring experience (cf. Jackendoff 1983; Heine, Claudi and Hünne Meyer 1991; Haspelmath 1997), it may also be expressed, in the majority of languages, by means of interrogative and indefinite adverbs or pronouns:

(23) *how, anyway, anyhow, someway, somehow, no way*

In French, two main markers are used for this purpose: *comment* ‘how’ and *comme* ‘like, as’:

(24) *Dites- nous comment vous vous sentez maintenant.*  
 tell.IMP.2SG us how you yourselves feel.PRS.2PL now  
 ‘Tell us how you are feeling now’

- (25) *Il est mort comme on ne meurt plus.*  
 he be.PRS.3SG die.PTCP like one/we not die.PRS.3SG more/no.longer  
 (J. Brel, *La Statue*)

‘He died like we no longer die’

This quick survey of the linguistic means of expressing manner in French reveals that there is a wide variety of available devices. An in-depth investigation shows that, in spite of their diversity, all these devices work in a similar way. Consequently, elucidating the main manner-generating mechanisms that operate at different linguistic levels is key to a better understanding of this concept.

## 2. Towards a more comprehensive definition of manner

The vast majority of scholars dealing with manner do not provide any definition or semantic description of this concept. Instead of definitions, what one regularly finds in the linguistic literature are various intuitive assessments (close to what can be found in dictionaries) according to which manner corresponds to: “a particular aspect of a process, action or state’ (*TLFi*), “the idea of quality applied to essentially verbal notions” (Sechehaye 1926), “a heterogeneous value involved in many various domains” (Guimier 1996), “the way in which the action the verbs denote is performed” (Levin and Rappaport Hovav 1992), “an additional activity” exhibited by a moving entity (Talmy 2000: 45), “an ill-defined set of dimensions that modulate motion, including motor pattern, rate, rhythm, posture, affect, and evaluative factors” (Slobin 2004: 255).

Such assessments are consistently unable to accommodate certain linguistic data, so that even though manner is a very familiar notion to ordinary speakers, students, grammarians, and linguists, its intuitive use in language description is highly problematic for many reasons. It is both too powerful and not refined enough to accurately capture subtle differences between lexical and grammatical items and constructions involving this value, which, although assumed to be uniform, turns out to be extremely heterogeneous. Whatever the language, the heterogeneity of manner is regularly observed at the level of the linguistic forms used as well as at the semantic level. A further difficulty in using manner as a well-assessed analytical and descriptive semantic notion arises from its complex and ill-defined relationships with several neighboring concepts such as quality, instrument, means, quantity, and so on (for more details about a possible articulation of these notions with manner, see Moline and Stosic 2016: 189–192).

The previous overview of encoding possibilities (see Section 1) clearly shows that manner interpretation is processed in utterances on the basis of a set of

mechanisms that can be helpfully used in providing a more accurate definition of manner. The following definition, initially proposed by Stosic (2011, 2013), and taken up by Moline and Stosic (2016), adequately captures them and will be adopted here:

Manner is a complex semantic value, incidental by nature to some substrate element that is processed by various lexical, syntactic, morphological, grammatical and prosodic means and strategies. This processing results in diversifying the substrate by specific qualitative features, and thereby in characterizing/modulating it. The substrate must belong to one of the following ontological types: actions, states or qualities.

This definition contains many elements specifying the substantive nature of manner and some important assumptions that require further explanation.

First, the concept of manner is by no means monolithic; it is rather a complex concept made up of a wide variety of more basic semantic values and/or parameters (see Section 3 for illustration). Manner thus appears as semantically compositional by nature, which is consistent with the observation made by some scholars that it is a heterogeneous and multifaceted notion (cf. Ikegami 1969; Snell-Hornby 1983; Guimier 1996; Slobin 2004: 255; Caballero 2007; Stosic 2009).

Second, processing manner both in language and language use is closely dependent on the existence of a substrate conceptual content that is to be modulated (but not altered in its essence) by various characterizing features and/or parameters. This point highlights the fact that manner is a non-autonomous semantic value: the conceptual subsidiarity of manner requires it to be never realized separately and apart from some other semantic content (see also Talmy 2000: vol. 2: 37). This is why manner is usually treated as an accompanying or additional dimension/aspect of an action or as a specific way of performing an action. Depending on the linguistic level at which manner is processed, the substrate content can be modified syntactically by so-called manner adjuncts as in (26), lexically by adding semantic specifications to a more general predicate as in (27), and so on:

(26) *A lady was walking very slowly/ like John Wayne.*

(27) *limp* (vs. *walk*) ‘to walk with difficult movement, with one leg or foot dragging behind’ (*WordReference*)

Third, the nature of the substrate is ontologically constrained: a manner interpretation is only possible when elaborating actions (28), states (29) or qualities (30):

(28) *She was talking very loudly.*

(29) *He was quietly sitting in the snow.*

(30) *Life is beautifully unpredictable.*

This characteristic of manner has been investigated in several studies dealing with manner adverbs and, more generally, with manner adjuncts, that are supposed to only modify verbs (=actions, states), adjectives (=qualities) or adverbs (=qualities). The importance of this constraint lies in its discriminatory power as it offers a reliable tool for distinguishing manner from quality. Thus, the same characterizing expression can involve manner (31) or quality (32) depending on the nature of (what is referred to by) its governor:

- (31) *Frappez sans pitié, vous serez craint.*  
 strike.IMP.2PL without pity you be.FUT.2PL fear.PTCP  
 (Balzac, *Le Père Goriot*)  
 ‘Strike ruthlessly, you will be feared’

- (32) *Les membres de ces organisations sont sans pitié.*  
 the members of these organizations be.PRS.3PL without pity  
 (<http://www.guylauzon.ca>)  
 ‘The people involved in these gangs are ruthless’ (<http://www.guylauzon.ca>)

These examples show that when applied to a verb (*frapper* ‘hit, strike’), *sans pitié* ‘ruthlessly’ expresses a specific way of performing the action of hitting whereas it describes a quality of individuals (cf. Strawson 1959) or substances in Aristotelian terms when applied to nominal expressions. This semantic and conceptual switch can be explained by the fact that both manner and quality fall within the same cognitive operation of characterization, which makes them extremely close to each other as evidenced by their relatedness in languages (see among others Le Goffic 2002; Van de Velde 2009; Stosic 2013).

Fourth, the notion of diversification is crucial for understanding the way in which manner is processed in language and language use. The role of manner thus consists in diversifying a given substrate by specific qualitative features, i.e. in distinguishing actions, states or qualities of the same nature from each other (see Van de Velde 2009; Stosic 2011).<sup>7</sup> This process leads to splitting a given class of actions, states or qualities into sub-sets of referents that, while belonging to the general class at issue, are somehow different due to the presence of some distinctive feature. For instance, saying *Patricia is walking slowly* makes this occurrence of the action of walking different both from its prototypical realization (*Patricia is walking*) and from other possible ways of walking (e.g. *Patricia is walking quickly/with a limp/ aimlessly...*), just as saying *intriguingly mysterious* distinguishes this manifestation of the property of being mysterious among many other possible ones. As long as *walk* and *mysterious* are used without any manner determination,

7. Like substances (as defined by Aristotle), actions, qualities and states are subject to a large variability of manifestations, which makes it possible to modify them.

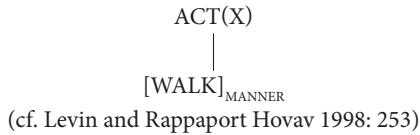
they simply describe a prototypical representation of the action/attribute at issue. By encoding in utterances some particular manner of walking or of being mysterious, one highlights a specific, probably dominant, distinctive aspect of their manifestation. As shown above, the diversification in question can be done in several ways, depending on the linguistic means used to express the peculiarity of the manifestation of some actions, states and qualities (see Examples (26)–(27)). It thus appears that a wide range of possible (syntactic, lexical, morphological, prosodic) manner determinations of a given action, state or quality reflect its individual variations (see Moline 2013; Moline and Stosic 2016).

Scrutinizing and bringing together various mechanisms involved in the processing of manner in language and language use makes it possible to provide a more comprehensive definition of manner. The main advantage of this definition is that it leads to a better understanding of this extremely complex and under-specified semantic concept, whatever linguistic means it is expressed by.

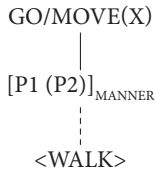
### 3. Manner of motion verbs in French: Where does the manner reading come from?

In this section, I tackle the issue of the *lexical encoding of manner* in French by providing a detailed analysis of what is commonly called “manner of motion verbs” (e.g. *courir* ‘run’, *voler* ‘fly’, *sauter* ‘jump’). Following some of the main trends in contemporary lexical semantics (see Section 1.2) and according to the definition of manner proposed in Section 2, one can recognize in the lexical meaning of manner of motion verbs two main types of components: a general motion predicate GO or MOVE (see Jackendoff 1990), which acts as the substrate element that is lexically processed, and a modifier whose role consists in diversifying, and thereby in modifying, the root predicate. In Levin and Rappaport Hovav’s model of lexical decomposition, the manner modifier is instantiated by a wide variety of “particular constants” corresponding to verbs’ idiosyncratic values that make each manner of motion verb distinct from the others (see Figure 2a). My hypothesis is that the manner component in the meaning of these verbs should be defined by one or two more basic semantic features pertaining to a small set of parameters that can be shared by several lexical items. I thus assume a lower additional level for the idiosyncratic component of a verb’s meaning, as shown in Figure 2b.

As in Levin and Rappaport Hovav’s model, manner plays the role of the constant, acting as the modifier of the general predicate GO or MOVE. The subscript on the square brackets around the constant indicates its ontological type (manner), the vertical solid line shows that the manner constant modifies the predicate, and finally the vertical dashed line specifies that the value enclosed in angle brackets



a. *walk*



b. *walk*

**Figure 2.** Extension of Rappaport Hovav's model of lexical decomposition of manner of motion verbs

instantiates the constant. Thus, in Figure 2b, the value WALK both instantiates the manner-triggering parameter(s) and bears the idiosyncratic part of verb's meaning. Consequently, the model makes it possible to instantiate by several lexical items the same parameter (or the same combination of parameters) that the manner constant is composed of.

In order to complete and to validate the model of lexical decomposition proposed in Figure 2b, it is necessary to identify a fixed set of parameters enabling the lexicalization of manner in the motion domain. This task requires an in-depth semantic analysis of manner of motion verbs.

### 3.1 Studying motion verbs in French: A long-standing tradition

There is a long-standing tradition of building and studying the lexicon of motion verbs in French in a very broad sense. The pioneering work of LADL researchers in the early 1970s (see the introductory chapter of this volume) was followed by several PhD dissertations dealing with either intransitive/indirect transitive (Laur 1991) or direct transitive verbs of motion (Sarda 1999), as well as, more recently, by in-depth extensive research done by Aurnague (see Aurnague 2008, 2011).

Beyond the building of the lexicon, central to all this research has been the understanding of what a motion verb is. As is well known, this is a highly controversial point in the literature dealing with the expression of motion in languages. In this regard, different researchers have used various features and criteria in defining motion verbs; some of them are spatial in nature (*change of place/location, change of position, change of placement, translocation, directed motion, boundary crossing, change of relation*), while others are rather aspectual (*telicity, transition, aspectual polarity*) or aspectuo-temporal (*boundedness, continuousness*) (see

Lamiroy 1983; Boons 1987; Aske 1989; Laur 1991; Levin 1993; Slobin and Hoiting 1994; Sablayrolles 1995; Tenny 1995; Sarda 1999; Borillo 1998; Aurnague 2008, 2011, 2012; Aurnague and Stosic 2002; Talmy 2000; Slobin 2003, 2004; Slobin et al. 2014; Filipovic 2007; Hasko and Perelmutter 2010). The features and criteria used by scholars are themselves problematic in several respects: what is a place, what is a boundary, what does boundary crossing mean, and so on? In this paper, I adopt both the definition and the classification of motion verbs proposed by Aurnague (2008, 2011, 2012). A number of reasons justify the choice of this framework.

First, Aurnague's description of motion verbs is based on a systematic, in-depth review of previously proposed criteria for the assessment of the class of motion verbs. The author revisits them and establishes his own criteria in order to both avoid the shortcomings of the existing criteria and to design more accurate ones. Second, Aurnague uses essentially spatial criteria for characterizing motion verbs, without excluding their aspectual side (see Aurnague 2012). Third, each criterion is meticulously defined through a set of linguistic tests, and with regard to various factors involved in the expression and conceptualization of both static and dynamic spatial scenes. Finally, by combining his criteria, Aurnague provides a clear definition of verbs of autonomous motion, as well as an accurate classification of them.

It is well known that motion is anything but a simple and homogeneous phenomenon. Thus, one can distinguish many kinds of motion as illustrated by the examples in (33)–(36):

- (33) *Pauline s'est redressée dans son lit.*  
 Pauline be.PRS.3SG straighten.PTCP in her bed  
 'Pauline sat up in bed'
- (34) *Sophie a marché dans la savane en direction de son village.*  
 Sophie have.PRS.3SG walk.PTCP in the savanna in direction of her village  
 'Sophie walked through the savanna towards her village'
- (35) *Margot est enfin sortie dans le jardin.*  
 Margot be.PRS.3SG finally exit.PTCP in the garden  
 'Margot finally went out into the garden'
- (36) *Un oiseau gris s'est posé sur notre balcon.*  
 a bird gray be.PRS.3SG land.PTCP on our balcony  
 'A gray bird landed on our balcony'

While all these situations are definitely dynamic – in all of them a material entity or some of its parts occupy distinct positions in space at successive points in time –, it is fairly obvious that the shifts involved all differ from one another. The notions of “change of basic locative relation” and “change of placement” as defined

by Aurnague (2008, 2011) enable one to explain what makes them different (see also Boons 1987; Borillo 1998).

In Example (33), both before and after the action, Pauline is in the bed: only her chest shifts from one point to another in space. In such a case, there is no change of basic locative relation between the figure (located entity, Pauline) and the ground (locating entity, the bed). Nor is there any change of placement: Pauline keeps the same overall location with respect to the bed. This kind of motion is generally evaluated with respect to a figure's own frame of reference.

In (34), the shift is greater because the motion described by *marcher* 'to walk' involves a change of placement: Sophie moves from one point or sub-part of the savanna to another, and thus changes her position in a frame of reference that is larger than the frame of reference corresponding to her own body. The fact is, however, that she remains located in the same ground throughout the whole process of walking. This means that, once again, there is no change of basic locative relation between the two entities since Sophie's motion is restricted to the savanna.

The kind of motion expressed in (35) is quite different from those in (33) and (34) because it involves both change of placement and change of basic locative relation. Not only does Margot shift from one point in space to another (change of placement), but this results in a change of basic locative relation: before she moves, Margot *is not in* the garden, but she *is* after the motion. According to Aurnague's description of motion verbs, this kind of motion entails a negation of the basic locative relation: depending on whether the shift is from *to be in/at* to *not to be in/at* or from *not to be in/at* to *to be in/at* the motion has respectively initial or final polarity (see Aurnague's contribution in this volume, Boons 1987; Borillo 1998).

Unlike (35) where the change of relation comes together with the change of placement, in (36) the verb's semantics only capture the change of basic locative relation between the figure (the bird) and the ground (the balcony). This does not mean that there is no change of placement before (in the reality out there), but all the verb *se poser* 'land' tells us about the motion described is that the bird enters a configuration of support/contact with respect to the balcony. There are many other verbs in French that exclusively highlight the change of relation (e.g. *atterrir* 'land', *frôler* 'brush past', *heurter* 'hit', etc.).

By combining these basic notions and some other spatio-aspectual features, Aurnague (2008, 2011, 2012) defined a set of fine-grained and well-delimited subclasses (see also Cappelli 2013; Aurnague's and Cappelli's chapters in this volume). For the purposes of this chapter, the combination of two basic parameters will be sufficient to assess the main subclasses of motion verbs, as well as the main types of motion processes (see Table 1).

Thus, the whole range of motion processes may be divided into two macro-categories, namely *Motion in a broad sense* and *Spatial dynamicity (without*



*motion*) depending on whether there is or is not a change of placement. Each of them is divided into two basic categories. As for *Motion in a broad sense*, one can distinguish *True motion* (or *Motion in a strict sense*) and *Weak motion* depending on whether a motion event entails both a change of relation and of placement or only a change of placement. As for *Spatial dynamicity*, one can distinguish *Simple change of relation* and *Change of disposition* depending on whether a motion event entails or not a change of basic locative relation. Table 1 summarizes and illustrates these basic oppositions in the domain of motion events.

**Table 1.** Classification of motion verbs and motion processes

		Change of placement	
		+	-
Change of basic locative relation	+	<i>True motion</i>	<i>Simple change of relation</i>
		<i>sortir</i> 'go out', <i>partir</i> 'leave, go away', <i>traverser</i> 'cross', <i>arriver</i> 'arrive', <i>s'enfuir</i> 'flee'	<i>se poser</i> 'touch down/land', <i>atterrir</i> 'land', <i>frôler</i> 'brush past', <i>heurter</i> 'hit', <i>bondir</i> 'leap'
	-	<i>Weak motion</i>	<i>Change of disposition</i>
		<i>marcher</i> 'walk', <i>courir</i> 'run', <i>grimper</i> 'climb', <i>errer</i> 'wander', <i>ramper</i> 'crawl'	<i>s'asseoir</i> 'sit down', <i>se pencher</i> 'lean', <i>s'allonger</i> 'stretch out', <i>se blottir</i> 'snuggle', <i>danser</i> 'dance'
		<i>Motion in a broad sense</i>	<i>Spatial dynamicity</i>

Using the two macro-categories and the four basic categories, the general domain of spatial dynamicity can be organized along a cline of higher or lower degree of dynamicity. Thus, the macro-category of *Motion in a broad sense* exhibits a higher degree of dynamicity and tends toward motion, contrary to *Spatial dynamicity (without motion)*, that is positioned towards the lower-dynamicity pole of the cline and, as such, tends toward movement (see the introduction to this volume).

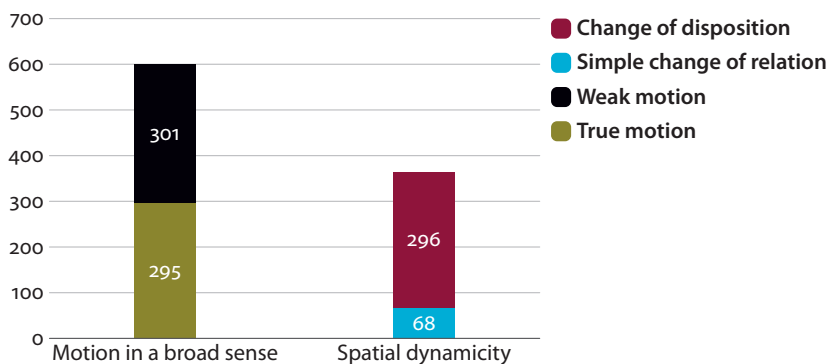
This classification will be the grid I will use in analyzing the lexicon of manner of motion verbs in French.

### 3.2 Lexicon of manner of motion verbs in French

Contrary to what has been stated in some previous research about the lexical codability of manner of motion in verb-framed languages (see Slobin 1996, 2004; Ozcaliskan and Slobin 1999), French has a rich lexicon of manner of motion verbs, even though it belongs to this typological group. This is what emerges from a detailed lexical analysis of an inventory of 960 French motion verbs, compiled on the basis of the list provided in Cappelli's PhD dissertation (see Cappelli 2013: 81–93).

This list was chosen to be the starting point for the analysis in this paper because Cappelli (2013) systematically and faithfully applied Aurnague’s classification to an inventory of 521 French motion verbs. This inventory is mainly based on Laur’s (1991) and Sarda’s (1999) PhD dissertations – dealing respectively with intransitive/indirect transitive and direct transitive verbs of motion –, and includes a few additions. For the purposes of my research, I extended the existing lexicon by exploring *GLAWI*, “a free, large-scale and versatile Machine-Readable Dictionary (MRD) extracted from Wiktionnaire, the French language edition of Wiktionary, and converted into a workable XML format” (Hathout and Sajous 2016: 1369).<sup>8</sup> The extraction of verb entries whose definition contains one of the 521 verbs present in Cappelli’s list allowed me to increase the lexicon of French motion verbs to 960 items.<sup>9</sup> The lexicon thus created, accompanied by several kinds of annotations, is freely available for download and browsing as the *DinaVmouv* database on the *REDAC* website (see Stosic & Aurnague 2017).

It is worth noting that expanding the list of motion verbs did not induce any changes in the initial analysis grid. Graph 1 shows the distribution of the whole lexicon into the four previously defined categories of motion verbs.



**Graph 1.** Distribution of motion verbs into the four basic categories

As can be observed, the number of verbs expressing motion in the broad sense is significantly higher than the number of verbs involving spatial dynamicity. Graph 1 also shows that three basic categories are similar in size, namely verbs expressing true motion (295 items), verbs expressing weak motion (301 items) and

8. *GLAWI* contains 335.487 lemmas and is freely available at [http://redac.univ-tlse2.fr/lexicons/glawi\\_en.html](http://redac.univ-tlse2.fr/lexicons/glawi_en.html).

9. More precisely, the summary of motion verbs includes 995 verbs. I don’t take into consideration here a sub-class of 35 verbs expressing motion by inference, such as *s’arrêter* ‘stop’, *rencontrer* ‘meet’, *se noyer* ‘drown’, and so on (see Cappelli 2013).

verbs describing changes of disposition (296 items), while there are fewer verbs denoting simple changes of basic locative relation (68 items).

Once the inventory of motion verbs in French had been established and organized into four categories, it was necessary to sort out manner of motion verbs. This was done by performing an in-depth semantic analysis of the meaning of all the indexed motion verbs. Following the previously assessed principles of decomposition, I defined and considered as manner of motion verbs all motion verbs in the meaning of which one can minimally identify two components, namely a general motion predicate GO or MOVE and a specific modifier whose role is to provide a qualitative diversification of the root predicate. This additional semantic specification of motion predicate constitutes a manner elaboration of the motion event, and makes a basic division between *arpenfer* ‘stride along’, *grimper* ‘climb’, *se précipiter* ‘rush’, *marcher* ‘walk’, *errer* ‘wander (about)’, all of which convey manner, and *aller* ‘go’, *se déplacer* ‘move’, *entrer* ‘enter, go in’, *passer* ‘pass’, *monter* ‘go up, ascend’, which are neutral in this respect. Dictionary definitions were regularly used in order to assess and/or improve the lexical decomposition analysis. In the great majority of cases, the definitions from different dictionaries converge, as seen in (37):

- (37) *marcher* ‘walk’  
 ‘Aller d’un endroit vers un autre en faisant une suite de pas à une cadence modérée’ (*TLFi*)  
 (‘go from one place to another by making a series of steps at a moderate pace’)  
 ‘Se déplacer par mouvements et appuis successifs des jambes et des pieds sans quitter le sol’ (*Le Grand Robert de la langue française*)  
 (‘move by successive movements of the legs and feet, always keeping one foot on the ground’)  
 ‘S’avancer, se déplacer par le mouvement alterné des membres inférieurs’ (*Dictionnaire de l’Académie française*)  
 (‘move forward, move by the alternating motion of the lower limbs’)  
 ‘Se déplacer en mettant un pied devant l’autre’ (*Dictionnaire Larousse*)  
 (‘move by putting one foot in front of the other’)

What is remarkable in these examples is that, regardless of their source, dictionary definitions clearly reflect the binary nature of the meaning of the verb *marcher* ‘to walk’. All of them start with one or more general and/or neutral motion predicate(s) like *aller* ‘go’, *se déplacer* ‘move’, *avancer* ‘go forward’, followed by some manner specification such as *en faisant une suite de pas à une cadence modérée* ‘by making a series of steps at a moderate pace’, *par mouvements et appuis successifs des jambes et des pieds sans quitter le sol* ‘by successive movements of the legs and feet,

always keeping one foot on the ground', and so on. Thus, the verb *marcher* 'walk' fulfils the criteria of manner of motion verb, and can therefore be considered as one of troponyms of the verb *se déplacer* 'move' (or *aller* 'go').

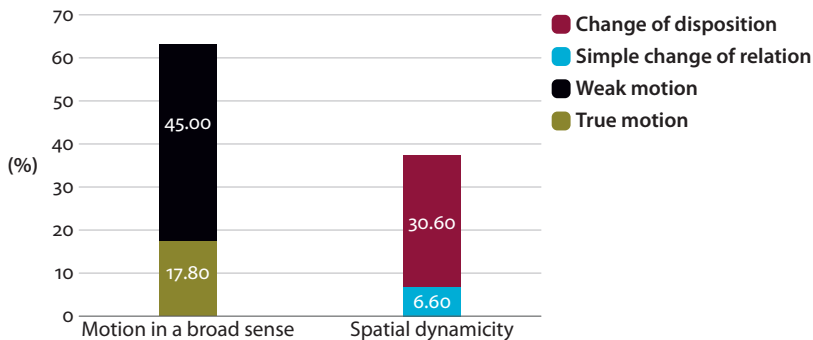
By applying this methodology to the whole list of motion verbs, I was able to delineate the boundaries of the sub-class of manner of motion verbs. It was found that more than one half of motion verbs, namely 562 out of 960 (about 59%), involve a manner component in their meaning (see the *DinaVmouv* database for examples). These data will serve as an empirical basis for further exploration of the lexicalization of manner of motion in French. At this point, two main observations may be made as part of a first-level lexical analysis of an inventory of 960 French motion verbs:

- i. far from being impoverished, the lexicon of manner of motion verbs in French is rich and varied. This finding is in contrast to the assumption about the scarcity of the lexicalization of manner of motion in French as predicted by Talmy's typology and stated by many other scholars (Slobin 1996, 2003, 2004; Ozcaliskan and Slobin 1999; Slobin et al. 2014),<sup>10</sup> and calls for a more comprehensive re-examination of this issue. What such an observation actually attests to is rather the existence of an obvious and significant gap between language system possibilities and actual language use (cf. Schøsler 2008; Iacobini and Corona 2016; Wälchli and Sölling 2013).
- ii. all four categories of motion verbs (see Table 1) are concerned with the lexicalization of manner, even telic ones. Consequently, in French, the presence of the change of basic locative relation in the verb stem is in no way incompatible with the simultaneous lexical coding of the manner component. It thus appears that, even though French belongs to VfL, it can conflate at the lexical level directionality and manner, which, in a way, contradicts restrictions on the use of manner verbs when describing telic motion events in verb-framed languages (see among others Aske 1989; Slobin and Hoiting 1994). This is the case, for example, with the true motion verb *décamper* 'to clear off' as well as with the simple change of relation verb *s'écraser* 'to crash', both of which conflate in their meaning both manner and spatio-temporal transition.

Graph 2 shows the distribution of manner of motion verbs into four basic categories of motion verbs. Most of them (45%) belong to the category of verbs expressing weak motion, that is simple change of placement (e.g. *courir* 'run', *zigzaguer* 'zigzag'). The category of verbs involving change of disposition includes 30.6%

10. According to Slobin (2003: 163), Satellite framed languages "have developed large lexicons with many fine-grained distinctions of manner, in comparison with smaller and less differentiated manner lexicons in V-languages".

of manner of motion verbs (e.g. *s'aligner* 'line up, get into line', *danser* 'dance'). It also shows that 17.8% of manner of motion verbs belong to the category of verbs expressing true (or strict) motion, involving both change of placement and change of basic locative relation (e.g. *surgir* 'arise, appear suddenly', *se glisser* 'slip'). Finally, the remaining 6.6% of manner of motion verbs fall within the category of verbs expressing simple change of relation (e.g. *buter* 'trip over, stumble over', *s'abattre* 'fall down').

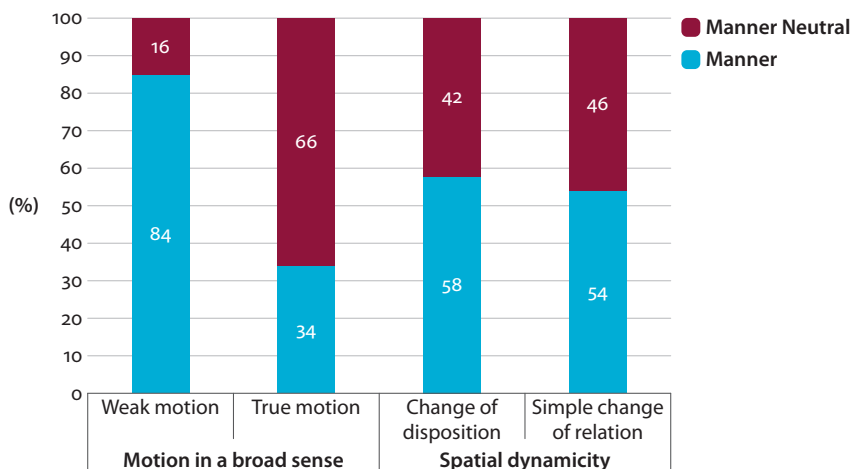


**Graph 2.** Distribution of manner of motion verbs into four basic categories of motion verbs

It can be clearly seen that nearly two thirds of manner of motion verbs fall within the domain of motion in a broad sense and that only 37.2% of them fall within the domain of spatial dynamicity. This graph also confirms the widely-held view that there is a close relationship between manner and atelic processes such as those involving simple change of placement (e.g. *marcher* 'walk', *courir* 'run', *errer* 'wander').

Another interesting observation that can be made from this analysis is that manner does not affect all four categories of motion verbs to the same extent. This is visualized in Graph 3.

This graph shows that the category of weak motion verbs is predominantly made up of manner of motion verbs; only 16% of this type of verb do not involve a manner component. On the contrary and as expected, the category of true motion verbs is the lowest among manner of motion verbs. However, the fact that 34% of them lexicalize manner in their meaning may be seen as quite surprising, given that manner is considered not to be consistent with telicity, particularly in verb-framed languages. As for the domain of spatial dynamicity, the lexicalization of manner appears in about the same proportion in both categories: 58% of change of disposition verbs and 54% of simple change of relation verbs have a manner component in their meaning.



Graph 3. Proportion of each category of motion verbs affected by manner

Whatever the category they belong to, the 562 manner of motion verbs constitute the primary data used to establish a limited set of semantic parameters that activate the manner interpretation in the case of motion verbs.

### 3.3 Towards an in-depth lexical exploration of manner of motion verbs in French

In this section, I seek to justify the claim that the manner component in the meaning of manner of motion verbs is made up of a small set of more basic non-idiosyncratic semantic parameters (see Figure 2). A low-level semantic analysis was therefore undertaken in order to define these parameters through a closer examination of the additional semantic specification of the motion predicate that constitutes its manner elaboration, as sketched in the lexical decomposition analysis (see Figure 2b). To put it in other words, my aim is to give an account of the very constituents of the manner component as lexically conveyed, independently of any syntactically construed meaning.

What components are relevant to manner of motion is a much-discussed question in semantics, and there is a considerable lack of consensus on the issue (cf. Ikegami 1969; Snell-Hornby 1983; Frawley 1992; Levin 1993; Slobin 2004; Cardini 2008; Stosic 2009; Ibarretxe-Antuñano 2009; Slobin et al. 2014; Moline and Stosic 2016). Based on an in-depth semantic analysis of 562 manner of motion verbs, both intransitive/indirect transitive and direct transitive ones, the following features seem to underlie the lexicalization of manner in the motion domain:

- BODY MOTION PATTERN (*marcher* ‘walk’, *boiter* ‘limp’, *tituber* ‘stagger’), matches various forms of body movements displayed by figures when moving in space. This feature is close to the dimension of “motion gait” as defined in Malt et al. (2008), and Malt et al. (2010).
- SPEED (*courir* ‘run’, *filer* ‘rush’), can be defined as the ratio between the distance traveled by the figure and the time spent and may be manifested as high speed (doing a lot in a short time) or as low speed (doing a little in a long time interval); thus, some motions are lexically coded as quick ones (*déguerpier* ‘clear off, run off’), others as slow ones (*lambiner* ‘dawdle’).
- SHAPE OF THE TRAJECTORY/PATH (*zigzaguer* ‘zigzag’, *louvoyer* ‘weave’), triggers manner when a given verb conveys information about whether the motion occurs as a straight line, as a curved line, as a circle, as a turning on an axis, as a spiral, and the like.
- POWER OF THE FORCE (*jaillir* ‘gush out’, *heurter* ‘knock’), activates a manner reading in cases where some force dynamics accompany motion; it may consist in the figure exerting either a powerful or weak force, or in more or less violent interaction between two spatial entities.
- FIGURE CONFIGURATION (*bifurquer* ‘fork’, *s’aligner* ‘line up’, *s’étaler* ‘spread’, *se blottir* ‘huddle, snuggle’), entails the very nature and the general appearance of the moving entity, and may cover the internal structure of the figure (its internal plurality, disposition of its components, e.g. *s’imbriquer* ‘interlock, interlink, intertwine’, *s’entresuivre* ‘follow each other, go one after the other’), various changes that can affect the figure (changes of posture or changes of disposition), the consistency of the figure, especially for liquids and steam (*couler* ‘flow’, *s’évaporer* ‘evaporate, dissipate’).
- ENVIRONMENT (*voguer* ‘sail’, *patiner* ‘skate’), assigns manner when the figure exhibits a particular way of moving because the motion needs to be carried out in some particular medium or environment that is unusual for humans: in the air, in the water, on ice, and the like.
- PURPOSE (OR PURPOSELESS)<sup>11</sup> (*se promener* ‘go for a walk’, *errer* ‘wander about’, *traîner* ‘crawl, drag oneself’), diversifies motion events when figures move with no precise goal, direction, or purpose; the lack of goal thus emerges as the most prominent purpose dimension in the motion domain since this feature is coded in the semantics of more than fifty motion verbs in French.

11. Even though “purposeless” would be a more accurate term for this parameter in the motion domain, the term “purpose” is preferred because of its generality, and therefore of its applicability to many other semantic domains.

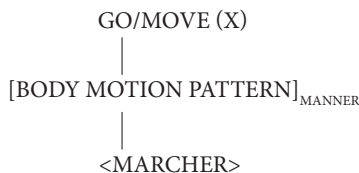
- INSTRUMENT (*chevaucher* ‘ride’, *ramer* ‘paddle’, *skier* ‘ski’), activates a manner reading each time the motion is conditioned by the use of some specific object, generally encoded by the verb stem.
- EFFORT (*gravir* ‘climb up’, *escalader* ‘climb’), triggers manner when, in order to move, the figure must expend a certain amount of effort.
- EXTENSION (*parcourir* ‘go all over’, *quadriller* ‘crisscross’), underlines manner if the moving entity covers almost the entire surface of the ground by its displacement.
- DISCREETNESS (*se dérober* ‘escape’, *s’infiltrer* ‘infiltrate’), activates the manner component when the figure’s motion is done in a more or less subtle and discreet way.
- CARRYING ALONG BY A FORCE (*couler* ‘flow’, *déraper* ‘skid, slide, move away’), enables a manner interpretation of some motion verbs when “one or more forces, mainly external to the target, cause the motion” (Aurnague 2011: 17); basically, but not exclusively, they include gravity and centrifugal force.
- IMMIXION (OR INTERFERENCE) (*s’incruster* ‘install/invite yourself’, *s’insinuer* ‘ingratiate yourself’), corresponds to an undue intrusion.

These 13 features act as trigger mechanisms responsible for a manner interpretation of 562 motion verbs in French. Some of these features are gradable in that one can move more or less quickly, exert a more or less powerful force when moving, while others are not gradable: INSTRUMENT, ENVIRONMENT, etc. (see Stosic 2009: 114 for French, and Cardini 2008: 546 for Italian). The presence of a single parameter is generally sufficient to trigger the manner interpretation, but in some cases, it may result from the combination of two parameters,<sup>12</sup> one of which is primary and the other secondary (see Stosic 2009). For instance, in the case of *marcher* ‘walk’, the use of only one parameter, namely BODY MOTION PATTERN, is sufficient to explain where the manner reading comes from. On the other hand, the verb *flâner* ‘stroll’ conflates the parameter of (low) SPEED and the parameter of PURPOSE(LESS), whereas the verb *crawler* ‘crawl’ involves both the parameter of BODY MOTION PATTERN and the parameter of ENVIRONMENT. Accordingly, the lexical decomposition of *marcher* ‘walk’ and *flâner* ‘stroll’ can be represented as illustrated in Figure 3.

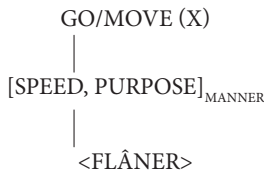
In addition to decomposing the manner modifier into a limited number of more basic features, the possibility of combining two features in explaining how

12. It is possible that combining three parameters could provide a more accurate lexical analysis of the lexical meaning of some verbs. However, such cases are very rare in the domain of manner of motion verbs because of the relative simplicity of their argument structure, which involves one, or two elements. Speech verbs, however, need a threefold schema (see Moline and Stosic 2016: Chapter 4).





a. *marcher* ‘walk’



b. *flâner* ‘stroll’

Figure 3. Lexical decomposition of two manner of motion verbs

the manner component of a given motion verb is elaborated is one of the key assets of this model of lexical decomposition of manner of motion verbs. In fact, there have been a few other attempts to point out more basic features underlying the manner component in the lexical meaning of motion verbs. In this respect, it is worth recalling that other scholars have used some of notions defined above, or similar ones, in their analysis of the verbal lexicon (see Ikegami 1969; Snell-Hornby 1983; Caballero 2007; Cardini 2008) or when talking about possible “dimensions” or “types of manner of motion” (Özçaliskan and Slobin 1999: 542; Pourcel 2004; Ibarretxe-Antuñano 2004; Slobin et al. 2014). However, few of them entertained the possibility of combining two (or more) features in their method of characterizing the manner component of motion verbs, which is crucial for defining both an accurate and economical model of their lexical decomposition. Moreover, an attempt is seldom made to give an explanation of what each feature refers to exactly (see however Malt et al. 2008; Malt et al. 2010 for a detailed analysis of walking and running events, Cardini 2008: 541–546 for his set of features, and Aurnague 2011 for the parameter of CARRYING ALONG BY A FORCE).

Two other points are worthy of note about my approach to manner of motion verbs. The first is that in my analysis I only deal with lexicalized features in order to ensure a strict separation between manner values that are encoded in the lexical meaning of motion verbs and those that are processed at the surface by syntactic means. This delimitation is fundamental from a methodological perspective as well as in terms of descriptive analysis, because it prevents one from postulating hybrid parameters conflating information from both lexical and syntactic levels when defining the manner component. For instance, my analysis clearly suggests that, in French, such subjective parameters as inner state or mental attitude are

hardly ever involved in the lexical meaning of motion verbs.<sup>13</sup> In French, this dimension of manner of motion is regularly construed on the syntactic level.<sup>14</sup>

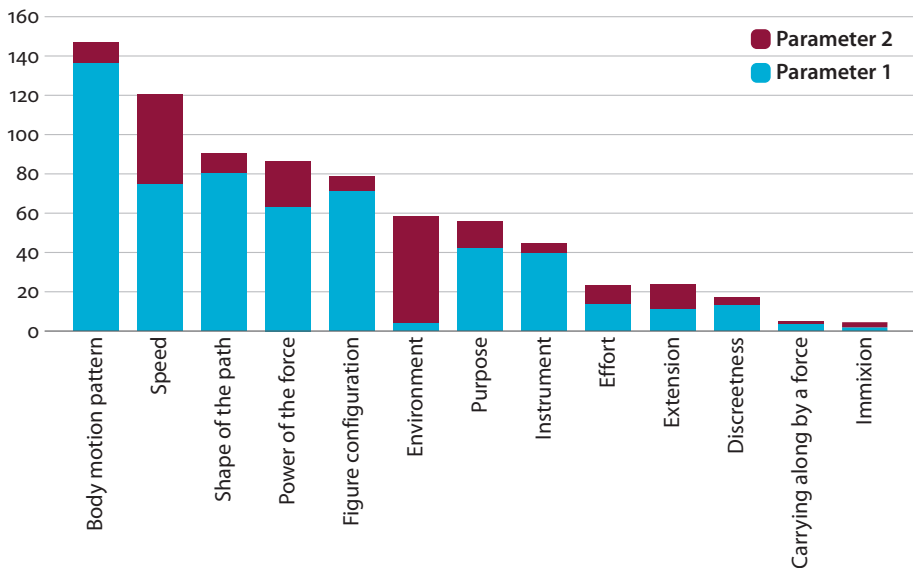
The second point, closely related to the first, is that the various kinds of manner of motion encoded at the lexical level represent only a small proportion of a broad range of possible types of manner of motion. More precisely, lexically encoded manners of motion are limited in number while syntactic ones are semantically various and countless. By exploring the semantics of manner adjuncts associated with the verb *marcher* ‘walk’ in a large sample of attested uses, Moline (2013) and Moline and Stosic (2016: Chapter 4) highlighted a wide range of possibilities for modifying this kind of motion by syntactic means. Thus, modifier expressions may characterize the way one makes steps, or the shape of the trajectory, but they can also describe the figure’s inner state and psychological attitude, or express the way the action takes place, and many other more or less salient aspects of walking.

It is also worth pointing out that the features listed above are not all equally salient in the lexicon of motion verbs in French: some of them are present in a large number of manner of motion verbs, other are very rare. Graph 4 shows the productivity of each parameter, both as the primary and secondary one, in the lexical coding of manner of motion in French. The results indicate that BODY MOTION PATTERN and SPEED are the most prominent features, triggering manner respectively in more than 140 and 120 French motion verbs. Next follow SHAPE OF THE PATH, POWER OF THE FORCE and FIGURE CONFIGURATION with approximately 80 items each, and ENVIRONMENT, PURPOSE and INSTRUMENT that enable manner in 58, 56 and 45 verbs respectively. The following cluster contains three parameters generating manner in around 20 motion verbs, namely EFFORT, EXTENSION and DISCREETNESS. The two remaining features, including CARRYING ALONG BY A FORCE and IMMIXION (OR INTERFERENCE), are relatively marginal.

Graph 4 thus outlines the profile of the lexicalization of manner of motion in French and it may be expected that some languages share the same profile, whereas others lexicalize the same features, but in a higher or lower degree (cf. Beliakov and Stosic 2018 for an initial study on Russian). Furthermore, it is entirely foreseeable

13. The only case that I have been able to find is the verb *se pavaner* ‘swagger’. Contrary to what my analysis revealed, in their cross-linguistic study of manner of motion based on data of English, Polish, French, Spanish and Basque, Slobin et al. (2014: 716) claim that “manner of motion verbs are concerned with subjective dimensions of attitude, inner state, and evaluation” (see also Cardini 2008: 545–546).

14. Such parameters seem to be highly relevant for the lexical decomposition of manner of speaking verbs, according to Moline and Stosic (2016: Chapter 3) (e.g. *délirer* ‘babble incoherently’, *se lamenter* ‘snivel, deplore’).

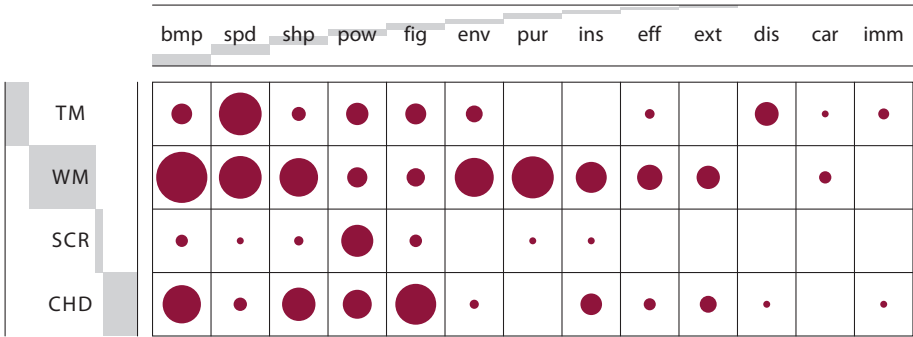


**Graph 4.** Productivity of manner-triggering parameters in the lexicon of motion verbs in French

that certain languages do not use some of them or code lexically some features that are not conveyed by motion verbs in French.

The next question I shall deal with is the possible relationship between features and categories. While Graph 4 shows the general salience of each feature in the lexical coding of manner of motion in French, it does not predict anything about their distribution in the four categories nor about their respective weight within each of them. A good way of visualizing the frequency of associations between categories and features is the use of the “balloon plot”, where each cell contains a dot whose size reflects the relative importance of the corresponding value. Likewise, this graphical matrix shows row and column sums in the left and top margins, respectively, which makes it possible to visualize the average profile of each class of motion verbs with respect to the lexical coding of manner and the average profile of each semantic parameter by comparing them respectively to other categories or to other parameters.

Graph 5 thus corresponds to a contingency table containing the 13 features and their distribution over the 4 categories of motion verbs. A visual inspection of the balloon plot shows that verbs expressing weak motion are the most concerned with manner, which confirms the main tendency from Graph 3 obtained by counting manner of motion verbs by categories. It is also easy to see that **BODY MOTION PATTERN** is a dominant feature in the case of weak motion verbs, but not in the class of true motion verbs where **SPEED** is the prevailing feature, and so on.



**Legend:** **bmp:** body motion pattern; **spd:** speed; **shp:** shape of the path; **pow:** power of the force; **fig:** figure configuration; **env:** environment; **pur:** purpose; **ins:** instrument; **eff:** effort; **ext:** extension; **dis:** discreetness; **car:** carrying along by a force; **imm:** immixion

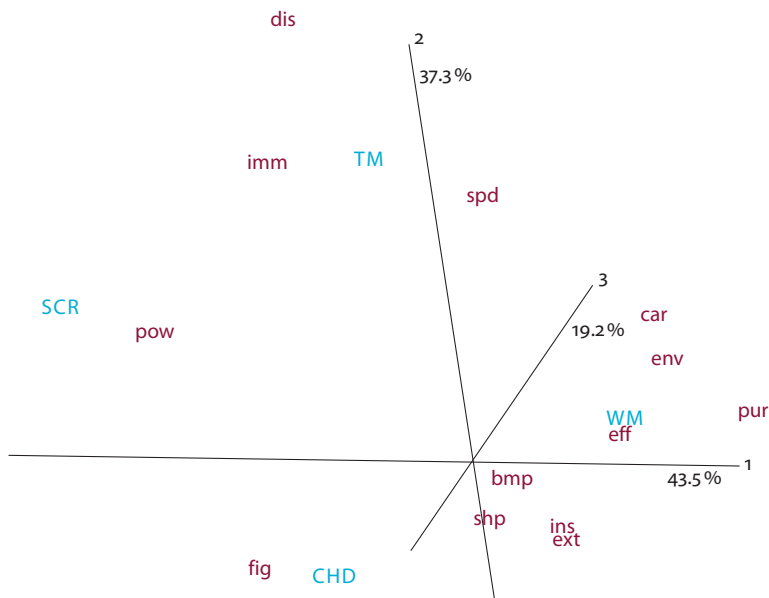
TM: true motion; WM: weak motion; SCR: simple change of relation; CHD: change of disposition

**Graph 5.** Balloon plot of associations between categories of motion verbs and manner-triggering parameters

Using a multivariate statistical framework based on canonical correspondence analysis (CA) as proposed by Greenacre (1993) provides several other interesting insights into the same data. In this study, CA is used to graphically visualize (as points in a 3-dimensional space) the relationship between the categories of verbs and the features in the lexicalization of manner of motion.

I thus used this statistical method both for further exploring similarities and differences in the way each parameter contributes to the lexicalization of manner in French, and for comparing category profiles with respect to the weight of the parameters. Graph 6 results from applying correspondence analysis to the data shown in Graph 5. The resulting three axis account together for about 100% of the total variance (Axis 1 = 43.5%, Axis 2 = 37.3%, Axis 3 = 19.2%). Parameters that are spatially closer together are expected to be similar in their distribution across the categories of motion verbs, whereas parameters that are far apart are expected to be dissimilar. Likewise, categories that are close are expected to have more similar profiles, that is to lexicalize manner on the basis of the similar combination of parameters. Parameters (or categories) may/should be compared to each other along each axis.

As can be seen, the distribution of the four categories of motion verbs in the three-dimensional plot clearly indicates that each of them has a very different profile, and consequently a very different set of parameters underlying the lexicalization of manner. As regards the parameters, some of them are grouped together and consequently similar in their distribution across the classes. Thus, in Graph 6, two relatively close clusters of points can be discerned in the lower right. The first and most central one is formed by four features: BODY MOTION PATTERN, SHAPE



**Legend:** **bmp**: body motion pattern; **spd**: speed; **shp**: shape of the path; **pow**: power of the force; **fig**: figure configuration; **env**: environment; **pur**: purpose; **ins**: instrument; **eff**: effort; **ext**: extension; **dis**: discreetness; **car**: carrying along by a force; **imm**: immixion; **TM**: true motion; **WM**: weak motion; **SCR**: simple change of relation; **CHD**: change of disposition

**Graph 6.** Correspondence analysis showing similarities and dissimilarities between parameters and between categories of motion verbs

OF THE PATH, INSTRUMENT and EXTENSION. The second cluster groups the parameters of CARRYING ALONG BY A FORCE, ENVIRONMENT, PURPOSE and EFFORT. On the other hand, some parameters (e.g. IMMICTION and DISCREETNESS, top center) are placed far apart from these clusters, which is a mark of the dissimilarity of their distribution across the four classes of motion verbs.

For what concerns the relation between classes and parameters, although their spatial closeness does not correspond to a statistically significant correlation, the fact that some classes and features are grouped together suggests the presence of a privileged relationship.

This is the case of the eight (out of thirteen) parameters having a privileged relationship with the class of weak motion: CARRYING ALONG BY A FORCE, ENVIRONMENT, PURPOSE(LESS), EFFORT, BODY MOTION PATTERN, SHAPE OF THE PATH, INSTRUMENT, EXTENSION. Some kind of matching may also be observed between the class of true motion and the parameters of IMMICTION (OR INTERFERENCE), DISCREETNESS and SPEED. Note that the latter lies at an intermediate position in relation to the classes of true and weak motion. Some kind of mutual attraction

also holds for the class of change of disposition and the parameter of *FIGURE CONFIGURATION*, as well as for the class of simple change of relation and the parameter of *POWER OF THE FORCE*. Conversely, the respective positions of the class of true motion and the parameters of *INSTRUMENT*, *EXTENSION* and *PURPOSE(LESS)* suggest that there is no matching between them. The same may be said of the class of weak motion and the parameters of *DISCREETNESS* and *IMMIXION*.

It follows from the above that the thirteen parameters can explain the manner component of the 562 manner of motion verbs in French. All four basic categories of motion verbs involve manner, but in an unequal way, because the identified parameters are unevenly distributed across them.

#### 4. Conclusion

The chapter has provided some new insights into the understanding of the lexical coding of manner through an in-depth semantic exploration of manner of motion verbs in French. It is based both on a detailed semantic analysis of an extensive lexicon of 960 motion verbs, created for the purposes of this study, and on a more stringent and more holistic definition of the notion of manner. A new model of lexical decomposition of manner of motion verbs is proposed, which made it possible to assess more accurately this sub-class within the lexicon of motion verbs.

Following Levin and Rappaport Hovav (1998), I argue that the lexical meaning of manner of motion verbs can be decomposed into two main components: a general motion predicate *GO* or *MOVE*, and a manner modifier. According to the proposed definition of manner (see Section 2), the first acts as the substrate element that is lexically processed, whereas the role of the manner component consists in diversifying, and thereby in modifying, the root predicate. More precisely, when manner specification is present in the lexical meaning of motion verbs, it acts as a diversification operator and, thus, modifies the general motion predicate.

What results from the in-depth semantic analysis of 562 manner of motion verbs in French is that despite their great semantic variability, the manner component involved is built on the basis of a very restricted set of more elementary, non-idiosyncratic features. They are thirteen in number: *BODY MOTION PATTERN*, *SPEED*, *SHAPE OF THE PATH*, *POWER OF THE FORCE*, *FIGURE CONFIGURATION*, *ENVIRONMENT*, *PURPOSE(LESS)*, *INSTRUMENT*, *EFFORT*, *EXTENSION*, *DISCREETNESS*, *CARRYING ALONG BY A FORCE*, *IMMIXION (OR INTERFERENCE)*. In some cases, the manner component is triggered by one of these parameters, whereas in some other cases it involves the combination of two of them. This also means that each feature is shared by several motion verbs. Thus, on the lexical level, manner should be seen as a cluster concept, rather than a unitary but fuzzy notion. Defining manner

as a cluster concept makes it possible both to establish more fully the sub-class of manner of motion verbs and to provide a parsimonious explanation of how similar to or different from one another manner of motion verbs are in their meaning, and where their similarities and differences come from.

This way of describing manner has a more general scope because some of the features defined for motion verbs are also relevant in other semantic domains. In the lexicon of speech verbs, for example, one can find at work the parameters of POWER OF THE FORCE (e.g. *s'exclamer* 'exclaim', *marmonner* 'grumble'), PURPOSE(LESS) (e.g. *dérasonner* 'rave', *radoter* 'ramble') and DISCREETNESS (e.g. *murmurer* 'whisper', *divulguer* 'divulge'), as well as a few others, that are domain dependent (cf. Moline and Stosic 2016). Even though each lexical field may involve several specific features, it is quite likely that the parameters underlying manner on the lexical level are limited in number. Thus, mapping the methodology used in the exploration of manner of motion verbs in French onto other domains can help to sketch out a more general approach to the lexical coding of manner in languages. In a cross-linguistic perspective, it would be interesting to investigate whether the same parameters also hold for other languages, both in the expression of motion and in other semantic domains.

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# Motion verbs and evaluative morphology

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This chapter addresses the issue of the interaction between evaluative morphology and the semantics of dynamic space in French by exploring the possibilities of constructing evaluative verbs from motion verbs. Previous research has suggested that motion verbs are relatively reluctant to serve as bases for evaluative affixation. Our aim is both to test the accuracy of this hypothesis and to account for the specificities of those French motion verbs that do allow evaluation. In doing so, we offer new insights into how evaluative morphology can contribute to the encoding of manner of motion. The empirical data on which the semantic and morphological analyses are based are extracted from extensive modern lexicographic resources and corpora.

**Keywords:** evaluative morphology, manner of motion, French, pluractionality, affixation

## 1. Introduction

Extensive descriptive and experimental research on the linguistic expression of motion has previously pointed out a wide variety of means and strategies for encoding the most prominent semantic components of motion and location descriptions in the languages of the world. Most of these studies focused on lexical and syntactic elements and on how they are distributed and combined within a single clause. Morphological means are dealt with when talking about the encoding of relationships – either static or dynamic – between spatial entities (cf. Wienold 1995; Talmy 2000; Beavers et al. 2010) but hardly ever when talking about expressing manner of motion (see however, Foley and Van Valin 1984; Comrie 1985; Levin 2009). Very few studies have systematically investigated the morphological encoding of either manner of motion or manner in general.

However, many affixal and non-affixal processes of what is called “evaluative” and “pluractional” morphology (cf. Cusic 1981; Newman 1990; Stump 1993; Grandi 2009; Fradin and Montermini 2009) can be taken into account when studying cross-linguistic diversity in the expression of the manner component, as shown in Examples (1)–(3). As we have argued in previous studies, in the verbal domain, such morphological markers express, among many other meanings, a non-canonical way of performing the process described by the base verb (cf. Amiot and Stosic 2011; Stosic and Amiot 2010, 2011):

- (1) French  
*voler* ‘to fly’ / *voleter* ‘to fly here and there, to flutter around’  
*sauter* ‘to jump’ / *sautiller* ‘to hop (around)’
- (2) Serbian  
*trčati* ‘to run’ / *trčkarati* ‘to run around, to run slowly’  
*skakati* ‘to jump’ / *skakutati* ‘to hop (around)’  
*skitati* ‘to wander’ / *proskitati* ‘to wander around a bit’
- (3) Zoque<sup>1</sup>  
*wit* ‘to walk’ / *witwitnay* ‘to walk aimlessly’ (reduplication)

As can be seen in these examples, *voleter* expresses a very specific way of flying, *sautiller* and *skakutati* a particular manner of jumping, *trčkarati* conveys a very specific way of running.

One would expect these kinds of means to play a very important role in the expression of manner of motion in languages with a rich evaluative morphology such as Italian (cf. Grandi 2009) or Serbian (cf. Stosic 2013). Nevertheless, this correlation does not seem to be valid, judging from pilot investigations based on lexicographic data from French (cf. Amiot and Stosic 2011), Italian (cf. Grandi 2009) and Serbian (cf. Stosic 2013). According to the results of these preliminary studies, the same pattern seems to work for the three languages: what are usually found are items that Wienold (1995: 314) called “basic manner of motion verbs” such as *to jump*, *to trot*, *to fly*, *to walk* and not any “pure” motion verbs (e.g. *to enter*, *to cross*, *to pass*).

Two main issues are addressed in this paper: the first one will consist in testing the accuracy of the hypothesis of the relative reluctance of the motion domain to use evaluative morphology. Secondly, we will try to explain and to account for the specificities of those motion verbs that can be modified by evaluative morphology. The chapter is structured into seven sections. After this brief introduction, Section 2 offers a quick overview of evaluative morphology, providing its definition,

1. The Zoque languages are spoken in southern Mexico.

a description of its main characteristics, and of the range of values it is able to convey. Section 3 is devoted to the relationship between evaluation and pluractionality, and provides general information about what pluractionality consists in. The fourth section addresses the question of the relationship between evaluation, pluractionality and the encoding of manner in the motion domain by reporting results from a previous study on this topic. Section 5 focuses on evaluative verbs in French; it describes both our method of data collection and our corpus, and also reports the results of an in-depth morphological analysis of what is, to date, the most comprehensive list of evaluative verbs in French. The sixth section of the chapter gives an empirical and descriptive account of French evaluative motion verbs as well as an explanation of constraints governing the possibility of their formation both by prefixation and by suffixation. Several criteria are cross-evaluated, especially the morphological processes involved (suffixation or prefixation), the semantic contribution of evaluative affixation and the aspectual type of the bases. The main hypotheses are tested using extensive lexicographic resources and corpora conducive to the exploration of informal written productions that are the most appropriate sources for gathering evaluative data. The last section provides a general discussion and concluding remarks.

## 2. Evaluative morphology

One can distinguish between two subfields of morphology, namely a “conceptual” (or “regular”, “core”, “canonical”) one and an “evaluative” one. The former is designed to form items denoting conceptual categories, whereas the latter provides some appreciation of existing conceptual categories (see Fradin 2003).

Typologically, evaluative morphology has several key features:

- It concerns all sorts of word classes: major word classes such as nouns, verbs, or adjectives (4), and minor ones, e.g. prepositions, adverbs, pronouns, etc. (5):
  - (4) N > N: *livre* / *livret* ‘book’/‘small book’  
 A > A: *gentil* / *gentillet* ‘kind’/‘kind enough’  
 V > V: *voler* / *voleter* ‘to fly’/‘to flutter’
  - (5) Adv > Adv: *ahora* / *ahorita* ‘now’/‘now’ (informal) (Spanish)  
 Prep > Prep: *e-kichen* / *e-kichenig* ‘near’/‘very near’<sup>2</sup> (Breton)

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2. Example from Stump (1993: 2).



Pro > Pro: *Wann* / *Wannerl* ‘when’/‘when’<sup>3</sup> (Austrian)

As can be seen in (4)–(5), the output usually belongs to the same category as the input, a property sometimes called “homocategoriality” (cf. Scalise 1986; Dal 1994; Stump 1993; Corbin and Temple 1994, and for an opposite point of view, Delhay 1999). But even if it is much less frequent, cases of heterocategoriality can also be found:

- (6) V > N: *sucer* / *sucette* ‘to suck’/ ‘candy to suck, i.e. lollipop’  
 N > V: *bourse* / *boursicoter* ‘stock exchange’/‘to dabble in the stock exchange’

– Morphologically, several processes can be used to express an evaluative meaning; the most frequent ones are suffixation (7), prefixation (8) and reduplication (9):

- (7) Italian  
*gatto* ‘cat’ / *gattino* ‘kitten’
- (8) French  
*poids* ‘weight’ / *surpoids* ‘excess weight’
- (9) Arabama<sup>4</sup> (Hercus 1994: 96, cited by Körtvélyessy 2015)  
*murla* ‘lizard’ / *murla murla* ‘big lizard’

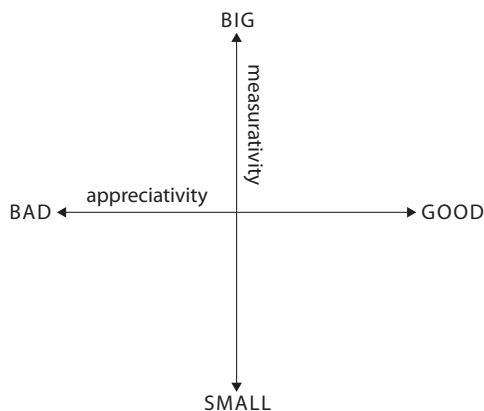
In affixal processes, the same affix is used regardless of the category involved (cf. *-et(er)* in examples under (6)).

– Semantically, evaluation involves two crucial dimensions (cf. Mel’čuk 1994; Grandi 2002; taken up by Fradin and Montermini 2009): a mesurative dimension and an appreciative one. The mesurative evaluation concerns the opposition “small/big”, while the appreciative evaluation concerns the opposition “good/bad”, as shown in Figure 1, from Fradin and Montermini (2009).

Fradin (2003) and Fradin and Montermini (2009), whose analysis concerns the *-et* suffix, distinguish two main poles in the meanings of evaluative lexemes, the “referential pole”, which contains the set of interpretations involving the mesurative dimension, and the “speaker pole” which contains the set of interpretations involving the appreciative dimension (good, bad, but also pejorative, meliorative,

3. According to Dressler and Karpf (1995: 111), in Viennese German, diminutives are used by small children on interrogative pronouns.

4. Arabama is an Australian language.



**Figure 1.** Bipolarity of evaluative meanings according to Fradin (2003) and Fradin and Montermini (2009)

hypocoristic).<sup>5</sup> A third pole, namely the “addressee pole”, is also mentioned by the authors, but it is not integrated in the general schema. Since it refers to the interaction between speaker and addressee, that is to the way they integrate each other in their own sphere, Fradin argues that the construction of meanings pertaining to this pole can only occur in discourse (see Fradin 2003: 60).

This representation of evaluation was expanded by Amiot and Stosic (2015) in order to explain a broader range of evaluative meanings, particularly those pertaining to verbal evaluation (see Figure 2). The symbol “N” in the middle of the schema stands for the *Norm*, which is the zero point of the system of evaluation: whatever dimension(s) is (are) at work, some norm is used as the reference point with respect to which evaluation is expressed. Thus, each evaluative term necessarily indicates that some kind of deviation is observed in the representation of what is referred to by the derived lexeme, with respect to the prototypical representation given by the base.

As concerns the *Referential pole*, the opposition BIG / SMALL proved to be insufficient for explaining the whole range of referential meanings in the verbal domain, especially those conveyed by evaluative prefixation. Two new dimensions were therefore introduced. The first pertains to the quantitative opposition MUCH, MANY / LITTLE, FEW (e.g. Serbian *na-seći* ‘to cut up a lot of (pieces of) something’, *pro-sušiti* ‘to dry for a while’), while the second mainly pertains to the intensity, or rather to the expression of high / low degree (e.g. *surestimer* ‘to overestimate’, *sous-doter* ‘to underprovide’), and corresponds to the opposition TOO MUCH / NOT ENOUGH. Grouping these three dimensions in the same pole is supported by

5. One could also include in the speaker pole the connivance between the speaker and his/her interlocutor, mentioned by Dressler and Merlini Barbaresi (1994).

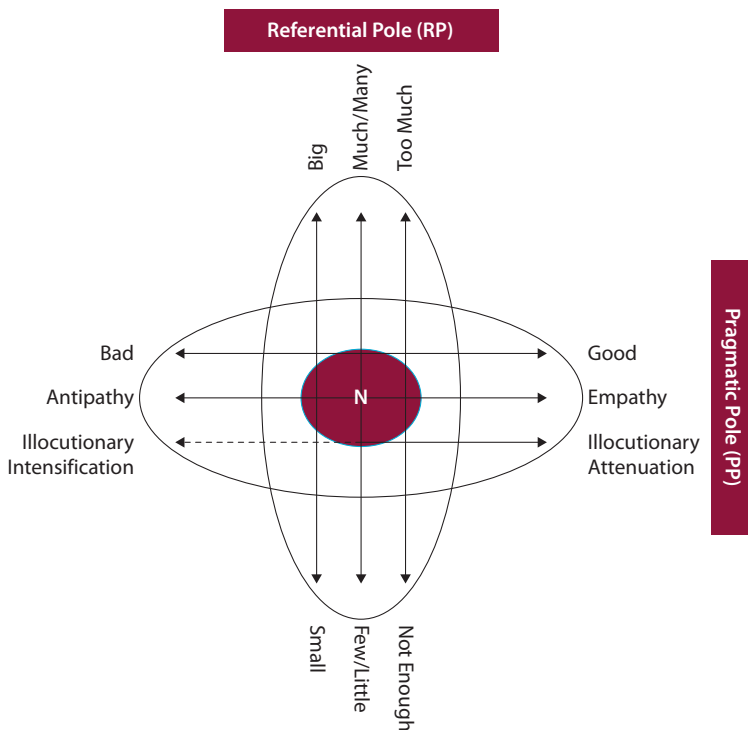


Figure 2. Bipolarity of evaluative meanings according to Amiot and Stosic (2015)

Wierzbicka's (1994: 495) claim that the notion of size, quantity and intensity are closely related:

It is interesting to speculate why the three meanings BIG, MUCH/MANY and VERY tend to share some of their exponents, if they are not compositionally related. Evidently, there are some inherent links between size, quantity and intensity.

Although to a certain extent intertwined, these three notions or dimensions cannot be reduced to a single one; indeed, according to Wierzbicka (1994: 495–496), all attempts to do so have failed. Generally speaking, evaluative lexemes that bear referential values are used to fill lexical gaps, and hence are often lexicalized. They thus express specific meanings (e.g. diminution, iteration, frequentativity), tightly related to concepts involved in their base, but perceived as displaying some differences at the referential level, which means that they are not congruent with the norm fixed by the base.

The *Pragmatic pole* incorporates Fradin's (2003) and Fradin and Montermini's (2009) "speaker pole" and "addressee pole": in both cases, evaluative lexemes express the speaker's attitude, be it positive or negative, toward either the addressee or what is being talked about, as stated by Merlini Barbaresi (2006: 332):

their meaning contributions to the speech event are better described within pragmatics, e.g., in terms of their dependence on speech situations, speech acts, attitudes of interactants.

The first dimension of the pragmatic pole is represented through the opposition GOOD / BAD (e.g. *écrivasser* ‘to scribble’), the second through the opposition EMPATHY / ANTIPATHY (e.g. *criticailler* ‘to nitpick on details, to criticize for the simple purpose of criticizing’, see Dressler and Merlini Barbaresi 1994; Kiefer 2001; Merlini Barbaresi 2006). A third dimension is added to the pragmatic pole, concerning the illocutionary attenuation and intensification occurring in linguistic interactions, because in some languages, evaluative lexemes or structures contribute to modulating the illocutionary force of speech acts (e.g. Serbian *imao bih jedno pitanje za vas* ‘I have a little/quick/short question for you’; lit. *pitanj-ce* ‘question-EVAL’, see Amiot and Stosic 2015 for more details). Even though such pragmatic values are closely related to communicative situations, the evaluatives bearing them may be (more or less) lexicalized. However, unlike evaluatives involving referential values, such lexemes do not signal any change in the representation of the concepts conveyed by their bases (cf. Sections 6.4 and 7).

The interpretation of an evaluative lexeme frequently encompasses both poles: for instance, many derived lexemes with the suffix *-et* refer to physically small entities which are rather positively connoted, e.g. *bleu / bleuet* ‘blue / nice small blue flower; cornflower’, *fenouil / fenouillette* ‘fennel / brandy which has been corrected and distilled with fennel seed’ (trad. from the *TLF*) (see among others Stump 1993: 1; Fradin 2003; Grandi 2009). Note that although, for descriptive purposes, the referential and pragmatic values have been separated and focused on in turn in this paper, this should not be taken to mean that the other one is not processed during interpretation.

Another characteristic feature is that evaluative morphology does not belong to core morphology:

- i. Evaluative lexemes are pragmatically marked: they do not belong to the standard vocabulary but to distinctive registers, e.g. informal, hypocoristic, childish, etc.;
- ii. Evaluative affixation is often redundant, in two ways:

First, it is very common for several (quasi-)synonymous lexemes to be built from a unique base (10–11):

(10) French

*pleuvoir* ‘to rain’ / *pleuvioter*, *pluviner*, *pleuvasser*, *pleuvouiller* ‘to drizzle’

- (11) Serbian  
*leteti* ‘to fly’ / *letuckati, letkariti, letkarati, letkati, letucati, letati* ‘to flutter around’, *letnuti* ‘to move quickly by fluttering around’, *doletnuti* ‘to come quickly by fluttering around’, *poletnuti* ‘to fly away by fluttering around’

Such redundancy does not occur in standard derivation. Generally, in this case, if two or more lexemes are derived from a unique base, they display different meanings (cf. Fradin 2014):

- (12) *étaler* ‘to spread’ / *étalage* ‘display, stand’; *étalement* ‘spread’  
*origine* ‘origin’ / *original* ‘original, uncommon’; *originel* ‘initial, primitive’

Second, redundancy is cumulative in prefixation: several prefixes are added to give an extremely intensive meaning to the derived form, which sounds informal; cf. e.g. *un invité hyper-méga-ultra-génial!* ‘a hyper-mega-ultra-great guest!’. Such a non-differential accumulation of affixes is impossible in canonical morphology.

iii. Evaluative lexemes are often derived in a non-canonical way with respect to the derivational processes existing in a given language. For example, in French, evaluative lexemes may be built by truncation and/or reduplication, sometimes with *-o* suffixation (13), or by truncation and affixal substitution (14), two processes that are not attested in core morphology:

- (13) *manifestation* ‘protest march’ / *manif* ‘demo’; *télévision* ‘television’ / *télé* ‘telly’,  
*propriétaire* ‘owner’ / *proprio* ‘landlord’  
 First names: *Cédric* / *Céd*; *Florence* / *Flo* or *Floflo*; *Juliette* / *Juju*

- (14) *valise* ‘suitcase’ / *valoché* ‘suitcase’ (informal), *télévision* ‘television’ / *téloche*  
 ‘telly’ (informal)

In this study, our analyses only address deverbal evaluative verbs.

### 3. Evaluation and pluractionality

These referential and pragmatic values of deverbal evaluatives are often closely related to pluractional meanings (see among others Cusic 1981; Lasersohn 1995; Collins 2001; van Geenhoven 2004, 2005; Wood 2007; Tovená & Kihm 2008; Greenberg 2010):

- (15) *mordre* ‘to bite (into)’ / *mordiller* ‘to nibble’:  
*Il mordille son stylo.*  
 he nibble.PRS.3SG his pen  
 ‘He nibbles his pen’



- (19) *jouailler* ‘1. jouer petit jeu (‘to place some bets’). 2. jouer médiocrement et sans passion (d’un instrument, à un jeu) (‘to play sth poorly and without passion’)’
- (20) *mâchouiller* ‘Mâcher, mastiquer de façon mécanique et sans avaler’ (‘to chew, to masticate in a mechanical way, without swallowing’)

As can be seen, in evaluative verbs, evaluation and pluractionality are closely related, but each has its specific features and its autonomy, even if there is considerable overlap between the two notions (for more details, see Amiot and Stosic 2015).

#### 4. Evaluation, pluractionality and manner of motion

Several studies have shown that languages differ in their richness in evaluatives and that a direct correlation can be established between the degree of inflectionality and the number of evaluatives that a given language displays (cf. Savickiene et al. 2007). Stosic (2013) provided a preliminary empirical investigation of the importance of the morphological encoding of manner in the verbal domain with a particular emphasis on manner of motion. Three European languages were compared: Serbian as a strongly inflecting language and French and Italian, considered as weakly inflecting languages (cf. Dressler 2007). Although viewed as a weakly inflecting language, Italian is reputed to have a rich evaluative morphology (cf. Grandi 2009: 61). The comparison was based on highly comparable data collected from dictionaries, as presented in Grandi (2009) for Italian, and Amiot and Stosic (2011) for French.

As can be seen in Table 1, in the verbal domain, evaluative morphology is the most fully developed in Serbian, which has many more evaluative verbs than Italian and French (see ‘Number of EV’ (evaluative) column).

**Table 1.** Deverbal evaluative verbs in French, Italian and Serbian

Language	Number of EV	Number of MV* -bases	Source of material**	Size of corpus	Reference study
Serbian	1550	30	<i>SER</i>	300 000 entries	Stosic (2013)
Italian	300	7	<i>GRADIT</i> <i>DISC</i>	270 000 entries 185 000 entries	Grandi (2009)
French	171	15	<i>TLFi</i>	100 000 entries	Amiot & Stosic (2011, 2014)

\* MV: motion verbs.

\*\* As regards the abbreviations, see under “Sources” at the end of the article.

This finding exactly matches their respective degree of inflectionality. As for French and Serbian, the number of EV is closely related to the number of suffixes and prefixes that contribute to the formation of EV: Serbian uses about 30 suffixes and 15 prefixes, whereas French has about 10 suffixes and 10 prefixes for the same purpose (cf. Amiot and Stosic 2011, 2015; Stosic 2013: 76–78). Even though these inventories are still provisional and can be refined, it is clear that all three languages exploit morphological devices for expressing manner, by forming evaluative verbs, including those that express event internal pluractionality. The data reported in Table 1 also show that French, Italian and Serbian have a relatively small set of motion verbs that can construct additional manner meanings by using evaluative suffixation and/or prefixation. Specifically, there are only 30 motion verbs that are used as bases for forming *deverbal evaluative verbs* (henceforth DEV) in Serbian, 15 in French and 7 in Italian (see Stosic 2013: 79–81). These results suggest that compatibility between motion and evaluation is weak: motion verbs appear to be poorly productive bases for evaluative morphology. Furthermore, very similar verbs appear in the three languages: *to jump*, *to trot*, *to fly*, *to walk*, and so on. One can also observe that the most of them are intrinsically atelic and express manner of motion. Finally, and most intriguingly, is the fact that Stosic’s lists do not include any pure motion (or “path”) verb, such as *to enter*, *to exit*, *to cross*, *to pass*, etc.

Two questions remain to be answered about these preliminary data: (i) where does the relative reluctance of the motion domain, if any, to use evaluative morphology come from? and (ii) why – at least according to the previously reported data from Serbian, French and Italian – do true motion verbs exhibit great resistance to modification by evaluative morphology?

To confirm or refute the results for French of this first study, we extended it in two ways. First, we considered a larger corpus of EV collected from the French language version of *Wiktionary* (see Section 5) and a more extensive lexicon of motion verbs (see Section 6).

## 5. Evaluative verbs in French: New data

The first methodological asset of the current study is the extension of the corpus used in the initial analyses of evaluative verbs in French (see Amiot and Stosic 2011, 2014). In our initial work, we extracted from the French “classical” online dictionary *Trésor de la Langue Française informatisé (TLFi)*, all the verbs ending in *-ard(er)*, *-ass(er)*, *-et(er)*, *-in(er)*, *-on(ner)*, *-ot(er)*, *-Vch(er)* and *-Vill(er)*.<sup>7</sup> Using

7. The *V* before *-cher* symbolizes any vowel, because the suffix can appear under different forms, cf. *-ocher*, *-icher*, *-ucher*; the symbolism is identical for *-Viller* (*-ailler*, *-iller*, *-ouiller*).



this extraction procedure, we obtained 171 evaluative verbs, the vast majority of which are formed from verbs. This inventory enabled us to make an initial empirical survey of suffixed evaluative verbs in French and to explore their various meanings and pragmatic functions, as well as the ways in which manner, lexical aspect and grammatical aspect can interact with evaluation and pluractionality, but it had at least three limitations: first, the dictionary used (*TLF*) has not been updated since its initial publication (1971–1994); second, evaluative lexemes are rarely and poorly indexed in traditional dictionaries because they are considered as coming from a non-conventional use of language;<sup>8</sup> third, only a small proportion of evaluative lexemes are really lexicalized so that dictionaries are not necessarily the most accurate source for collecting this type of data.

In order to overcome these limitations, we designed a new methodology of data collection, which consisted in two steps. First, we performed a new data extraction from the French version of *Wiktionary* (cf. 5.1). Second, we searched the Web for attestations of possible candidate forms, that is, of potential evaluative verbs formed from a set of motion verbs not found as bases in *Wiktionary* (cf. 6.3).

## 5.1 Wiktionary as a new source of indexing deverbal evaluative verbs

*Wiktionary* is a freely available multilingual online dictionary containing, in addition to definitions, etymology, examples, semantic relations between lexemes and translations in various languages. Unlike traditional dictionaries, built by skilled professional lexicographers, *Wiktionary* is collaboratively constructed by “crowdsourcing”, which makes it different from traditional dictionaries in many ways. Since its construction relies on “crowds” and not on a small number of professionals, its growth is fast and continuous, so that its lexical coverage is, for a lot of languages, larger than that of available professional dictionaries (cf. Sajous and Hathout 2015). For instance, the size of the French *Wiktionary*’s headword list is about 333 000 entries, whereas that of the *TLFi* is about 100 000 and that of *Le Petit Robert* about 60 000 entries. This at least three times greater lexical coverage is a very important resource for our new extraction of evaluative verbs. Also, the fact that any “naive speaker” can contribute to the resource intuitively and without taking sociolinguistic and theoretical considerations into account, considerably increases the possibilities of inventorying lexemes belonging to colloquial and other non-conventional uses of language, such as those we deal with in

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8. One reviewer mentioned that the lack of evaluative terms in traditional dictionaries can also be due to the fact that their formation is too predictable to deserve inclusion in dictionaries. We believe that while this may be true for some strongly inflecting languages with rich evaluative morphology, it is not really the case for French, which displays the opposite tendency.

our study. Even though the quality of lexical resources collaboratively constructed by non-specialists is often called into question, the French *Wiktionary*, called *Wiktionnaire*, answers the need for a more comprehensive dictionary including non-conventional lexemes, such as evaluative ones.

## 5.2 The method

In order to extend the existing list of French evaluative verbs (cf. Section 4.), we used a free XML French dictionary *GLAWI*, that corresponds to a structured and normalized version of the French language edition of *Wiktionary* (see Sajous and Hathout 2015). For the purposes of this study,<sup>9</sup> we performed an automatic extraction of all verb entries:

- i. ending in *-ard(er)*, *-ass(er)*, *-et(er)*, *-in(er)*, *-on(ner)*, *-ot(er)*, *-Vch(er)* and *-Vill(er)*
- ii. beginning with *sur-*, *sous-*, *hyper-*, *hypo-*, *super-*, *supra-*, *infra-*, *sub-*, *mini-*, *micro-*, *macro-*, *maxi-*, *mega-*

All these affixes are recognized as participating in the formation of lexemes with, among others, evaluative meanings. This extraction procedure resulted in a collection of 5330 verbal candidates, with their definitions and attestations. Next, these data were manually analyzed and annotated by the authors of the study.

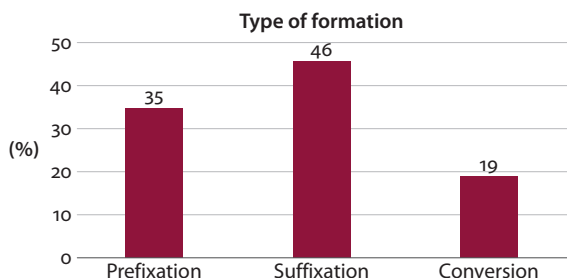
## 5.3 The results

From a total of 5330 verbal candidates with possible evaluative affixes, we identified about 960 evaluative verbs (*vs.* 171 items studied in Amiot and Stosic 2011, 2014). This considerably larger sample of evaluative verbs allowed us to ascertain more accurately: (i) a categorial type of bases, and (ii) what affixes are the most frequently used in forming evaluative verbs in French.

Graph 1 provides information about the processes by which the inventoried evaluative verbs are formed. It can be seen that 81% of them are created by the two processes targeted in this study, namely by suffixation and prefixation. They are built (i) on verbal bases, for example *neiger* ‘to snow’ / *neigeoter* ‘to snow lightly’, *critiquer* ‘to criticize’ / *criticailler* ‘to make many small criticisms’, *armer* ‘to arm’ / *surarmer* ‘to overarm’, *alimenter* ‘to feed’ / *sous-alimenter* ‘to undernourish’, and (ii) on bases belonging to other categories: nouns (*cane* ‘female duck’ / *caneter* ‘to hop up and down like a female duck’, *nez* ‘nose’ / *nasiller* ‘to twang’), adjectives (*fin*

9. We thank Franck Sajous for his valuable help in extracting data from *GLAWI*.

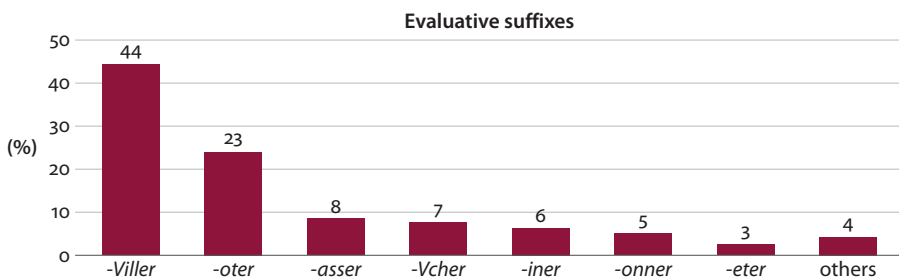
'fin' / *finasser* 'to use duplicity, to beat around the bush', *gris* 'grey' / *grisonner* 'to be going grey') or onomatopoeia (*clapoter* 'to lap', *piailler* 'to chirp').



Graph 1. Distribution of evaluative verbs by type of formation

The remaining 19% of evaluative verbs are obtained by conversion from lexemes ending in sequences used for the extraction of suffixed evaluative verbs, either because the base is suffixed by one of the suffixes under study (e.g. *brouiller* 'to scramble' → *brouillard* 'fog' → *brouillarder* 'to be foggy', *litre* 'liter' → *litron* 'a liter / a bottle of wine' informal → *litronner* 'to drink alcohol'), or because it looks like a suffixed base. This last case is well-illustrated by verbs formed on bases denoting animals: *furet* 'ferret' / *fureter* 'to ferret about', *papillon* 'butterfly' / *papillonner* 'to flit around', *grenouille* 'frog' / *grenouiller* 'to connive'.<sup>10</sup>

Among the affixes used in forming evaluative verbs in French, suffixes are more numerous than prefixes. Our data clearly indicate that, taking all semantic domains and all types of bases together, suffixed evaluative verbs are mainly derived with the suffixes *-Vill(er)* and *-ot(er)*, as suggested by Graph 2:



Graph 2. Distribution of evaluative verbs by type of suffix

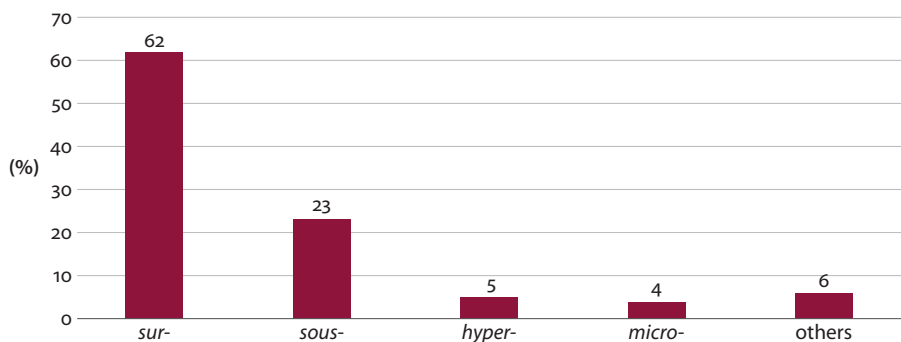
10. We believe that such examples show the influence that evaluative suffix-like endings have on the interpretation: *fureter* 'to ferret' and *papillonner* 'to flit around' have principally pluractional and diminutive meanings (they denote processes performed rapidly, with small movements, etc.), as the *-eter* and *-onner* suffixed verbs have, and *grenouiller* 'to connive' has a dysphoric interpretation, as the *-ouiller* suffixed verbs have (for more details, cf. Roché 2002 and Section 6.4).

Table 3 illustrates the most frequent suffixes in our corpus:

**Table 3.** Suffixes used for forming evaluative verbs in French

Suffix	Base	Evaluative verb
-Viller	<i>crier</i> 'to scream' <i>bloguer</i> 'to make a blog; to write on a blog' or <i>blog</i> 'blog'	<i>criailler</i> 'to moan' <i>blogouiller</i> 'to make a small blog'
-ot(t)er	<i>neiger</i> 'to snow'	<i>neigeoter</i> 'to snow lightly'
-asser	<i>brume</i> 'mist'	<i>brumasser</i> 'to be misty' (informal)
-Vcher	<i>amour</i> 'love' <i>flâner</i> 'to stroll'	<i>s'amouracher</i> 'to fall in love with' <i>flânocher</i> 'to stroll'
-iner	<i>bavarder</i> 'to chat'	<i>bavardiner</i> 'to chat' (informal)
-onner	<i>gris</i> 'grey'	<i>grisonner</i> 'to turn grey'
-eter	<i>mouche</i> 'fly'	<i>moucheter</i> 'to fleck'

As for prefixed evaluative verbs, our data indicate that French speakers mainly use the prefixes *sur-* and *sous-*, which are the only ones allowing the formation of verbs in large numbers, and to a lesser extent, *hyper-*, *micro-* (see Graph 3). Under the label "other" are grouped mainly "old" vernacular and/or local prefixes such as *ra-*, *ca-*, *cha-* (cf. Roché 2008):



**Graph 3.** Distribution of evaluative verbs by type of prefix

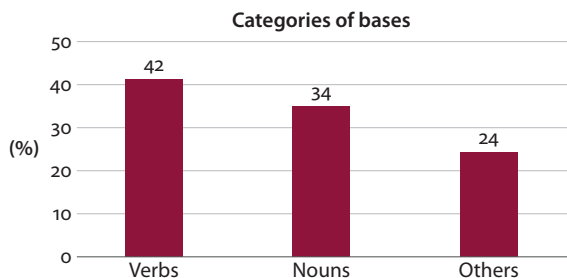
Table 4 illustrates the most frequent prefixes in our corpus:

**Table 4.** Prefixes used for forming evaluative verbs in French

Prefix	Base	Evaluative verb
<i>sur-</i>	<i>communiquer</i> 'to communicate'	<i>surcommuniquer</i> 'to overcommunicate'
<i>sous-</i>	<i>informer</i> 'to inform'	<i>sous-informer</i> 'to underinform'
<i>hyper-</i>	<i>protéger</i> 'to protect'	<i>hyperprotéger</i> 'to overprotect'
<i>micro-</i>	<i>doser</i> 'to dose'	<i>microdoser</i> 'to microdose'

## 5.4 Discussion

The use of the French language version of *Wiktionary* therefore proved highly useful in inventorying evaluative lexemes: it allowed us to substantially expand the initial list of French evaluative verbs. An in-depth morphological analysis of the larger sample of evaluative verbs had an unexpected result: it called into question the alleged homocategoriality of evaluative terms. Homocategoriality is claimed to be one of the main peculiarities of evaluative morphology (see Section 2, as well as Scalise 1986; Dal 1994; Stump 1993; Corbin and Temple 1994). Even though cases where the output does not belong to the same category as the input are possible (cf. Delhay 1999; Dal 1999), they are usually considered as rare and marginal. In our data, homocategoriality holds true for evaluative verbs built by prefixation, but not for the others. Among evaluative verbs built by suffixation and conversion, less than half of bases are verbal, 34% are nominal and 24% belong to other types of expressions (adjectives, onomatopoeias, phonesthemes<sup>11</sup> and so on), as shown in Graph 4.



**Graph 4.** Distribution of evaluative verbs formed by suffixation and conversion according to the category of their bases

This unexpected finding makes verbal evaluation different from nominal and adjectival evaluation where homocategoriality tends to be the rule. Semantically speaking, in the case of heterocategoriality, evaluation seems to operate not on the concept expressed by the lexeme used as base, but on some other conceptual content. For instance, the verb *nasiller* ‘to talk through one’s nose / to speak with a sharp, nasal tone’ formed on the base noun *nez* ‘nose’ evaluates the process of speaking, conceived as not performed in accordance with the prototypical way of speaking, that is by making sounds through one’s mouth. Similarly, the verb *papillonner* formed by conversion from the noun *papillon* ‘butterfly’ means ‘to

11. A phonestheme is a “sound that, because it appears in a number of words of similar meaning, has a recognizable semantic association.” (*OED*); for an analysis in terms of phonesthemes (see e.g. Roché 2008).

flit around / to flutter around'; far from expressing an assessment of the concept of butterfly described by the base, its role is to evaluate the action of motion, by denoting a very specific way of moving in space. This could mean that the role of evaluative affixation in the verbal domain is not limited to only providing appreciation of existing conceptual categories, as expected, but that it also ensures the formation of (new) lexemes in order to fill lexical gaps.

In concrete terms, in our list of 960 evaluative verbs, there are 587 items formed from verbal bases. The next step consisted in sorting out the deverbal evaluative motion verbs that are the main focus of our study.

## 6. Toward a more comprehensive account of evaluative motion verbs in French

Identifying motion verbs in the previously established list of evaluative verbs needs a careful definition of what is meant by "motion verb". Motion verbs have been the object of extensive research in France over the past few decades, as stated in the introductory chapter, as well as in Aurnague's, Stosic's and Cappelli's chapters in this volume. For the purposes of this chapter, we will use the definition proposed by Aurnague (2011) as well as the main oppositions from his classification of French motion verbs, which is the most recent and elaborate one. Also, for a better understanding of the interplay between motion and evaluation, we needed to use a significantly larger lexicon of motion verbs in French.

### 6.1 Aurnague's classification of motion verbs

This classification is grounded on two basic notions, namely "change of placement" and "change of basic locative relation" (see Aurnague 2011).

"Change of placement" is defined as a kind of motion limited to the inside or to the outside of the frame of reference corresponding to the target. For instance, motion predicates such as *to run* or *to walk* describe situations where a figure moves from one point (or subpart) of a frame of reference to another. Generally, the change of placement is evaluated with respect to the terrestrial frame of reference, which does not need to be explicitly mentioned in utterances.

Contrary to the notion of change of placement that does not bring into play any change of relation between figure and ground as wholes, the concept of "change of basic locative relation" can be defined as the succession of a negation and an assertion (or the succession of an assertion and a negation) of a spatial relation between two spatial entities. Predicates such as *to enter* or *to land* are good examples of this kind of motion: they describe situations where the figure's

motion leads to negating one relationship and establishing another: *NP enter PP* presupposes that NP is not in PP and poses that at the end of the process, NP is in PP; in the same way, *NP land PP* presupposes that NP is not in contact with PP and that, at the end of the process *to land*, it is in contact with it.

Based on these two notions (and their combination), one can divide motion events into two macro-categories depending on whether they involve or do not involve a change of placement, respectively *Motion in a broad sense* and *Spatial dynamicity (without displacement)* (cf. Aurnague 2011; Aurnague's and Stosic's chapters in this volume). The macro-category of *Motion in a broad sense* is further split into *True motion* (or *Motion in a strict sense*), which groups the most typical motions entailing both a change of relation and a change of placement (e.g. *entrer* 'go in/enter', *traverser* 'cross'), and *Weak motion*, which groups motions entailing only a change of placement (e.g. *marcher* 'walk', *courir* 'run'). The macro-category of *Spatial dynamicity* is also divided into two basic categories: *Simple change of relation*, grouping motion verbs whose semantics is exclusively focused on a change of basic locative relation (e.g. *se poser* 'touch down/land'), and *Change of disposition* (as layout or arrangement in space), which concerns spatial dynamic events excluding both a change of relation and a change of placement (e.g. *se pencher* 'lean', *danser* 'dance'); verbs expressing change of disposition refer to modifications that affect the parts of a whole and occur "within the framework corresponding to the whole entity and do not imply that the latter is also moving with respect to a larger frame of reference" (Aurnague 2011: 4). Figure 3 summarizes this classification.

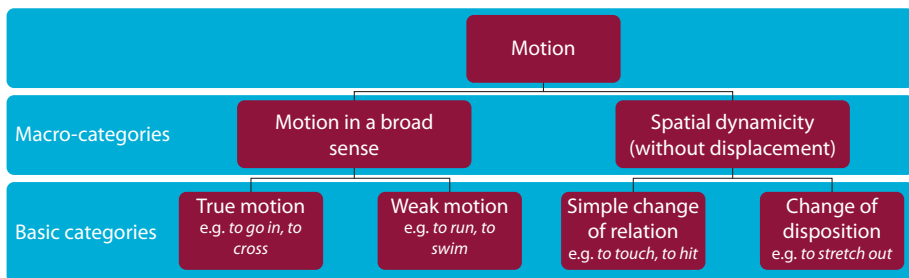
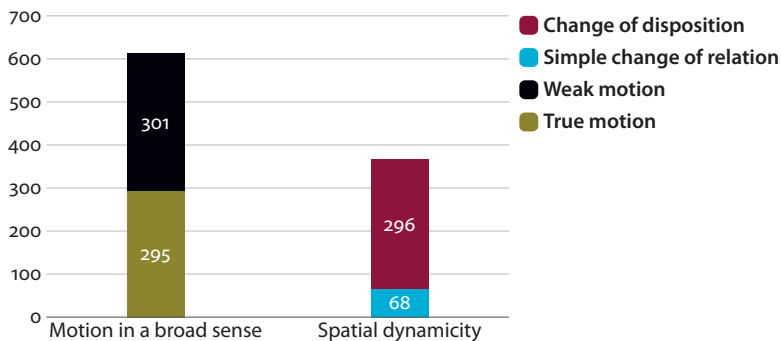


Figure 3. Classification of motion verbs and motion processes

## 6.2 The lexicon of motion verbs in French

The identification and the inventorying of motion verbs have been an important issue in French linguistics since the early 1970s (for an overview of relevant studies, see the introductory chapter). For the purposes of our work, we used the *DinavMouv* online basis, which represents the most recent and the most exhaustive inventory of French motion verbs (see Stosic & Aurnague 2017 and Stosic's

chapter in this volume). This lexicon contains 960 motion verbs, organized around the two macro-categories and the four basic categories, as reported in Graph 5. In this study, we take into consideration all four basic categories of motion verbs in order to assess the extent to which each of them is able to provide bases for forming evaluative verbs.



**Graph 5.** Distribution of motion verbs into the four basic categories (cf. Stosic, this volume)

### 6.3 Evaluative motion verbs in French revisited in the light of new data

The methodological and theoretical developments reported in the Section 6.2. provide both a valuable empirical basis and an integrated analytical framework for further investigation of evaluative motion verbs. First of all, this made it possible to sort out 110 evaluative motion verbs<sup>12</sup> from the list of 960 inventoried evaluative verbs. Again, *Wiktionary* turned out to be a very valuable source of data, as it enabled us to increase the number of evaluative motion verbs: Amiot and Stosic's (2011) and Stosic's (2013) lists contained about twenty items of this type.

In accordance with general observations made in Section 6.1, some of them are built on nominal (about 32%, e.g. 21) and other types of bases (about 8%, e.g. 22).

(21) *pied* 'foot' / *piétiner* 'to stamp, to shuffle along'  
*jambe* / *gambe* 'leg' / *gambiller* 'to dangle one's legs from side to side when hanging'

(22) *dodo* 'beddy-byes' / *dodeliner* 'to nod (head)'

12. This number does not take into account *re*-prefixed verbs (e.g. *reboitiller* 'to limp slightly again', *retrainasser* 'to lag (behind) again', *retrotiner* 'to trot around again', etc.), because they systematically duplicate their base, which has already been taken into account as such.



This further means that 60% or, in raw numbers, 65 of the 110 indexed evaluative motion verbs are deverbal. Some examples are given in (23):

- (23) *flâner* ‘to stroll’ / *flânoter* ‘to stroll a little’  
*lambiner* ‘(informal) to dawdle’ / *lambinocher* ‘(more informal) to dawdle’

The number of deverbal evaluative motion verbs obviously increased but it remained relatively low. Some of them are built on new bases, not inventoried in our initial studies, whereas the others are formed from bases that we had already identified. For instance, *dansoter*, *flânocher* and *rôdailler* were present in our first corpus but not *dansouiller*, *flânoter*, *rôdasser* and *rôdiner*.

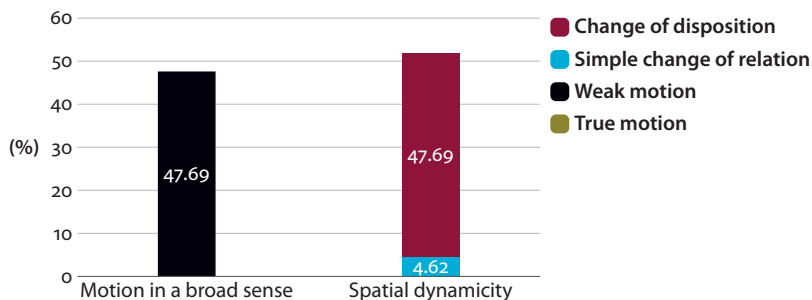
- (24) *danser* ‘to dance’: *dansoter*, *dansouiller* ‘to dance slightly’  
*flâner* ‘to stroll’: *flânocher*, *flânoter* ‘to stroll’  
*rôder* ‘roam’: *rôdailler*, *rôdasser*, *rôdiner* ‘to roam’

Such a phenomenon is well attested in evaluative morphology (cf. Section 2). In any case, these 65 verbs are the main focus of this section and they will serve as an empirical basis for further examination of the interaction between motion and evaluation in French.

#### i. Qualitative analysis of bases

The 65 inventoried evaluative motion verbs are formed from 47 different base verbs, which all express motion. This increase from 15 to 47 motion verbs used for forming evaluative lexemes is due both to the enlargement of the corpus of evaluative verbs that we performed and to taking into account a more comprehensive lexicon of motion verbs in French.

As for the semantic type of the 47 base verbs, our analysis clearly suggests that both macro-categories of motion verbs are capable of providing bases for the formation of evaluative verbs. Verbs expressing *Spatial dynamicity without displacement* are slightly more numerous (52.31%) than those describing *Motion in a broad sense* (47.69%). Taking into account a finer-grained level of categorization of motion verbs – namely the four basic categories (see Section 6.2, Graph 5) – provides however more clear-cut evidence regarding the spatio-aspectual nature of motion processes likely to be affected by evaluation. Thus, Graph 6 shows that the vast majority of bases belong to two basic categories, namely to verbs expressing *Weak motion* and to verbs expressing *Change of disposition* (see Table 5 for illustration). Interestingly, no verb of *True motion* was found among the base verbs, and there are only three verbs describing *Simple change of relation* that were used as bases in forming evaluative verbs.



**Graph 6.** Distribution of base verbs across the four basic categories of motion verbs

Even though verbs expressing *Weak motion* and *Change of disposition* proved to be the most suitable for forming evaluative motion verbs, note that this is the case for only a small portion of them, because evaluation affects only ten percent of each of these categories.

Table 5 provides a list of motion verbs that we identified as bases in our new corpus.

**Table 5.** Extended list of motion verbs used as bases for forming DEV in French

#### True motion

∅

#### Weak motion

*boiter* 'to limp', *border* 'to border', *caler* (a.fr.) 'to run away', *c(l)amper* 'to roam the fields', *cloper* 'to limp', *courir* 'to run', *dégouler* (a.fr.) 'to pour forth/out', *filer* 'to dash/pop to', *flâner* 'to stroll', *flotter* 'float', *galoper* 'to gallop', *glander* 'to loaf about', *lambiner* 'to dilly-dally', *marcher* 'to walk', *muser* (a.fr.) 'to dawdle with one's nose in the air', *nager* 'to swim', *se promener* 'to go for a walk', *rôder* 'to roam around', *rouler* 'to roll, to drive', *touiller* 'to stir', *trainer* 'to hang around', *tracer* 'to dash to, to rush', *trotter* 'to trot', *voler* 'to fly', *voyager* 'to travel'

#### Simple change of relation (without displacement)

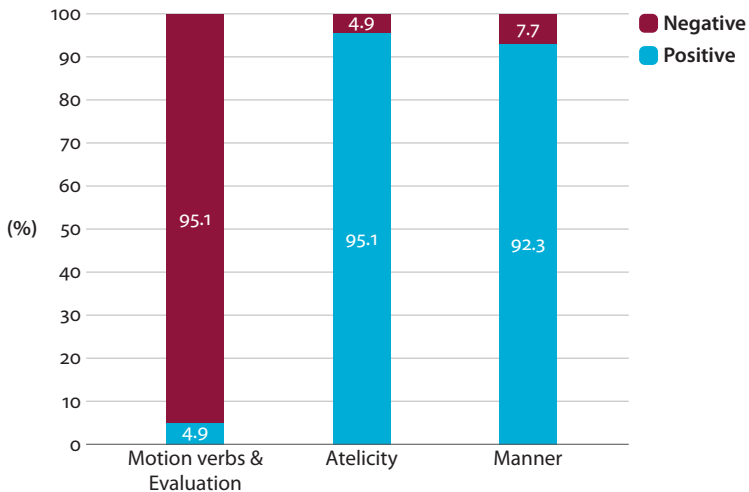
*frotter* 'to rub', *sauter* 'to jump', *toucher* 'to touch'

#### Change of disposition

*baller* 'to toss', *bouger* 'to move', *bougiller* 'to move a little', *bouillir* 'to boil', *brandir* 'to brandish, to wave', *branler* 'to wobble', *cligner* 'to blink', *danser* 'to dance', *fouiller* 'to rummage through/about', *plisser* 'to crease, to wrinkle', *s'accroupir* 'to squat/crouch down', *s'attrouper* 'to crowd (a)round', *s'étirer* 'to stretch', *se tordre* 'to twist', *se tortiller* 'to wriggle', *tourner* 'to turn', *trembler* 'to shiver', *virer* 'to tack', *vriller* 'to spin, to corkscrew'

Although we included new and more extensive data and used a larger lexicon of French motion verbs, our results confirm the weak compatibility between motion and evaluation. On a large scale, only 4.9% of motion verbs inventoried in the *DinaVmouv* base (i.e. 47/960) are used as bases for forming evaluative verbs. What is particularly worth highlighting is the fact that verbs involving true motion, that

is both a change of placement and a change of basic spatial relation (e.g. *entrer* ‘enter’, *traverser* ‘cross’, *passer* ‘pass’, etc.), are not used as bases for evaluative verbs. In addition, there are two other results worthy of closer consideration: most of the indexed bases are intrinsically atelic and they lexically encode manner of motion. Graph 7 is a summary display of some of the main properties of motion verbs serving as bases in our new corpus of evaluative bases:



Graph 7. Motion verbs, evaluation, telicity and manner

## ii. Qualitative (semantic) analysis of affixes

Among the evaluative affixes applied to motion verbs, our data reveal a clear-cut opposition between prefixation and suffixation: only two prefixes are used in forming evaluative lexemes from motion verbs, and the number of these verbs is also very low: only two verbs, one per prefix. On the other hand, all the suffixes that we have retained can be used in the formation of evaluative verbs from motion verbs, and the number of these suffixed verbs is much greater (about 60 items).

### Evaluative prefixation

Generally, evaluative prefixes form very few verbs: *hyper-*, *micro-* and the ancient prefixes *ca-*, *far-*, etc. form respectively 16, 13 and 18 verbs. Only *sous-* and mostly *sur-* form verbs in large numbers, respectively 68 and 183. For the latter two, if the base verb is a motion verb, there seems to be some sort of conflict between the inscription of the process of motion in space and the evaluative meaning of the prefixation: while in other domains the *sur-/sous-* prefixed verbs express respectively excess (or sometime superiority) / inferiority (*sur-/sous-alimenter* ‘to overfeed/to undernourish’, *sur-/sous-artermer* ‘to over-/underarm’, *sur-*

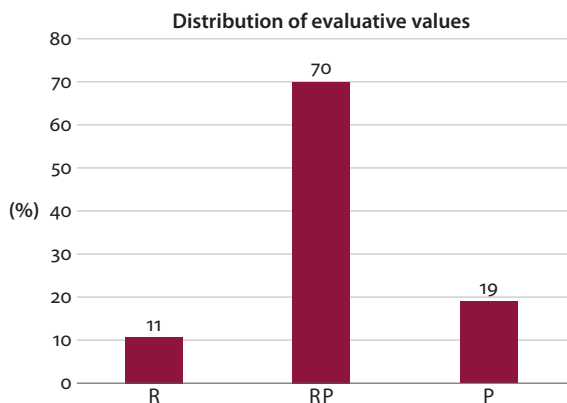
*sous-dimensionner* ‘to over-/undersize’) (cf. Amiot 2004, 2012; Lefer and Grabar 2014), this is not the case in the spatial domain, where the prefixed verb may have:

- i. a purely spatial interpretation; this is the case of verbs such as *survoler* ‘to fly over’ or *surnager* (< *nager* ‘to swim’) ‘to float’, which do not mean ‘to fly/swim in excess or better than the others’.
- ii. an interpretation implying spatial superiority: *surélever* and *surbaisser* mean ‘to raise/lower the height of something’. Such an interpretation does not involve an evaluation in comparison to a well-established norm (cf. Section 2).
- iii. an evaluative meaning but in this case the base verb no longer denotes a true motion. This case may be illustrated by a verb such as *surpasser* ‘to surpass/outdo’, which semantically no longer has any relation with the motion verb *passer* ‘to pass’.

Actually, the only prefixed motion verbs in our corpus that have an evaluative meaning are *survirer/sous-virer* ‘to over-/understeer’; in their case, the spatial meaning and the evaluative meaning seem to be compatible. However, as no assumptions can be made from only two verbs, suffixation is the main focus of what follows.

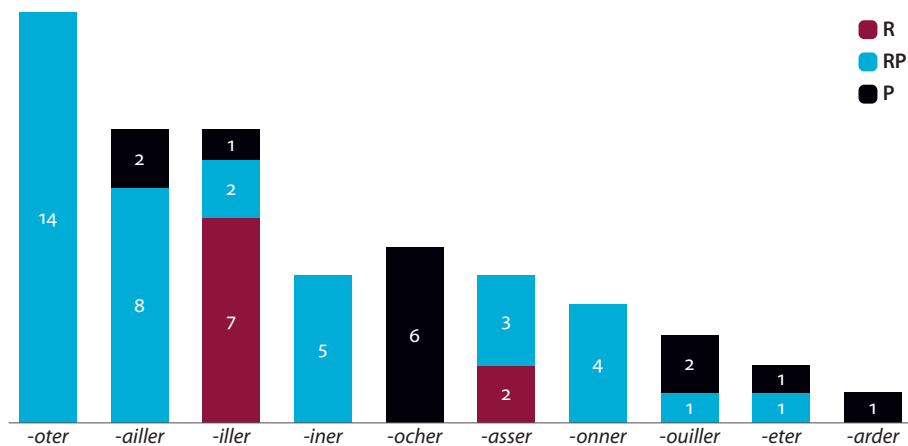
#### Evaluative suffixation

An in-depth analysis of the evaluative values concerned by suffixation showed that, in the motion domain, evaluative suffixes fundamentally carry pragmatic meanings. Graph 8 shows that in general, the addition of evaluative suffixes to motion verbs gives them both referential and pragmatic values (RP), and that 19% of them take on only a pragmatic value (P), as opposed to 11% of them with only a referential one (R).



**Graph 8.** Distribution of referential and pragmatic evaluative values in the corpus of DEV

The importance of pragmatic marking is particularly salient with the most frequent suffixes, namely *-oter* and *-ailler*, but also with less frequent ones. Graph 9 shows the distribution of referential and pragmatic marking for each evaluative suffix when they take motion verbs as bases.



Graph 9. Types of values constructed by each of the evaluative suffixes

The suffix *-iller* appears as a noticeable exception in that it mainly carries referential meanings because evaluative verbs formed by it describe actions whose processing and representation are different from those expressed by their bases (e.g. *sauter* ‘to jump’ vs. *sautiller* ‘to hop (around)’, *tourner* ‘to turn, to rotate’ vs. *tourner* ‘to do a lot of little rotations’). The importance of the referential marking in the case of *-iller*-suffixed motion verbs is also supported by the fact that most of them are highly lexicalised in French (e.g. *sautiller* ‘to hop (around)’, *boitiller* ‘to hobble, to limp slightly’). It is not inconceivable that these verbs have lost an initial pragmatic value because there still exist some *-iller*-suffixed verbs bearing pragmatic marking (e.g. *bougiller* ‘to move a little bit, informal’, < *bouger* ‘to move’). However, all these evaluative verbs, whether they have a pragmatic value or not, generally have a referential value and consequently participate in the morphological encoding of manner of motion.

Scrutinizing the evaluative motion verbs displaying primarily pragmatic marking is of particular relevance for our study. They fall into two groups depending on the aspectual nature of the base verb.

- i. If the base verb is atelic, two subtypes must be distinguished. The first and the most frequent subtype comprises atelic motion verbs such as *nager* ‘to swim’ that, lexically, do not involve any meaning falling within the scope of the evaluation, and more precisely, of its referential pole, namely repetitive,

diminutive, tentative or some other evaluative meaning (see Sections 2 and 3). Due to evaluative suffixation, the derived motion verb *nageoter* (see Example 25) is provided with the two possible markings, a referential one (<sub>R</sub>) and a pragmatic one (<sub>P</sub>):

- (25) *nager* ‘to swim’ / *nageoter* ‘to swim (a little, with small movements)<sub>R</sub>  
+ (colloquial)<sub>P</sub>’

It thus appears that *nageoter* is concerned with the referential pole because the process of swimming itself is modified (‘a little, with small movements’) and also with the pragmatic pole because the derived verb belongs to a colloquial register. This is the reason why the verb *nageoter* has to be considered as describing a specific way of performing the action of swimming.

The second subtype comprises atelic motion verbs such as *flâner* ‘to stroll’ that already express, at the lexical level, one of the referential meanings belonging to the domain of evaluative morphology. More precisely, *flâner* ‘to stroll’ already has a sort of tentative meaning because it means ‘to walk slowly, without a precise direction’. Depending on the evaluative suffix that such verbs are formed with, they can take on either a pragmatic and an additional referential value (26a) or only a pragmatic value as suggested in (26b) and (26c):

- (26) a. *flâner*<sub>{R}</sub><sup>13</sup> ‘to stroll’ / *flânoter* ‘to stroll<sub>{R}</sub> (a little, with small movements)<sub>R</sub> + (informal)<sub>P</sub>’  
b. *flâner*<sub>{R}</sub> ‘to stroll’ / *flânocher* ‘to stroll<sub>{R}</sub> + (informal)<sub>P</sub>’  
c. *baller*<sub>{R}</sub> ‘to sway’ / *ballocher* ‘to sway<sub>{R}</sub> + (informal)<sub>P</sub>’

Unlike *flânoter* (26a), which is concerned with the referential pole because the process of wandering is not realized as expected (see the component ‘a little, with small movements’), and also with the pragmatic pole because the derived verb belongs to an informal register, *flânocher* (26b) denotes the same process as the base verb *flâner*, but in an informal register. In this case, the evaluative suffix only ensures a pragmatic marking, which often concerns diastatic or diaphasic variations. The same applies to *baller* / *ballocher* in (26c). However in this case the lexical meaning of the base verb *baller* does not display a sort of tentative value but repetition, which is also one of the referential meanings belonging to the domain of evaluative morphology.

In addition to *-ocher*, a few other French evaluative suffixes are characterized by a high capacity for pragmatic marking: *-ouiller*, *-ailler*, *-arder* and *-asser*. What

13. The symbol <sub>{R}</sub> is used to indicate that the term in question involves in its lexical meaning some of values falling within the scope of the evaluation, and more precisely, of its referential pole (see Section 3).

one can observe in such cases is an interesting combination between a particular type of lexical base and very specific suffixes having a strong pragmatic value.

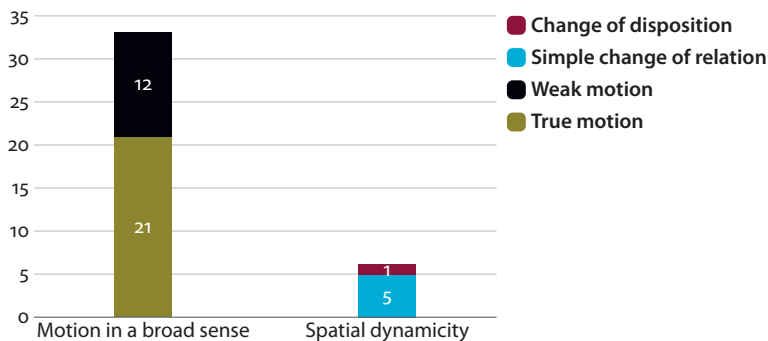
These data highlight the fact that, when evaluative motion verbs are formed from atelic bases, there is considerable interplay between the lexical properties of the base verb and the specific contribution of evaluative suffixation. More specifically, the concomitant presence of both referential and pragmatic values specific to evaluative morphology appears as a default case. While the pragmatic marking is systematically due to the evaluative suffixation itself, referential meanings falling within the scope of evaluation can originate from evaluative suffixation itself (see 25), from the semantics of the base (see 26b or 26c), or from both of them (26a).

- ii. If the base verb is telic, the referential marking seems to be blocked, so that the adjunction of an evaluative suffix can only impact the pragmatic level. This observation suggests that the telicity parameter plays an important role in the explanation of constraints governing the possibilities of referential and/or pragmatic marking by evaluative affixes. As previously mentioned (see Graph 7), most of the motion verbs available for evaluation are inherently atelic, and all these verbs bear, in one way or another (cf. i), the two kinds of values specifically related to evaluative morphology: referential ones and pragmatic ones. The same cannot be said for telic verbs that do not appear to be referentially marked. This is what we observe with two telic motion verbs *s'accroupir* 'to squat' and *s'attrouper* 'to flock together, to gather' used for forming *s'accroupiller* 'to squat + colloquial and/or regional (Picardy)' and *s'attroupailler* 'to herd together, to gather + informal'. These verbs, which express transitional and hence heterogeneous motion processes, can only be marked by pragmatic values, so that they do not encode any specific way of performing the actions described by their base verbs.

The affinity between evaluation and atelicity has already been noted in several studies (especially van Geenhoven 2004, 2005), and our analysis of evaluative motion verbs demonstrates the accuracy of this correlation. Our results also point out a relative incompatibility between telicity and the referential value of evaluative suffixation, but our corpus contains very few telic verbs: the vast majority of derived evaluative verbs are built from atelic verbs and as established in Section 4, none of the evaluative verbs are derived from true motion verbs (which are telic ones, cf. Aurnague 2012). It is therefore difficult to know whether this apparent incompatibility is a coincidence or if it is motivated. In order to confirm or refute these results, we decided to conduct a final search on the Internet.

## 6.4 Going beyond lexicographic resources in the study of evaluative motion verbs

Despite our methodological choices, the data this research is based upon should be seen rather as a sample of deverbal evaluatives because of the vitality of evaluative affixation. In the domain of evaluative morphology, spontaneous attested forms are generally considered to be much more numerous than what is found in dictionaries, however comprehensive and updated they may be (cf. Roché 2008 on evaluative morphology and non-conventional morphology and the vitality of this type of morphology; see also Dressler & Merlini Barbaresi 1994; Grandi 2009). In order to address doubts regarding the accuracy of lexicographic inventories of evaluative verbs, we decided to further verify whether other evaluative verbs built from motion verbs were also attested. For this purpose, we tested on the Internet 39 motion verbs not indexed in our list extracted from *GLAWI*. Most of them were taken from the category of *True motion verbs* that proved to be missing as bases in our extraction from *GLAWI*. Moreover, the majority of verbs selected (26/39) were telic ones. Graph 10 offers a portrait of these new sample data.



**Graph 10.** Semantic type of motion verbs used as additional sample for testing two parameters on the Internet

Candidate forms were obtained by adding to each verb five suffixes *-ailler*, *-arder*, *-eter* *-oter* and *-ouiller* (see Example 27), which returned a total of 195 different candidate verbs.

(27) *grimper* / *grimpailler*, *grimparder*, *grimpeter*, *grimpoter*, *grimpouiller*

These suffixed verbs were used in a minimal context: to avoid nominal forms they were preceded by the pronoun *il*, and they were conjugated in a neutral form (third-person singular, present indicative), *i.e.* for example, for the verb



*s'approcher* 'to come nearer': "il s'approchaille / il s'approcharde / il s'approchète / il s'approchote / il s'approchouille". The sequence was between quotation marks.<sup>14</sup>

- i. *Overall results.* From the 195 forms tested on the Internet, we found 28 additional deverbal evaluative verbs: 18 suffixed by *-ouiller*, 8 by *-ailler* and 2 by *-oter*. Several of these verbs are built from the same base, for example *sortouiller* and *sortailler* are both built from *sortir* 'to go out', and *grimper* 'to climb' is the base of 3 different verbs: *grimpailler*, *grimpoter* and *grimpuiller*. This resulted in 28 derived verbs but only 21 bases. Consequently, some motion verbs from our list are not attested as forming evaluative verbs (e.g. *aborder* 'to reach, to land on', *traverser* 'to cross', *regagner* 'to go back to, to regain', etc.).
- ii. *Base verbs.* The motion verbs these new deverbal verbs are based on clearly suggest that all the possibilities of forming evaluative motion verbs were not exhausted in our previous corpora. What makes these new suffixed verbs different is (a) the telicity and (b) the kind of motion their base verbs denote.

Concerning telicity, our sample data from the Internet show that the formation of evaluative verbs from telic motion verbs is not impossible, contrary to what emerged from lexicographic data. Thus, whereas in Section 6.3 we saw that almost all the base verbs were atelic, by testing the set of given forms on the Internet we found, among the 21 base verbs, 13 telic verbs and 8 atelic ones.

Concerning the kind of motion expressed by base verbs, telic verbs are fundamentally true motion verbs (12), for example *arriver* 'to arrive' or *sortir* 'to go out', and atelic ones are fundamentally weak motion verbs (7), such as *grimper* 'to

**Table 6.** Motion verbs attested as bases in the sample data from the internet

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**True motion (telic)**

(*s'*)*approcher* 'to come nearer', *arriver* 'to arrive at/in', *atteindre* 'to reach', *se carapater* 'to run away', *dépasser* 'to overtake', *entrer* 'to go into', *larguer* 'to throw down', *passer* 'to pass', *pénétrer* 'to penetrate, to get into', *quitter* 'to leave', *rejoindre* 'to reach, to lead to', *sortir* 'to go out'

**Weak motion (atelic)**

*descendre* 'to go down', *escalader* 'to scale', *fuir* 'to flee', *grimper* 'to climb', *monter* 'to go up', *parcourir* 'to roam, to travel along', *patrouiller* 'to patrol'

**Simple change of relation (without displacement) (telic)**

*s'accrocher* 'to hold on to, to cling to'

**Change of disposition (atelic)**

*envahir* 'to invade, to overrun'

---

14. Testing the possibilities of attestation of candidate forms as sketched in our protocol should be done through a large-scale data collection. For verification purposes, we confined ourselves in this study to a small-scale web search.

climb' or *parcourir* 'to roam, to travel along' (see Table 6). There is also one change of disposition verb (*s'accrocher* 'to hold on to, to cling to', telic) and one change of position verb (*envahir* 'to invade, to overrun', atelic).

iii. *Kind of evaluation.* Both referential and pragmatic values are conveyed by these new evaluative motion verbs found on the Internet. We focus first on referential meanings, then on pragmatic ones.

The only verbs that are concerned by referential meanings (R) are those formed on atelic bases, whatever the suffix. *Grimpailler* and *grimpoter*, formed from the atelic verb *grimper* 'to climb', are good examples:

- (28) a. *D'où ces derniers partaient pour y grimpailler*  
 from.where these latter leave.IMPRES.3PL for there climb(inform).INF  
*comme des chèvres*  
 like DET.INDEF.PL goat.PL  
 'from there, they set out to scramble up [the mountain] like goats'
- b. *pour vous faire grimpoter au mat de cocagne*  
 in order to you make climb(inform).inf to.the mast of feast  
 'to make you climb the greasy pole'

In these two evaluative derived verbs, the process of climbing is perceived as modified at the referential level: *grimpailler* means 'to climb here and there, in several directions' (tentative meaning), and *grimpoter* 'to climb a bit' (diminutive meaning).

On the other hand, if the base verb is a telic one, suffixal evaluation does not modify the process it denotes. Thus, none of the telic motion verbs used as bases in our sample data from the Internet (see Table 6) involve any modification in the way the motion is processed at the referential level, as shown in Examples (29)–(33).

- (29) a. *J'arrivouille chez ma Doudou (Génial le surnom*  
 I arrive(inform).PRS.1SG at my sweetie-pie great the nickname  
*nan?) Vers 2h30 et qui voiije?*  
 isn't at around 2h30 and who see.PRS.1SG.I  
 'I get to my sweetie-pie's place (great nickname, no?) around 2h30 and who do I see?'
- b. *demain je partouille en Bulgarie !!*  
 tomorrow I leave(inform).PRS.1SG to Bulgaria  
 'I'm off to Bulgaria tomorrow!!'
- c. *Ouuuuuuuh la volée qui passouille par dessus le filet.*  
 wow the volley who pass(inform).PRS.3SG over the net  
 'wow what a volley over the net'

In all these examples, evaluative motion verbs are only endowed with pragmatic meanings, and the morphological encoding of manner of motion is blocked.

The 39 suffixed evaluative verbs found on the Internet all carry pragmatic evaluative values (P), whether their base is telic or atelic. The pragmatic value of the derived verbs is very high, especially those suffixed by *-ouiller* and *-ailler* (30–32) and may concern several aspects: the register (30) and plays on sounds (31), (32) and (33) (cf. Roché 2002).

In (30), the derived verbs *s'accrochouiller* and *entrouiller* are just informal forms corresponding to their base verbs *s'accrocher* 'to cling to' and *entrer* 'to go in', and they are used in informal contexts as shown by the use of *morfals* '(informal) glutton, pig' in (30a) and the use, in (30b), of three synonymous expressions, one pragmatically neutral, *rien* 'nothing', and two from an informal register: *que t'chi* and *nada* (< sp. *nada* 'nothing').

- (30) a. *ça s'accrochouille n'importe où, et les gros morfals n'*  
 it cling.to(inform).PRS.3SG all.over.the.place and the big glutton.PL NEG  
*y ont pas accès*  
 there have.PRS.3PL NEG access  
 'you can hang it anywhere and the greedy pigs can't get at it'
- b. *j'ai fait un reset du toit ouvrant !!! et*  
 I have.PRS.1SG do.PTCP a reset.of.the.sunroof and  
*rien, que t'chi, nada, ça craquouille quand ça*  
 nothing nothing nothing it creak(inform).PRS.3SG when it  
*s'entrouille !!!!*  
 enter(inform).PRS.3SG  
 'I reset the sunroof but nothing doing, zilch, it still creaks when it opens'

In (31) and (32), the derived verbs are also informal, but their uses also illustrate cases where suffixation processing plays on sounds: in (31) the *-ailler* suffixed verbs, *j'entrouille* and *j'approchaille*, are part of the rhyme in a popular song from Quebec; in (32) the suffixed verb *descendouille* resonates with the two informal forms in *-ouille* present in the sentence: the noun *cafouille* 'coffee', and the verb *réveillouille* 'to wake up'; this is an example of the use of "outbursts", *i.e.* sequences containing series of terms all with the same suffix, here *-ouille* (cf. Tanguy 2012; Dal and Namer 2018).<sup>15</sup>

15. This example comes from a Website, *Nini Bidouille* (<http://ninibidouille.canalblog.com/>), where the blogger enjoys using the suffix *-ouille* on all sorts of words, several times in each sentence.

- (31) *Quand le mai fut planté. Labouré. Dans la maison j'*  
 when the maypole be.PST.3SG plant.PTCP dig.PTCP in the house I  
*entraïlle. Voyant la table mie, labouri. Sans*  
 enter(inform).PST.1SG see.PTCP.PRS the table put.PTCP dig.PTCP without  
*façon j' m'approchaille* (1854)  
 fashion I get.closer(inform).PST.1SG  
 'When the maypole was erected./ Dug./ Into the house I went./ Seeing the  
 table laid./ Dig-i/ Free and easy, I approach'
- (32) *j' avais mis mon réveil, à six heures pour mon retour*  
 I have.IMPRES.1SG put.PTCP my alarm at six o'clock.PL for my return  
*au boulot, je suis descendouille boire mon*  
 to.the work I be.PRS.1SG go.down.(inform)PTCP drink.INF my  
*cafouille avant de réveillouille ma Doudou.*  
 coffee(inform) before wake.up(inform).INF my darling  
 'I'd set my alarm-clock for 6 to go back to work, I went downstairs to have a  
 coffee before waking my sweetie-pie up'

As for (33), the verb *pénétroter* appears in a context that is a sort of fanciful imitation of a regional dialect (the author, André Martel, revels in using a very personal and funny language, either in the sounds or the spelling):

- (33) *Mon rôle maintonnant cé de m' espiliquer en léga-teux*  
 my role now it.is to me explain.INF in légateux.language  
*por pénétrotter danleu cervelier des bravasgens*  
 in.order.to penetrate(inform).INF into.the brain.SUF of.the.PL brave.people  
*contrompe*  
 that.one.mislead  
 'My job now is to couch things in legal lingo to make myself understood by  
 all the good folks who're being conned'

As can be seen, the verbs cited in the examples are not used in a conventional way and it is easy to understand why these verbs are not listed in dictionaries. Besides the fact that many of these verbs are slang, they seem to have been created "on the fly", and their use is highly dependent on the context in which they were produced. These verbs are in no way "academic lexical innovations" (Crystal 2000), they are *contextual formations*, or *nonce words*, i.e. "new complex word[s] created by a speaker/writer on the spur of the moment to cover immediate need" (Bauer 1983: 45). In our examples however, the "immediate needs" that must be covered are ludic purposes; these evaluative verbs therefore appear to correspond to what Dal and Namer (forthcoming) name *playful nonce-formations*.

## 7. General discussion and conclusion

The main focus of this paper was the interaction between evaluative morphology and the semantics of dynamic space in French, with a few considerations of cross-linguistic data. More specifically, we sought to refine the hypothesis put forward in our previous research that motion verbs are relatively reluctant to serve as bases for evaluative affixation. By cross-referencing a larger sample of French evaluative verbs extracted from the French language version of *Wiktionary* (960 items) and an extended list of French motion verbs (960 items), we found 65 deverbal evaluative verbs formed from 47 motion verbs, which is three times the number of verbs that we indexed from the *TLFi* in our previous study. Obviously, the ratio of evaluative motion verbs to the total number of indexed evaluative verbs is very low, but it does not prove that they are more reluctant than other semantic types of verbs to allow evaluation. Concerning the affixation processes, what stood out clearly is that the vast majority of evaluative motion verbs are obtained by suffixation. The evaluative prefixes such as *sur-* and *sous-*, when combined with motion verbs, do not allow the construction of the evaluative meanings that they build with other kinds of verbs (intensity, excess, etc.). The spatial anchoring of motion verbs seems to block evaluative values in favour of the spatial meanings they involve.

Next, we addressed the question of the semantic nature of the 47 French motion verbs that proved to be compatible with evaluative affixation. A fine-grained lexical analysis of these verbs, based on Aurnague's (2011) description and classification of motion verbs, led us to conclude that telicity is a key factor for understanding the complexity of rules governing the evaluation of motion processes. What clearly appeared is that the vast majority of them fall into two categories of motion verbs, namely verbs expressing either weak motion or a change of disposition. Also, most of them are atelic and involve the manner component in their semantics. Consequently, homogeneous motion processes already coding manner are best suited to be affected by evaluation, while telic motion processes are hardly ever targeted by it. This result confirms the prediction that verbs describing true motion are reluctant to express evaluation, at least that is what was suggested by our data obtained from lexicographic sources.

In order to check the validity of this finding, we introduced new data gathered from the Internet by targeting the types of motion verbs with the least affinity for evaluation, namely those expressing telic motion processes (mainly, *True motion verbs*). Testing almost 200 candidate forms on the Internet enabled us to clarify two important points. First, there is no rule or principle that, from a strictly formal point of view, would block the formation of an evaluative verb from true motion verbs: in appropriate contexts (*i.e.* informal contexts), speakers/writers coin and use such verbs very easily, especially with *-ouiller* and *-ailler*, currently the

two most informal suffixes. Second, the Internet search highlighted both the importance of taking into account the telicity parameter and the need to make a clear distinction between referential and pragmatic evaluative meanings. More precisely, these additional data confirmed the lack of affinity between telicity and one particular type of evaluative meaning, i.e., a referential one. As for pragmatic evaluative meanings, which do not involve any modification in the representation of the process denoted by the base verb, their construction seems to be allowed whatever the kind of motion verb. These conclusions stress the accuracy of the bipolar distribution of evaluative meanings (see Section 2), and hence the importance of distinguishing referential and pragmatic values as far as possible when analysing data pertaining to evaluation.

This further suggests that only certain evaluative verbs participate in the morphological encoding of manner, namely those that involve one of the referential meanings characteristic of evaluation. In other cases, the addition of evaluative affixes does not trigger any change in the representation of motion described by the base verb. The role of evaluative morphology in such cases is not to convey a non-canonical way of performing the action described by the base verb; its role is reduced to expressing the speakers' attitude towards their addressee or towards what is being talked about.

This study also raises interesting questions about the very nature of linguistic and conceptual representations of motion events as well as about the possibility of modulating them by morphological means. As previously stated, using evaluative morphology for referential purposes involves the modification of the internal structure of processes described by the base verbs. In this regard, the results reported in this chapter clearly suggest that there are two sub-groups of motion processes depending on their capacity to be modified and conceptualized as somewhat different from their prototypical representation. The first group is made up of "easy to modify" motion processes that are fundamentally atelic and homogeneous. The best representatives of this group are weak motion and change of position (atelic) verbs. The second group consists of "difficult to modify" motion processes that are unable or much less able to tolerate a deviation from their prototypical representation; they are fundamentally transitional and hence heterogeneous. True motion verbs, involving both a change of placement and a change of basic spatial relation, describe eventualities that are a good example of processes that are difficult to modify. Distinguishing these two categories of motion processes helps to understand why some motion verbs exhibit resistance to evaluative morphology.

Our overall conclusion is that using morphological means in expressing manner is conditioned, first, by the very nature of the motion process described by a given verb, second, by the extent of evaluative morphology in a given language, and third, by the kind of evaluative meaning a given verb is supposed to convey.

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# Fictive motion in French

## Where do the data lead?

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This chapter reports the results of a corpus study on fictive motion (the use of motion verbs to describe motionless scenes) in French, carried out to investigate some proposals made by Langacker, Matlock, Matsumoto, and Talmy regarding this topic. The 589 attested utterances collected show that fictive motion involves more verbs and entities than is generally assumed. The suggested explanations draw on Aurnague's semantic analysis of motion verbs and Vandeloise's account of the meaning of spatial markers in terms of force dynamics and functional properties. The phenomenon is also analyzed in its discursive context, with a presentation of some properties of the "discourse mode" in which fictive motion expressions appear.

**Keywords:** corpus study, discourse mode, motion verbs

### 1. Introduction

Virtual Motion, Subjective Motion, Fictive Motion,<sup>1</sup> Non-Actual Motion: all these terms have been coined to categorize more or less the same family of utterances. A simple glance at these various denominations reveals three things about this phenomenon:

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1. I use the term "fictive motion" because of its frequency of use, and do not endorse any theoretical framework by doing so. The term "Non-Actual Motion" proposed by Blomberg and Zlatev (2014) might seem a good alternative, but its definition does not allow one to take into consideration Matsumoto's (1996b) Type II (which can be briefly described as an inversion of the "target", or located entity, and the "landmark", or locating entity) or other examples that are more difficult to classify, as for example *Le Rangitoto sortait des nuages* 'Rangitoto [a volcano] was coming out of the clouds'.

- it pertains in some way to motion (a point on which everybody seems to agree);
- the way in which it pertains to motion is not the usual one, i.e., it is the opposite of an objective, actual, factual motion;
- there has been debate in the research community on what it is exactly (hence the various denominations).

According to some authors, a phenomenon found in all (or almost all) languages is the use of expressions related to motion in order to express a situation in which no concrete entity moves. The prototypical example is (1a), but some of the other sentences in Example (1) are considered by some scholars to be more or less loosely related to the phenomenon:

- (1) a. *The road goes from Auckland to Helensville.*  
 b. *The path is rising quickly as we climb.* (Langacker 2005)  
 c. *The sun is shining into the cave/onto the back wall of the cave.*  
 (Talmy 1996)  
 d. *The general's limousine keeps getting longer.* (Langacker 1999)  
 e. *The bakery is across the street from the bank.* (Talmy 1996)  
 f. *The concert went from midnight to 4AM.* (Langacker 1986)  
 g. *Prices are going up.*  
 h. *I am going to give you some examples of fictive motion.*

We can thus see that the debate involves from the outset the very scope of the phenomenon. This variation in scope is a consequence, if not a cause, of the discrepancy in the explanations proposed.

A wide range of studies, conducted in the field of American cognitive linguistics, has emphasized the role of cognitive features on semantics: the phenomenon at issue is considered to exist because meaning is colored by cognitive processes external to pure language, such as perception, or spatial or scenic (re)construction. From this angle, Fictive, Virtual or Subjective Motion is the sign of a mental simulation of motion, or of the motion of a focus point along an imagined entity. This is notably justified by the directionality implied in fictive motion utterances, as for example in the following, where, although (2a) and (2b) can refer to the same situation, their meaning is slightly different:

- (2) a. *Dairy Flat Highway goes from Silverdale to Albany.*  
 b. *Dairy Flat Highway goes from Albany to Silverdale.*

Blomberg and Zlatev (2014) showed that these different denominations for what broadly seems to be a consensus actually reveal considerable disagreement about the nature of the phenomenon. They distinguished three kinds of

psychological motivation for Non-Actual Motion: enactive perception, mental scanning, and imagination.

The first one can be illustrated with a phenomenologico-gestaltist theoretical framework, represented in French semantics by Visetti and his colleagues:

Verbs such as *monter* [to go up, to ascend] intrinsically are not verbs of motion / displacement [...] roads, lanes etc. are not objects that are dissociated from the notions of motion, access, route, etc. and [...] the words *route* [road], *chemin* [lane] and *escalier* [stairway] intrinsically express these notions.

(Lebat and Cadiot 2003: 29)

The entities involved in fictive motion expressions incorporate in their semantics an affordance, a “praxeological anticipation”, acquired through our concrete daily experience, and on the other hand, as shown in the quotation, there is, in this model, no motion embedded in the semantics of verbs such as *monter*, but rather aspectual and directional properties which, in combination with moving entities, can express the aspectual and directional properties of motion.

The idea that the nature of the sentence subject plays a key role is also present in some work in cognitive linguistics, and notably in Matsumoto (1996b), who shows that Japanese allows fewer verbs to be used in subjective motion utterances when the subject is not a ‘travellable’ entity. He considers, however, that all three psychological motivations may be at play in subjective motion: “In some cases it is the movement of the focus of attention; in other cases the motion of some imaginary entity is involved; and in still other cases the mover is a specific person (e.g. a speaker or a hearer)” (Matsumoto 1996a: 137).

In American cognitive linguistics, Talmy (1996) is, according to Blomberg and Zlatev, the best representative of this first type of motivation: distinguishing two modes of givenness, Talmy argues that fictive motion is the result of the conflict of these two modes. The first one is an enactive, engaged mode of perception, biased towards dynamism, while the second is more distanced and reflective.

For the second type of motivation, mental scanning, the argument is often put forward that the entities have to be elongated or long enough to trigger the need for a sequential scanning of the object described by the motion verb (as opposed to being wholly perceivable in one glance):

In some cases, the TR [trajector] is a traversable path [...] and in others, a relatively long entity that is not ordinarily traversed [...]. In still other cases, the TR is neither linear nor long, but, rather, it becomes lengthened through dynamic construal [...].

(Matlock and Bergmann 2015: 546–7)

Langacker’s sequential scanning is the prototype of this second approach, and pertains to abstract motion rather than to subjective motion only. This scanning

is not only related to perception, but, more importantly, to conceptualization, and explains even the imperfective aspect (see Langacker 1986).

The third motivation, imagination, is illustrated according to Blomberg and Zlatev by the work of Matlock, who has shown, through an extensive set of psychological experiments, that fictive motion is probably tied to some kind of mental simulation of a motion.

Despite these divergences, there is broad agreement in all the American literature on certain features, such as for example the elongated nature of the figure, or target. However, as early as 1976, Boons et al. showed that in French there are two major classes of use of motion verbs to express static configurations, the first one involving a subject “denoting an elongated body or surface” and the second one involving subjects that are neither elongated objects nor body parts. These two classes can be revealed, for example, by the difference of interpretation when an adverb such as  *brusquement*  ‘suddenly’ is used:

- (3) a.  *Le chemin débouche brusquement sur la place.*   
 the lane open\_into-PRS.3SG suddenly on the square  
 ‘The lane suddenly opens into the square’  
 b.  *Le rocher émerge brusquement de l’ eau.*   
 the rock emerge-PRS.3SG suddenly from the water  
 ‘The rock suddenly emerges from the water’

In (3b), a fictive motion construal is possible (hence a feeling of ambiguity that doesn’t occur with (3a)), without implying in any fashion a stretched or lengthened rock.

This important discrepancy about the supposedly elongated nature of entities involved in fictive motion description could, ultimately, come from a disagreement about which verbs (or expressions, or verb+satellite combinations) can relate to motion or not. For example in (3b), one could argue that  *émerger*  ‘to emerge’ is not a motion verb and therefore that (3b) is not a fictive motion expression. The fact is that, except for peripheral work on the topic, there is no clear typology of motion verbs/expressions. The vast majority of research on fictive motion involves Talmy’s theoretical framework, in which “Motion” encompasses both static localization and the various intuitive categories of motion (change of posture, change of extent, change of place, etc.). It is therefore sometimes rather complicated to assess to what extent fictive motion is fictive, if the “Motion” expression serves to express a static situation even with a movable entity. In order to clarify this matter, it will be necessary to adopt an appropriate semantic theory about motion verbs (see Section 2.2).

The discrepancy could also come from a difference in method. Cognitive linguistics research on fictive motion often relies on the manipulation of invented

examples, while studies carried out in the theoretical framework of the “lexicon-grammar” (Boons et al. 1976; Guillet and Leclère 1992)<sup>2</sup> are grounded on a methodical inventory of attested constructions, partly established with the help of corpus studies. Of course, intuition is a powerful tool, and a corpus is limited in that it cannot reveal each and every possibility. Nevertheless, by repeatedly using the same canonical constructions, research may be impoverished, restricting its scope around a prototypical core, especially when transposing from English to another language (in the present case, French, which is centrally opposed to English in Talmy’s typology).

Lastly, the definition of the phenomenon itself can generate divergences in the object of study. For instance, Matlock (2004b) defined fictive motion as “roughly, mentally simulated motion along a path or linear configuration” (p. 221). The problem with such a definition is that it does not call on linguistic criteria or concepts in its formulation. The advantage is that it clearly states that not all static uses of motion verbs are considered as fictive motion (FM) utterances. In the same chapter, the author added several linguistic constraints to her definition of fictive motion (p. 226):

An FM-construction has the following constituents: subject noun phrase (NP), motion verb, and either a prepositional phrase (PP) (e.g. *along the coast* in *The road runs along the coast*) or a direct object (e.g. *the creek* in *The road crosses the creek*).

Thus, a sentence like *Uphill just means that the road goes up*<sup>3</sup> does not contain, according to this theoretical account, an FM-construction (even if the target is the prototypical road!). This shows the importance of a proper and agreed definition.

From these observations, I proposed in Cappelli (2013) to study fictive motion in French:

- using a definition that would not needlessly distort the results by biasing the outcome without strong theoretical justifications;
- with a clear and concise theoretical framework regarding the semantics of motion verbs;
- from attested utterances, and a corpus study, in order to compensate for potential flaws of intuition/imagination;
- with an approach that is as integrative as possible, for the sake of communication with the research community, and transferability to other languages;

2. See the Introduction chapter for more details on this research framework.

3. <http://forum.wordreference.com/threads/uphill-downhill-up-down-the-road.1152/> (created the 29th of August 2004, consulted the 31st of July 2016).



- by going beyond the sentential level, and looking at the linguistic reality of the phenomenon, which has seldom been done before.<sup>4</sup>

## 2. Theoretical framework and constitution of the corpus

### 2.1 Definition

As pointed out in the introduction, fictive motion can be conceived of in various ways, and though one may wish to be integrative, there is a limit to the disparate entities that can be subsumed in the same conceptual group. The core of the concept can be considered to be what is illustrated with the prototypical examples of roads going from A to B: the use of *motion verbs* to describe the *static situation* of one or several concrete, material entities.

This definition excludes:

- utterances involving flows (rivers, streams, canals, etc.), unless the ‘motion’ is oriented upstream;
- those pertaining to Talmy’s radiations (lights, temperatures, sounds, etc.);
- those pertaining to Matsumoto’s Type II (or Langacker’s perfective virtual motion, or Talmy’s frame-relative motion), i.e., when a moving target is described as being immobile in a moving environment (e.g. ‘passing landscape’ seen from a train).

Indeed, in all these cases, one can argue that there actually is a motion in the situation described.

### 2.2 Semantics of motion verbs

The theoretical framework adopted here towards motion verbs is the one developed by Aurnague (2011), which is in turn an elaboration of Boons’ (1987) seminal proposal of the concept of “change of basic locative relation” (see Aurnague’s contribution in this volume). Basically, Boons pointed out that a crucial difference between motion verbs comes from the fact that some express a change of location with respect to a landmark, whereas others do not. This can be captured by the change in truth-value of the basic locative relation embedded in the verb, which

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4. A notable exception is work on fictive motion in Italian, where fictive motion has been described as pertaining to a specific textual genre: “The widespread use of verbs of motion and location in fictive motion constructions does not seem, therefore, to be a peculiarity of the English language. It seems rather to be a common feature of guidebooks as a genre” (G. Cappelli 2012; see also Demi 2009 for this approach).

takes the form “X is Prep Y”. *X goes to Y* can therefore be seen as expressing the change of the relation “X is at Y”, since the proposition means that at first, “X is not at Y”, and that finally “X is at Y”. *X leaves Y*, in contrast, means that at first “X is at Y”, and that finally “X is not at Y”. This contrast between *to go* and *to leave* is addressed in this approach by the notion of “polarity”: a motion verb is said to be “initial” if the change of the embedded basic locative relation is from assertion to negation (*to leave*), “final” when it is from negation to assertion (*to enter*), and “medial” when the assertion is flanked by an initial and a final negation (*to go through*).

However, we intuitively grasp that motion cannot be restricted to the concept of change of basic locative relation. An utterance such as *Sandy ran all day* does not assert any change of basic locative relation, but surely expresses some kind of motion, called a “change of placement” (see Aurnague’s contribution in this volume). Aurnague (2000) suggests that the preposition *par* ‘by’ reveals this difference between change of placement and change of relation. The verbs whose semantics contains a change of basic locative relation accept a prepositional phrase (PP) introduced by *par* in its “path interpretation” (4b), while the others (4a) seldom accept a PP in *par*, and when doing so, only express a vague, “imprecise localization”:

- (4) a. *Libres, débridés, errent par les vignes les chevaux.*  
 free unbridled wander-PRS.3PL by the vineyards the horses  
 (A. Calvos, *Odes nouvelles*, 1826)  
 ‘Free, unbridled, the horses are wandering through the vineyard’
- b. *Max est sorti/arrivé par la rue*  
 Max be.PRS.3SG come\_out/arrive-PTCP by the street  
*St François.* (Aurnague 2011)  
 St. François  
 ‘Max went out/arrived by St François street’

Again, we might feel that a substantial proportion of motion events is missing: for example *to stretch*, *to sit*, *to kneel*, denote neither any change of basic locative relation nor a change of placement, but still, our intuition is that there is some motion expressed by this kind of verb. Illustrated through “changes of posture” in Aurnague (2011), this family of verbs also includes changes of extent, and the full set of motions that are more or less limited to a moving entity’s (or target’s) own frame of reference (see “changes of disposition” in the chapters by Stosic and Stosic and Amiot, this volume). Another preposition, *à travers* ‘through’, has been shown by Aurnague to efficiently help distinguish change of placement from change of posture:

- (5) a. <sup>??</sup> *Max s'est assis/étendu à travers le jardin.*  
 Max REFL-be.PRS.3SG sit/lay\_down-PTCP through the garden  
 'Max sat/lay down through the garden'
- b. *Max a couru/marché à travers le jardin.*  
 Max have.PRS.3SG run/walk-PTCP through the garden  
 'Max ran/walked through the garden'

What is shown by the difference between (5a) and (5b) is that changes of posture are closer to stillness than to motion. *A travers* implies a coverage of the entity it introduces, and (5a) would perhaps be acceptable if, for example, Max were a giant, taking up all the space in the garden to lie down or sit.

Changes of posture, of placement and of basic locative relation structure the motion continuum, but do not form three mutually exclusive categories of motion verbs: changes of relation and placement combine in different manners, which leads to a sharper categorization of motion predicates.

Often, where a change of basic locative relation occurs, it is correlated to a change of placement (in these cases, we are dealing with motion *sensu strictissimo*): in order to go out of my house, I have to pass by the entrance and therefore to walk a little, changing my position within the terrestrial frame of reference. To escape from jail, I might have to run a fair distance! Changes of relation alone are actually quite limited in the lexicon of French. A good example is *se poser* 'to land':

- (6) a. <sup>??</sup> *L' oiseau s'est posé sur la maison par le jardin.*  
 the bird REFL-be.PRS.3SG land-PTCP on the house by the garden  
 'The bird landed on the house through the garden'
- b. *L' oiseau est entré dans la maison par le jardin.*  
 the bird be.PRS.3SG enter-PTCP in the house by the garden  
 'The bird flew into the house through the garden'

To be acceptable, (6a) requires a context in which the roof of the house is difficult to reach, making it necessary to accommodate the predicate in order to include the approach phase (that is to say, to combine the change of relation with an *ad hoc* change of placement). In strict motion verbs and descriptions, changes of relation are, then, combined with one or several changes of placement.

On the other hand, some specific verbs expressing a change of placement can, with the appropriate complementation, serve to express a change of relation:

- (7) a. *Max a glissé dans le ravin.*  
 Max have.PRS.3SG slide-PTCP in the ravine  
 'Max slid into the ravine'
- b. *La voiture a dérapé sur le bas-côté.*  
 the car have.PRS.3SG skid-PTCP on the verge  
 'The car skidded on(to) the verge'

These verbs have semantic features that have been grouped under the concept of “tendentiality”, as they possibly convey the idea of end or aim of the motion event: speed, opposition to a force, direction, and being carried along by a force (see Aurnague’s contribution in this volume and Aurnague 2011).

For the purpose of this chapter, closing this subsection with a list of the different categories of motion predicates established with the guidelines of this framework should suffice (the internal structure of the first eight categories is further commented on in Aurnague’s chapter):

- Independent initial change of relation (*s’en aller* ‘to go away’, *partir* ‘to leave’)
- Extended initial change of relation (*s’enfuir* ‘to run away’, *décamper* ‘to decamp’)
- Double change of relation with initial saliency (*déménager* ‘to move out’, *émigrer* ‘to emigrate’)
- Inclusion/containment-type initial change of relation (*sortir* ‘to go out’, *jaillir* ‘to gush’)
- Final change of relation with integrated prior motion (*aller* ‘to go’, *venir* ‘to come’)
- Final change of relation with presupposed prior motion (*atteindre* ‘to reach’, *arriver* ‘to arrive’)
- Double change of relation with final saliency (*immigrer* ‘to immigrate’)
- Inclusion/containment-type final change of relation (*entrer* ‘to go in’, *pénétrer* ‘to penetrate’)
- Change of relation and placement based on distance (*approcher* ‘to move near’, *s’éloigner* ‘to move away’)
- Change of relation and placement based on direction (*bifurquer* ‘to fork’, *dériver* ‘to derive’)
- Double change of relation without saliency (*migrer* ‘to migrate’)
- Double change of relation with constraints on the whole motion (*franchir* ‘to go through’, *traverser* ‘to cross’)
- Medial change of relation (*passer* ‘to go by’, *transiter* ‘to transit’)
- Change of placement only (*naviguer* ‘to sail’, *marcher* ‘to walk’)
- Tendential change of placement (*courir* ‘to run’, *monter* ‘to go up’)
- Change of relation only (*toucher* ‘to touch’, *se poser* ‘to land’)
- Verbs without change of relation or placement – changes of posture, extent and, more generally, “changes of disposition”.

### 2.3 The corpus

First of all, in order to obtain the broadest picture possible of fictive motion in French, a list of motion verbs was needed. As previously pointed out, this is not

a straightforward task if one wishes to avoid the pitfall of projecting a particular theory, definition or understanding of what a motion verb is, and then limiting the scope of the investigation to this definition. In order to provide data that can be useful for researchers disagreeing with the chosen theoretical framework for the semantics of motion verbs, a large, quite objective and consensual list of French motion verbs was selected. Laur (1991) and Sarda (1999) propose such lists, respectively for intransitive (including indirect transitive) and for direct transitive motion verbs. The lists are the ones drawn up by linguists from the former LADL lab (Paris) within the “lexicon-grammar” approach (Boons et al. 1976; Gross 1975; Guillet and Leclère 1992). A few verbs have been added, some suggested by the first results, such as *tournoyer* ‘to swirl’, others in order to detect examples like the ones proposed by Talmy (1996), such as *se regrouper* ‘to gather’. This gave a final list of 521 verbs (Cappelli 2013: 86–93).

As previously said, trying to generate examples with these verbs and to assess their acceptability was not a viable option, especially by using the small set of traditional target entities in subject position (roads, fences and mountain ranges). In order to find enough attested utterances of fictive motion with these 521 verbs, a computerized textual database was required. Frantext<sup>5</sup> provided an appropriate answer to these needs. To avoid problems of diachronic variation and to keep a reasonable corpus size, a subset of texts was constituted by taking into account the last decade of publication only. This does not preclude a larger time range of production, as some texts are published a relatively long time after having been written, but the production period is nevertheless confined to the twentieth century (mainly the second half). After a preliminary pass on the data, poetry was excluded, as contemporary poetry deliberately produces literary chimeras that are not at all representative of more regular uses. The final selection contained 68 books (novels, autobiographies, diaries, essays), on which the list of 521 verbs was projected.

### 3. Fictive motion at the sentential level

As shown in Table 1, this method yielded 70,932 utterances including an inflected or infinitive form of one of the 521 motion verbs. From these 70,932 utterances, only 589 could be classified as fitting into the broad definition of fictive motion adopted here, that is to say, less than one percent.

Out of the seventeen classes of motion verbs (plus one which groups the verbs that do not directly denote motion) only three tiny ones (representing no more

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5. See the Introduction chapter for more information about Frantext.

than seven verbs altogether: *déménager* ‘to move out’, *émigrer* ‘to emigrate’, *s’exiler* ‘to go into [self-imposed] exile’, *s’expatrier* ‘to expatriate oneself’, *immigrer* ‘to immigrate’, *migrer* ‘to migrate’, *transmigrer* ‘to transmigrate’) are not represented in the fictive motion examples. The common point between them is that they all express two changes of locative relation, initial and final. This absence will be addressed in Section 3.5, and, if we leave these categories aside, we can see that the full range of motion verbs is used to produce fictive motion utterances. At the level of macrocategories of verbs, the four classes distinguished on the basis of the concepts previously highlighted are thus involved: strict motion verbs (changes of relation and placement), changes of placement (tendential verbs included), changes of relation only, changes of posture and, more generally, of disposition (neither change of relation nor change of placement).

**Table 1.** Count of utterances with motion verbs in the corpus

Total	70,932	100%
Actual motion	31,684	44.67%
Fictive motion	589	0.83%
Type II	87	0.12%
Radiation	145	0.20%

Regarding the entities involved, while travelable or stretched ones are abundant, other types also frequently occur (e.g. worn clothes, body parts, plants or plant parts) and do not belong to these two categories. The explanation in terms of mental scanning due to the length of the entity, not perceivable at one glance, is very often contradicted as well. Verbs simply expressing a change of locative relation of inclusion/containment (such as *sortir* ‘to go out’, or *entrer* ‘to come in’), for example, are not primarily used to express an elongation but rather the spatial configuration made up by the target and the landmark (here a relation of support/contact and, perhaps, of “attachment”) together with issues related to access to perception:<sup>6</sup>

- (8) *Du milieu de chacune de ses paumes sort un nez*  
 from;ART;SG middle of each of his palms come\_out.PRS.3SG a nose  
*rose.* (E. Levé, *Œuvres*, 2002)  
 pink  
 ‘A pink nose comes out from the middle of each of his palms’

6. These verbs embed in their semantics the meaning of the preposition *dans* ‘in’, and Vandeloise (2003) showed that in the family resemblance characteristics of the containment relation, expressed by this preposition, one is that “The container hides the content”.

Another verb, *traîner* ‘to lie around’, also appears with many non-elongated entities:

- (9) *Encore aujourd’hui, une bille traîne toujours dans le*  
 still today a marble lie\_around-PRS.3SG always in the  
*fond de ma poche.* (G. Bouillier, *Rapport sur moi*, 2002)  
 bottom of my pocket  
 ‘To this day, a marble has always lain around in the bottom of my pocket’

As this verb is very interesting to investigate the manner condition, postulated by Matsumoto (1996b), this is where will start a more detailed examination of the results.

### 3.1 The manner condition

Matsumoto (1996b: 194) proposed two general conditions in order to explain the acceptability or unacceptability of subjective motion constructions in English and Japanese:

The path condition: Some property of the path of motion must be expressed.

The manner condition: No property of the manner of motion can be expressed unless it is used to represent some correlated property of the path.

These conditions result in certain restrictions on the kinds of motion verbs and concomitant adpositional and adverbial phrases that occur in subjective motion expressions.

The manner condition is close to what Honda (1994: 201) also proposed: “From the manner of motion, the conceptualizer figures out the shape of an external path.” It is generally well accepted (even if Rojo and Valenzuela (2003) note that it might be “a bit more questionable” than the path one) and has served as the basis for numerous psychological experiments related to fictive motion. As pointed out by Stosic (2009), manner is a difficult concept to define and handle (see Stosic’s contribution in this volume). Although very frequent in the semantics of motion verbs, it is usually processed in a more intuitive than systematic or formalized way. In the theoretical framework adopted here, manner is not an operational feature, but to facilitate comparison with other studies, a broad approach is adopted and the predicates that could be considered as being “manner verbs” are taken into account. Obviously, we will find a lot of them among the verbs expressing only a change of placement. In addition to the verbs that express the shape of motion according to Stosic (2009), i.e. *défiler* ‘to stream’, *filer* ‘to dash’, *louvoyer* ‘to tack’, *zigzaguer* ‘to zigzag’, one can include *serpenter* ‘to snake, to wind’, and among the verbs with no change of relation or of placement: *cerner* ‘to surround’, *enjamber* ‘to

stride over, to span', *entourer* 'to surround', *ployer* 'to bend', *tournoyer* 'to swirl'. An interesting fact, for some of these verbs, is that their dictionary definition already includes a sense with no mention of motion, but concerning the expression of a particular shape, or configuration.

More interestingly, some counter-intuitive and marginal examples illustrate the manner condition by contradicting the way it is usually presented. These are not the canonical travelable or stretched entities generally involved in examples with *marcher* 'to walk' or *danser* 'to dance', and without the corpus I confess that I would not have been able to imagine such occurrences as:

- (10) *Deux mules blanches à talons hauts marchent vers le canapé.*  
 two slippers white with heels high walk-PRS.3PL toward the couch  
 (A. Ernaux and M. Marie, *L'usage de la photo*, 2006)  
 'Two high-heeled white slippers walk toward the couch'

- (11) *À l'arrière-plan, un petit village dansant comme dans les tableaux de Chagall: église, maisons, fenêtres de guingois.*  
 Chagall church houses windows lop-sidedly  
 (L. Flem, *Comment j'ai vidé la maison de mes parents*, 2004)  
 'In the background, a little village dancing like in Chagall's paintings:  
 lop-sided church, houses, and windows'

However, it is clear that, as motion predicates, these verbs, if they are to be considered motion verbs, should be included in the domain of manner of motion, since the manner component included in their meaning provides us with information on the shape of the entity, or, more precisely, on its internal structure or its configuration with other entities. On the other hand, these examples illustrate that the manner condition does not allow us to predict which verb will be used in which context. Quite the opposite in fact: by collecting such examples, we can grasp what manner in these verbs truly is, thanks to the manner condition. In this respect, *marcher* is closer to *enjamber* than to *courir*, and this might be very useful in attempting to formalize the semantics of these verbs.<sup>7</sup>

7. See for example Mani and Pustejovsky (2012), who proposed to formalize *to run* as being the alternation between connection and disconnection of feet with the ground: while this may be relevant here for *to walk*, it is difficult to accept the idea for *to run* and the coverage it implies when used in fictive motion descriptions.



### 3.2 Duration and speed

Other parameters have been proposed. For example, Honda (1994: 201) stated that “From the duration of motion, the conceptualizer figures out the extent of an external entity”. In Matlock (2004a), speed and difficulty of the terrain are said to be correlated with thinness, length and straightness of the subject entity. However, for Matsumoto (1996b: 199), speed is not a relevant criterion at all: “when *run* and *hashiru* are used to represent subjective motion, they do not convey any information about the manner of motion. That is, information about the manner of motion (e.g. rapidity) is suppressed.”

How can we decide if speed is a relevant semantic feature or not when it comes to fictive motion (that is to say, when no actual motion and therefore no actual speed is present in the situation described)? In the results, the other verbs used to express straightness and length can involve rapidity (e.g. *dévaler* ‘to hurtle down’) or not (*tomber* ‘to fall’). *Traîner* is, in this respect as well, highly interesting. This verb has two possible meanings in fictive motion constructions. The first one is related to the transitive use of the verb that can be translated by ‘to drag’, and that gave nouns like *traîne* (‘train’ as in the bride’s train) and *trainée* ‘trail’. As these nouns show, this sense of *traîner* (let’s call it *traîner*[1]) is used to express long, straight entities:

- (12) *Elle porte une abaya couleur corbeau. La tenue traîne jusqu’*  
 she wear-PRS.3SG a abaya color raven the outfit drag-PRS.3SG until  
*au sol.* (L. Le Vaillant, *Libération*, 2015/12/07)  
 to;ART;SG floor  
 ‘She wears a dark abaya. The outfit trails to the floor’

The second meaning (*traîner*[2]) might follow from a first derivation from the spatial use to the temporal one (‘to drag on’), and can be translated by ‘to lie around’. As shown in (9), it does not imply that the entity is long or straight, but just that an object is not in its right place.

With respect to rapidity or duration, both meanings of *traîner* appear to be on the side of slowness and length. However, an important difference between *traîner*[1] and *traîner*[2] is that the first one still contains the idea of being passively dragged. Moreover, all the other verbs used to express straightness and length can be understood as describing an entity undergoing an external force:

- *dévaler*, *tomber*: the entity is experiencing gravity;
- (*s’en*)*fuir*: the entity escapes an initial control;
- *jaillir*: the entity is propelled, sometimes constrained.

*Courir* and *run*, instead of encoding only speed in their semantics, may additionally embed in their manner component the idea of a moving entity experiencing its own momentum. This could reconcile Matlock's and Matsumoto's accounts. The other parameter chosen by Matlock (2004a), difficulty of the terrain, can be formalized in terms of force dynamics as well.

### 3.3 Instrumentality

Another component of the semantics of motion verbs, instrumentality, was recently investigated in a corpus study (where unfortunately the subject entities were limited to the traditional travelable or elongated entities) by Waliński (2015) who concluded that “no property of motion instrument can be expressed in a coextension path, unless it is used to represent some specifically correlated property of the path” (p. 98). Indeed, the author found only one such utterance in the British National Corpus.

The study presented here is mostly in accordance with intuition and Waliński's findings: verbs like *pagayer* ‘to paddle’, or *canoter* ‘to go boating’, which are derived from the name of the instrument (*pagaye* ‘paddle’, *canot* ‘boat, dinghy’), were not found to produce fictive motion constructions. One utterance was found with *naviguer* ‘to sail’, and when expanding the search to the internet, an interesting one with *surfer* ‘to surf’ (however it remains highly debatable whether a pure expression of instrumentality can be discerned in these verbs):

- (13) *La route surfe sur des collines, de vraies*  
 the road surf-PRS.3SG on INDF;ART;PL hills PTV real  
*montagnes russes.*<sup>8</sup>  
 roller coaster  
 ‘The road surfs the hills, a real roller coaster’

In a way similar to the manner condition, the instrument condition seems to be a guideline for interpretation rather than a true predictive rule that would allow us to prognosticate which verb can be used in a fictive motion utterance or not.<sup>9</sup>

8. <http://frogsonbents.over-blog.com/article-24366920.html> (created the 6th of July 2009, last consulted the 31st of July 2016).

9. Additionally, it is interesting to note that the verb *chevaucher* ‘to ride’, which is directly derived from *cheval* ‘horse’, is mainly used in French to express the fact of overlapping.

### 3.4 Properties of the path

What about the path condition, or the properties of the path that should allow a manner or instrument verb to be used in a fictive motion construction? A good opportunity to determine which properties a verb should possess to fully be able to be used in a fictive motion expression would be to observe fictive motion sentences without complements denoting the landmark or an extent. A dozen verbs were spotted in such a context in the corpus: *descendre* ‘to go down’, *dévaler* ‘to hurtle down’, *disparaître* ‘to disappear’, *grimper* ‘to climb’, *monter* ‘to go up’, *redescendre* ‘to go down again’ or ‘to go back down’, *retomber* ‘to fall down again’ or ‘to fall back down’, *s’aligner* ‘to align’, *s’élancer* ‘to rush forward’, *s’élever* ‘to ascend’, *s’étendre* ‘to stretch’, *tomber* ‘to fall’, *tourner* ‘to turn’, *traîner* ‘to hang about’, ‘to lie around’.

Some of them can already be explained. The last one, *traîner*, has been dealt with above. *Disparaître* cannot be considered as a motion verb *per se*, but if it were, it would be an independent initial change of relation like *partir* ‘to leave’. However, with respect to interpretation and fictive motion, it could be grouped with the verbs involving a change of relation of the type inclusion/containment, to show that fictive motion does not always express a path, or an extent, but also issues of access to perception. *S’élancer* can be related to the problem of force dynamics mentioned earlier, as it denotes a self-motivated impetus: unsurprisingly, the entities using this verb are elongated. *S’aligner* is a borderline case: it is not a reflexive use, here, but a reciprocal one (some objects are said to align with each other), in which each target is the landmark of the others.<sup>10</sup> *Tourner* is an easy problem to solve: the shape of the entity is denoted as being at least partially circular.

What remain are the verb *s’étendre*, and eight verbs for which vertical orientation is essential, or at least recurrently and non-arbitrarily accidental in the case of *(re)tomber*. Hence, vertical orientation is one of the path properties that deserves a closer scrutiny. Indeed, Emirkanian (2008), in her study of the verb *monter* ‘to go up’, already pointed out what the results show with respect to vertical orientation. There is a major difference in the possible constructions if the subject entity is intrinsically vertically stretched or not:

- (14) a. *La route/ la rue/ le sentier monte jusqu’à l’ église.*  
 the road/ the street/ the track go\_up.PRS.3SG up to the church  
 ‘The road/street/track goes up to the church’

10. This shows that the boundary between fictive motion and fictive or subjective change is not always clear. “Subjective change is a fictive change that is induced when an object in an unusual state is felt to have undergone a change from its expected or usual state” (Matsumoto 1996a: 150). Here is a Japanese example given by the author: *Sono heya wa maruku natte iru* (Lit. ‘The room is in the state of having become round.’), ‘The room is round.’

- b. *Le mur/ l' arbre/ l' échelle monte jusqu' à ma fenêtre.*  
 the wall/ the tree/ the ladder go\_up.PRS.3SG up to my window  
 'The wall/tree/ladder goes up to my window'
- (15) a. *La route/ la rue/ le sentier monte.*  
 the road/ the street/ the track go\_up.PRS.3SG  
 'The road/street/track goes up'
- b. \**Le mur/ l' arbre/ l' échelle monte.*  
 the wall/ the tree/ the ladder go\_up.PRS.3SG  
 'The wall/tree/ladder goes up'
- (16) a. *La route monte sur 300 mètres (puis elle est plate).*  
 the road go\_up.PRS.3SG on 300 meters after she is flat  
 'The road goes up for 300 meters (and after is flat)'
- b. \**Le mur/ l' arbre/ l' échelle monte sur 2 mètres.*  
 the wall/ the tree/ the ladder go\_up.PRS.3SG on 2 meters  
 'The wall/tree/ladder goes up for 2 meters'

When the target is intrinsically vertically elongated (like a wall, or a ladder), the verbs involving vertical motion can only be used to express the whole extent of the target, through a measure of its elongation (14b). When the target is not intrinsically vertically elongated (like a road), the motion verb is used to express a declivity of the entity. Looking at vertical orientation allows us to grasp something that is often masked by the fascination for the ability to swap directionality in fictive motion sentences, as in (2):

- (2) a. *Dairy Flat Highway goes from Silverdale to Albany.*  
 b. *Dairy Flat Highway goes from Albany to Silverdale.*

It is not always possible to observe this flexibility: long hair always falls from the head to the shoulders, and does not climb from the shoulders to the head, just as trees always go up to windows, and never go down to the ground. Directionality of scanning in fictive motion is not completely subjective, and is sometimes constrained by canonical dependencies between entities or parts of entities (and, more generally, the way some entities emerge from other ones).

But let's go back to the list of verbs that can be used in a fictive motion utterance without any complementation expressing the path: *s'étendre* 'to stretch' is used, like the verbs involving vertical orientation of motion with intrinsically vertically elongated entities, to express an extent, a measure of the target entity (the subject of the verb). Example (16) is revealing in this respect as the complements express a metrical measure, not a landmark. There are very few verbs in the data with that kind of complementation: *aller* 'to go', *monter* 'to go up', *s'arrêter* 'to stop', *s'élever* 'to ascend', *s'étaler* 'to spread', *s'étendre* 'to stretch', to which can be

added *courir* ‘to run’ if one considers complements of the form *de* + *Nlandmark*[1] ... *à* + *Nlandmark*[2] or *depuis* + *Nlandmark*[1] ... *jusqu’*à + *Nlandmark*[2] ‘from + *Nlandmark*[1] ... to + *Nlandmark*[2]’.

Here, we are at the core of fictive motion as presented until now, and it is clear that this little list covers a large part of the motion continuum (see Section 2): *s’étaler* and *s’étendre* are changes of extent, and do not express changes of relation or placement, *s’arrêter* does not even directly denote motion, *courir*, *monter*, and *s’élever* are tendential verbs while *aller* is the only verb directly expressing a change of relation. However this last remark should be nuanced or supplemented, as *aller* might originally have been a verb simply denoting a change of placement (Aurnague 2011), as shown by residual uses where it is combined with *par* in its imprecise interpretation (see Example (3a)) or with *à travers* (see (4)). Indeed, for some philologists, the Old French verb *aler* associated to the auxiliary *avoir* ‘to have’ denotes the fact of ‘walking’ or ‘hitting the road’ (Nordhal 1977). *Aller* is one of the few verbs in its category that does not incorporate a deictic value, and which therefore has a relative semantic neutrality, coupled with the ability to denote a motion process in its entirety.

Another motion verb is often used to introduce an extent, namely *arriver* ‘to arrive’. In such cases, the description usually expresses a measurement in terms of comparison between the target and the landmark:

- (17) *Le sommet de la chevelure des mères arrive à peine*  
 the top of the hair of;ART;PL mothers arrive-PRS.3SG barely  
*aux épaules des fils.*  
 at;ART;PL shoulders of;ART;PL sons

(H. Guibert, *Le Mausolée des amants: Journal 1976–1991*, 2001)

‘The top of the mothers’ hair barely reaches the sons’ shoulders’

This phenomenon can be explained by the presupposed prior motion embedded in the semantics of the verb (a change of placement: see Aurnague’s contribution, this volume), which occasionally allows us to conceptualize the event as an extent. The final change of relation which is focused on by the verb’s meaning operates as a boundary for the measurement of the whole extent. Here again, the final change of relation very often involves the “variable” end or extremity of the target entity (see the previous remark on canonical dependencies between entities or parts of entities).

### 3.5 The exception of migration paths

If all kinds of motion verbs, in the broad sense of motion, can be used in a fictive motion construction, why is there this exception about the double change of relation without constraint on the whole move?<sup>11</sup> Manner or instrument conditions do not allow us to explain this particularity... The solution is provided by Vuillaume (2012: 129), who insists on the linguistically expressed unity of the target involved in a fictive motion construction:

It is ordinary to mentally divide a road into segments and to refer to each of these segments by the NP *the road*. And if we ‘add up’ these segments, if we put them end to end, it is still the NP *the road* that we use to refer to the result of this operation.

Fictive motion is not just about decomposing an entity into sequences, but also about being able to still consider the whole as entire in the same operation. The initial or final change of relation matches with an end of the entity, while the subsequent or consequent change of placement (when present) helps to depict the extent of the entity. That is why, for example, verbs of change of relation of the type inclusion/containment, which do not embed an additional change of placement outside the one combined with the change of relation, are not obligatorily used to describe extended, lengthened entities. Double changes of relation with constraint on the whole move, such as *traverser* ‘to cross’, are productive with regard to fictive motion, because the whole process of motion is connected: the direct object (the landmark) provides the frame of reference in which the motion takes place, hence a continuity between the initial change of relation, the medial change of placement and the final change of relation. On the other hand, one can migrate from Paris to Auckland, passing through Singapore, Tokyo, Mexico...: this has no impact on the truth-value of the sentence as the medial change of placement is not really part of the predicate in terms of the semantic constraints on it. It is as if a gap was left between the initial and final changes of relation that would make it difficult to recover a unitary target entity from the different sequences of the process. Once this mechanism is understood, it is quite easy to imagine correct examples of fictive motion based on this kind of verb, such as:

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11. As a reminder, the verbs concerned are: *déménager* ‘to move out’, *émigrer* ‘to emigrate’, *s’exiler* ‘to go into [self-imposed] exile’, *s’expatrier* ‘to expatriate oneself’, *immigrer* ‘to immigrate’, *migrer* ‘to migrate’, *transmigrer* ‘to transmigrate’.

- (18) *Les arbres du domaine migraient de l'autre côté de la rivière.*  
 the trees of;ART;SG domain migrate-IMPERF.3SG of the other side of the river  
 'The trees of the estate were migrating to the other side of the river'

The river materializes this gap between the initial and the final changes of relation, and the trees, taken as a whole, a Figure (here in the true gestaltist meaning), migrate from one bank to the other. This example is actually based on the following attested utterance:

- (19) *Les rares micocouliers qui, en direction du nord, tentent de franchir la Loire, font quelques pas encore, titubant, puis s'effondrent, squelettiques, morts de froid.*  
 the rare nettle trees which in direction of;ART;SG north attempt-PRS.3PL to cross-INF the Loire do.PRS.3PL some steps still stagger-PCP then collapse-PRS.3PL skeletal dead of cold  
 (J.-L. Benoziglio, *La voix des mauvais jours et des chagrins rentrés*, 2004)  
 'The rare nettle trees which, heading north, attempt to cross the Loire [a river], take a few more steps, staggering, and then collapse, skeletal, frozen to death'

which partly refers to the question about the context in which fictive motion expressions occur. Are these particular constructions specific to a somewhat poetical style, with a hint of personification (or "animalification", to take the term used by Blomberg and Zlatev 2014)? Fortunately, the corpus enabled this matter to be investigated.

#### 4. Fictive motion in discourse

126 of the 589 examples extracted from Frantext consisted of a verb whose close cotext included another predicate giving rise to a fictive motion interpretation (this means that part of an example appeared in another example). I was able then to connect these occurrences and to obtain 52 composite utterances, longer than the others, which are likely to give a better idea of the discursive contexts in which fictive motion expressions appear.<sup>12</sup> In order to characterize and describe these discursive contexts, the modes of discourse defined by Smith (2003) were used.

12. Due to how Frantext works, most of the examples are 330 characters long, therefore the maximum distance between two fictive motion occurrences in the composite utterances is *circa* 310 characters.

These five modes of discourse are text units, of the size of a passage, for which Smith highlights precise linguistic properties: Narrative, Description, Report, Argument, and Information. Unsurprisingly, all these 52 examples pertain to the Descriptive mode (whether embedded in Narrative passages or not), with the exception of one, a marginal occurrence extracted from a dictionary entry, which appears to belong to the Informative mode:

- (20) [...] *une zone pélagique qui va de 3 000 à 5 000 mètres de profondeur*  
 a zone pelagic which go.PRS.3SG from 3,000 to 5,000 meters of depth  
 (J.-B. Pontalis, *Fenêtres*, 2000)  
 '[...] a pelagic zone, that goes from 3,000 to 5,000 meters of depth'

Every occurrence is a State (as opposed to other situation types: Events, General Statives and Abstract Entities), which, in Smith's typology, means that the utterances involve concrete entities, and static or durative aspectual properties.<sup>13</sup> The tenses are therefore present or imperfect, for all the instances except one, which is in the simple past, with a durative temporal PP (for the verb *traîner*[2]). Descriptive passages can serve as background parts during a Narrative text, and are characterized, when the narration involves past tenses, by their potential use of the present tense. The temporal progression is stopped during the time needed to perform the spatial progression, and the present tense is used to access a timeless situation, beyond the temporal scope of the narrative:

- (21) *Nous avons rencontré, en sortant, la voiture qu' était allée chercher à Beaulieu le chasseur en veste rouge – l' hirondelle, dirait Colette – et nous sommes parties à Saint-Hospice, que j' ignorais, car c' est un réel miracle. La route monte et longe la mer que l' on aperçoit entre des bois d' oliviers, prairies d' herbe tentantes où l' on aimerait appuyer le sommeil sourd d' une*  
 we have.PRS.1PL meet-PTCP while come\_out-PCP the car which be.IMPERF.3SG go-PTCP seek.INF at Beaulieu the bellboy in jacket red the swallow say.COND.3SG Colette and we be;PRS;1PL leave-PTCP to Saint-Hospice which I know\_not.IMPERF.1SG as it be.PRS.3SG a real miracle the road go\_up.PRS.3SG and go\_along.PRS.3SG the sea which one glimpse.PRS.3SG between ART;INDF;PL woods of olive-trees meadows of grass tempting where one like.COND.3SG lean.INF the sleep dull of a

13. Smith adapted Vendler's classification (1957), adding Semelfactives to the four other well-known categories.



*journée chaude. Saint-Hospice nous apparut très au crépuscule*  
 day hot Saint-Hospice us appear.PST.3SG very at;ART;SG dusk  
*et déjà ouatée de mystères et d' ombres exquisés.*  
 and already muffled with mysteries and with shadows exquisite

(M. Havet, *Journal 1919–1924*, 2005)

‘Going out, we came across the car that the bellboy – the swallow, Colette would say – fetched at Beaulieu, and we left for Saint-Hospice, which I didn’t know, as it is a real miracle. The road goes up and along the sea that is glimpsed between woods of olive-trees and meadows of tempting grass where one would like to lie in the dull sleep of a warm day. Saint-Hospice appeared to us at the dusk, already shrouded in mystery and exquisite shadows’

What is striking about the Descriptive mode for those interested in fictive motion is that it is described as follows by Smith (2003: 28): “Descriptive passages progress spatially through a scene.” Here we encounter again the concept of internalized motion, either the motion of an attentional focus or that of an imaginary traveler. As the 52 composite examples are sometimes quite long, they are a good basis to investigate how this spatial progression works, and although the notion of mental scanning or motion no longer appears relevant to define fictive motion alone (as it pertains to description in general), it is still possible to offer some linguistic evidence of the type of virtualization at play in fictive motion utterances.

Spatial descriptions have been investigated and described in several studies that are synthesized in Tversky (1996). The author distinguished three types of description, each related to the three types of orientation in language highlighted by Levinson (1996):

- Route: virtual tour, in which the viewer travels through the scene, and then serves as a landmark. Localization will be expressed in terms relational to the viewer;
- Survey: static point of view, from above. The localization will be expressed in relation to cardinal points, or in other environment-centered relational terms. Tversky (1996) mentions occurrences of fictive motion in this mode of description (verbs are generally less dynamic than in the route descriptions);
- Gaze Tour: also a static point of view, but the localization is expressed relative to this point of view, or calls on the intrinsic orientation of the described objects.

Of course, these are not closed, mutually exclusive categories. It is in fact very likely that any detailed description will include elements from the different types. As we can see, the authors mention fictive motion in their second type (Survey), whereas the first and the third types appear to fit better with what is said in most

work on fictive motion (Gaze Tour matches with the idea of a moving focus of attention, and the Route is essentially a virtual motion along a path).

Actually, in the 52 composite examples, Survey is the least frequent of the three types. An interesting finding about Survey is that descriptions of persons seem to relate to this type. Of course, cardinal points will not be used in these descriptions, but body parts, as they have a fixed arrangement (within the frame of reference delimited by the whole body), play the role of fixed and canonical landmarks in the spatial progression of the description. The other two types occur frequently, which provides linguistic evidence that fictive motion does not exclusively concern virtual motion of an object in the scene, or mental scanning. This concurs with Blomberg and Zlatev's (2014) conclusions.

But who is the viewer in these occurrences? Studying the persons is very informative in this respect: out of the 52 composite examples, more than two thirds use mainly the first person singular. The other third is equally divided between the third person singular, and no expression of person at all. A couple of examples involve the second person singular, but this is due to a stylistic trend in some recent French novels, in which the authors speak to themselves.

A cursory reading of these results highlights the importance of subjectivity, of personal perception, that accompanies the use of the first person. In fact, it is interesting to note that almost half of the examples involving the first person singular also contain the personal pronoun *on* ('one' used as a subject). This same pronoun is used in all but one of the examples related to the third person. *On* is an indeterminate pronoun, referring to an indeterminate human being. It can also be used in a more casual way to refer to the first person plural, but the first kind of use prevails here. This oscillation between the first person and an indeterminate one shows that the perspective depends rather on the moment, the location, and the orientation of the point of view, than on the subjective perception of a particular individual (in any case, "subjective motion" does not refer to this kind of subjectivity).<sup>14</sup>

The third set of examples, the one using no person at all, importantly features nominal sentences (also found, though less frequently, in the other examples). Nominal sentences are not mentioned by Smith (2003) as a canonical process of the Descriptive Mode, but are a significant feature of the results presented here. The feeling of timelessness is even stronger than in Descriptive backgrounds in the present tense framed by narratives in past tenses. In the absence of conjugated

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14. It is interesting to emphasize this alternation, considering the psychological experiment designed by Blomberg and Zlatev (2015) in which a difference between a first-person and a third-person perspective is assumed to be a potentially differential factor in the generation of non-actual motion utterances. The texts from the corpus do not seem to illustrate this dichotomy.

verbs in the main clause, frame-creating preposed adverbials are very frequently used in order to make the spatial progression easier. The following example offers good instances of nominal sentences and preposed adverbials (underlined). The frames created by the preposed adverbials have been enclosed in brackets.

- (22) [*Sur le fond vert pâle de la moquette, un soutien-gorge violet, on the background green pale of the carpet a bra purple rose et noir, des bas noirs avec une large bordure de pink and black INDF;ART;PL stockings black with a wide edge of broderie en dentelle, un porte-jarretelles s'emmêlent en un fouillis embroidery in lacework a garter-belt entangle-PRS.3SG in a jumble inquiétant, constituant une composition florale. Le soutien-gorge, avec un worrying constitute-PCP a composition floral the bra with a bonnet retourné, est posé au-dessus comme une grande cup turn\_around-PTCP be.PRS.3SG lay-PTCP above like a big paire de lunettes. Du fouillis s'échappe un lacis de jarretelles pair of glasses from;ART;SG jumble escape-PRS.3SG a lattice of garters et de brides dessinant un 8.*] [*À côté, le tee-shirt noir à rayures and of straps draw-PCP an 8 nearby the tee shirt black with stripes blanches de M. qui s'étale et plisse en une autre fleur white of M. which spread-PRS.3SG and crease-PRS.3SG in an other flower sombre, avec une petite flèche blanche – l'étiquette – en son centre. Absence dark with a little arrow white the label in its center absence de tout autre objet, en dehors d'une bande orangée de coussin.*] of any other object outside of a band orangey of pillow

(A. Ernaux and M. Marie, *L'usage de la photo*, 2006)

'On the pale green background of the carpet, a purple, pink and black bra, black stockings, with a wide edge embroidered with lace, and a garter-belt entangle in a worrying jumble, creating a floral composition. The bra, a cup inside out, lays on it, like a big pair of glasses. From the jumble a lattice of garters and straps escapes, forming a figure of 8. Nearby, M.'s black and white striped tee shirt, spreading and creasing in another dark flower, with a little white arrow – the label – in its middle. No other objects, except for an orangey pillow band'

The passage in bold corresponds to a postposed subject, or "locative inversion" (Cornish 2001), which is another way to use adverbials in order to facilitate spatial progression, especially in fictive motion utterances, as Fuchs and Fournier (2003: 86) already noted:

all things being equal, one can note that a verb in the imperfect is more easily followed by a postposed subject than a verb in the simple past [...]; this is particularly

clear for so-called verbs of motion that are interpreted in the imperfect as localization statives.

In the results presented here, this construction is much more widely used than the traditional presentational constructions (“there is”, “here is”, “it is”) and Taylor and Tversky (1996: 377) offer an interesting explanation of this phenomenon:

Coherent descriptions should adhere to the given/new principle [...] Applying this principle to spatial descriptions leads to expectation that people will first describe a known spatial location and then describe the position of a new landmark with respect to it. Each component of a description containing locative information should consist of a known spatial location followed by a new landmark. Then ordering spatial components in a continuous or organized fashion is known to promote comprehension.

Finally, the explicit mention of perception is often present, either through verbs such as *regarder* ‘to watch’, *voir* ‘to see’, *apercevoir* ‘to glimpse’ or nouns such as *regard* ‘look’, *vue* ‘sight’, just to mention visual perception. Traces of other modalities can also be found (mainly auditory and olfactory). All these characteristics led me to propose, in Cappelli (2013), the hypothesis that fictive motion is a property of a free indirect perceptual style, reporting the narrator’s perception as it arises, on the model of free indirect speech.

Going back to the first question, personification seems to be marginal in the corpus, even if sometimes clearly indicated, for example by the attribution of an intention, or of body parts:

- (23) *La falaise contre quoi le Tappan Zee Bridge semble vouloir*  
 the cliff against which the Tappan Zee Bridge seem.PRS.3SG want-INF  
*se jeter [...]* (A. Garréta, *Pas un jour*, 2002)  
 pounce-INF  
 ‘The cliff on which the Tappan Zee Bridge seems to want to pounce’
- (24) *La route va droit devant elle; elle peut se le*  
 the road go.PRS.3SG straight in front of her she can. PRS.3SG REFL it  
*permettre.* (J. Roubaud, *La Bibliothèque de Warburg: version mixte*, 2002)  
 afford-INF  
 ‘The road goes straight ahead ; it can afford it’
- (25) *Dans le Morvan dont la lourde main de granit gantée de fougère*  
 in the Morvan whose the heavy hand of granite glove-PTCP of fern  
*se pose près du Creusot [...]*  
 REFL lay-PRS.3SG next to;ART;SG Creusot  
 (C. Bobin, *Prisonnier au berceau*, 2005)

‘In the Morvan [a massif] whose heavy granite hand, gloved with fern, rests near The Creusot [a town] [...].’

These examples (as in (19)) show that even when personification is used, fictive motion is still relevant, as the road from (24) and the bridge from (23) are still not moving. Similarly, the nettle trees from (19) are still apprehended as a whole, a gestaltist form, not described as moving, but rather depicted in its internal configuration by means of fictive motion.

## 5. Conclusion

Fictive motion clearly lies within the descriptive mode of discourse and, as such, does not pertain to a particular textual genre. Rather, it can occur in any textual genre resorting to descriptions. According to Le Pesant (2012), fictive motion is a “phenomenon of regular polysemy”, meaning that there is not necessarily a primary meaning, the kinetic one, and a derived meaning, the static one. Motion verbs, which the author calls “verbs with locative arguments” to avoid prioritizing the motion facet, have two modes of action, a stative mode, leading to a static interpretation, and a non-stative mode (encompassing the other three lexical aspects defined by Vendler 1957), giving rise to dynamic interpretations. Here, I adopted Smith’s (2003) theoretical framework and showed that the notions of change of relation and change of placement (Aurnague 2011) – intended to describe the internal structure of motion events and, indirectly, their dynamic mode of action – can be transferred to the stative mode in order to express various spatial properties of the target entity denoted by the predicate’s grammatical subject. This is made possible by conceptualizing this entity as a whole, broken up into parts (referred to in a way similar to the whole) and reassembled through the process of fictive motion, as pointed out by Vuillaume (2012).

This exploratory research has also shown that fictive motion can be used to express shapes, measures, issues of access to perception and, more generally, the internal structure of various kinds of entities. It does not only involve travelling or stretched entities, although some semantic components of motion verbs seem to strengthen the expression of length: this is the case of changes of placement that do not coincide with a change of basic locative relation (at a point in time), especially when they are related to what Aurnague (2011) has grouped under the term of tendentiality (speed, opposition to a force, direction, and being carried along by a force). Likewise, the notion of a necessary scanning due to the size of the described entity has been largely proven wrong by the data, and it has been recalled that any description entails a spatial progression.

Marginal data provided by the corpus approach (e.g. descriptions involving *marcher* ‘to walk’, *bondir* ‘to bounce’, *danser* ‘to dance’) provide a novel illustration of the third kind of motivation for non-actual motion proposed by Blomberg and Zlatev (2014), that is to say, imagination. These examples show that the manner condition or the instrumentality condition are, in the state of our knowledge about these alleged semantic components, guidelines for determining the manner and instrumentality components rather than predictive rules. They also show that fictive motion utterances could be informative for the formalization of semantic features, if we assume that the same semantic features are at play in regular and fictive motion.

The approach presented in this chapter, giving priority to semantic analysis over hypotheses about cognitive processes, confirms first that there is a gradation between pure static localization and motion *stricto sensu*. This gradation can be illustrated through the four macrocategories of verbs of “movement” ensuing from the concepts of change of placement and change of basic locative relation (see Stosic’s and Stosic and Amiot’s chapters in this volume) and, more specifically, through the contrast between changes of posture or disposition and changes of relation and placement. From this point of view, it might be exaggerated to speak of fictive motion when, for example, the verbs used only denote changes of extent. If we adopt the traditional distinction made by French linguists between *mouvement* (movement) and *déplacement* (motion or displacement), we should thus acknowledge that fictive motion includes many cases of pure movement (that is to say predicates tending towards stillness). But this is not the only fuzzy boundary between localization and motion. Some verbs, such as *serpenter* ‘to snake, to wind’, or *zigzaguer* ‘to zigzag’, have both senses in their dictionary definitions: to have a motion of the shape X, and to have the shape X. I proposed in Cappelli (2013) that fictive motion might be sometimes a *motive for the lexicalization* of a new sense, or maybe even a shift from a dynamic to a static meaning; this has to be carefully scrutinized through diachronic case studies. The preliminary study on *trainer* mentioned in this chapter shows a more complex pattern, which still requires further confirmation and a finer-grained analysis. What has also been shown is the limitation of a purely geometrical, or topological, account of the semantics of verbs and prepositions. The notion of tendentiality brings to light the importance of force dynamics, as do verbs such as *jaillir* ‘to gush’, *(s’en)fuir* ‘to run away’, *tomber* ‘to fall’, and the link between access to perception and containment underlined by Vandeloise (2003) is also strongly supported by the results. These functional properties clearly seem to belong to the semantic core of spatial verbs and prepositions, whilst the relevance of including manner or instrumentality components that would allow one to infer properties of the path (either the motion of body parts, or for example the path of a canonical surfer on waves) is less clear. There

is still a long way to go in order to establish an effective account of motion verbs and spatial preposition semantics, but fictive motion, like other alleged non-literal uses (e.g. the temporal use of motion verbs, as in *Winter is coming*), are certainly informative areas to explore in order to achieve this goal.

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PART III

## Psycholinguistic issues



# Casting an eye on motion events

## Eye tracking and its implications for linguistic typology

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In the last few decades there have been several attempts to connect language use with cognitive mechanisms underlying event representation. This language-thought interface is difficult to capture and highly debated. This chapter provides an overview of empirical and experimental studies relevant to this debate, focusing on the relation between eye movements, categorization and linguistic variation in the domain of motion events. It raises theoretical and methodological questions that have important implications for linguistic typology and cognitive studies more generally.

**Keywords:** typological differences, language-thought debate, categorization, similarity judgments, production, eye tracking

### 1. Introduction

We move our eyes and focus on entities or events in order to increase the resolution of a particular portion of our visual field and to interact with it more effectively. Motion events, such as an individual moving, provide critical information (e.g. Scholl and Tremoulet 2000) which is particularly complex and attracts cognitive processes, including visual attention (Gibson 1950). But what particular features of motion attract our attention? Do all motion components capture our visual attention to the same extent or does this process operate only under certain conditions? It has been argued that motion *per se* may not affect visual attention but that certain types of motion can have such an effect, such as linear, oscillating or looming motion (e.g. Skarratt, Cole, and Gellatly 2009), specific events such as abrupt onsets (e.g. von Mühlenen, Rempel, and Enns 2005), or the specificities of

the viewer's spatial language (e.g. Coventry et al. 2010). This paper addresses the question of how people allocate visual attention, how they deal with and categorize specific aspects of motion events, and whether their language can direct their attention to particular aspects of the visual world in verbal and non-verbal tasks.

The idea that language-specific properties may guide our visual attention is much debated in the literature. For example, it is well established that the languages of the world differ strikingly in how they encode spatial information, particularly for the expression of motion events. But is this typological difference sufficient to make speakers of different languages experience motion events differently when observing them? And analogously, is gaze behavior a good predictor of linguistic variation?

From a linguistic point of view, most differences have been observed at the lexical and morphosyntactic levels, mostly underlining variation across language types (e.g. Romance vs. Germanic patterns of lexicalization). Some differences, however, have also been noted within language types or even within a given language (Talmy 2000, 2013). The question addressed here is the extent to which such differences influence the way people interact with the world, especially the visual world. If core aspects of the human cognitive system, i.e. our perceptual mechanisms, are universal as many cognitive scientists suggest, typological variations should not have any impact on how people interact with the external world or on how they perceive or understand events occurring in their environment. However, if language-specific properties directly interact with high- and/or low-level processing mechanisms, one would expect that underlying cognitive processes would be actively involved not only when speaking (Hickmann and Robert 2006; Papafragou, Hulbert, and Trueswell 2008), but also when perceiving, understanding, categorizing or remembering events (e.g. Choi and Hattrup 2012; Coventry et al. 2010; Engemann et al. 2015; Hickmann et al. 2017; Slobin 2003; Soroli 2011a; Soroli and Hickmann 2011; Talmy 2015 among others).

This paper provides an overview of typological and experimental studies relevant to these debates, with attention to the relation between linguistic variation and eye patterns, comparing French – the focus of this book – to English and other languages whenever relevant. The main focus of the paper is two-fold: to determine (a) if, and to what extent, language-specific features may impact non-verbal behavior (attention allocation, categorization); and (b) whether non-verbal measures can provide insights into linguistic variation, thus further informing typology. The experimental studies below all address these questions: whether speakers of typologically different languages conceptualize motion events verbally and non-verbally in different ways; whether they attend to different (sub-)types of spatial components, and whether they rely on the same mental categories in decision-making.

## 2. Linguistic and cognitive theories

### 2.1 Motion components in cognitive linguistics: The Path-Manner asymmetry

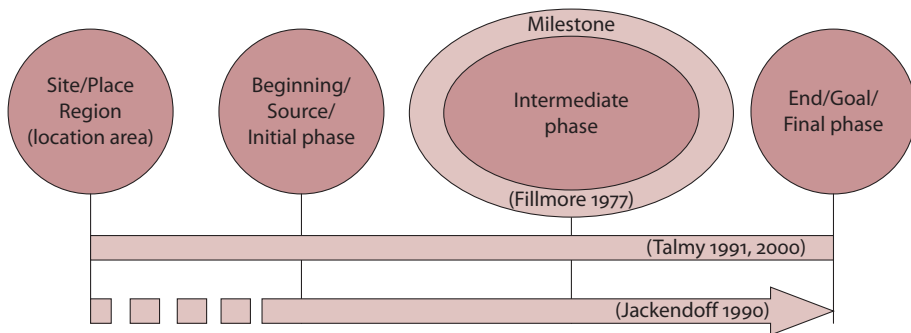
Spatial language is characterized by great variability both across and within languages. A first major difference concerns the ways in which speakers of different language types (e.g. Romance vs. Germanic) package the main components of motion, *Path* and *Manner*, within the clause. Although authors differ with respect to how they define these two components, minimal consensus is needed to achieve comparability among experimental designs.

For example, in its narrowest interpretation, Path refers to a particular type of ground through or in which a figure travels (Fillmore 1977). According to this definition, Path is considered to be a particular part of the ground, the main local part of a complete trajectory or the milestone traversed by a moving figure (see Figure 1). Talmy (1983, 1991, 2000) interprets Path in a *Gestalt* framework. He considers that the spatial system belongs to the core of language and that linguistic schematization in this domain involves “primary” and “secondary” objects that appear to be “closely related to the notions of “Figure” and “Ground” [as] described in Gestalt psychology [...]” (Talmy 2000: 184, vol. 1). “The figure is a moving or conceptually movable object whose path, or site is at issue. The ground is a reference frame, or a reference object stationary within a reference frame, with respect to which the Figure’s path or site is characterized” (Talmy 2000: 26, vol. 2).<sup>1</sup> According to these descriptions, Path takes values such as Zero (location at place or region), Beginning, Middle and End, in order to account for both displacement and self-contained motion with no displacement.<sup>2</sup> Finally, a broader interpretation is given by Jackendoff (1990), for whom Path refers to any point of a trajectory that provides a *vector* for motion, be it a static location, or the initial, intermediate or final phase of the displacement.

With respect to Manner, several interpretations have also been proposed, mostly focusing on how Manner is lexicalized. According to Miller and Fellbaum (1992), a Manner verb “refer(s) to an action or event that constitutes a manner elaboration of another activity or event” (Miller and Fellbaum 1992: 217), or as Talmy says (2000: 45): “an additional activity that the Figure of a Motion event

1. Similar Path features can be found in Zlatev and Yangklang (2004).

2. Independently of the validity of the opposition between “Path” and “Manner” and of proposed alternatives (see also introductory chapter of this volume), our aim is to illustrate, through these few examples, the variety of interpretations associated with these two concepts and underline the need for some consensus in order to achieve comparable experimental studies.



**Figure 1.** Path as a complete trajectory (Talmy), as a vectorial trajectory (Jackendoff), and as an intermediate local part of a trajectory (Fillmore)

exhibits”. More specifically, *Manner of motion* may refer to a complex “ill-defined set of dimensions that modulate motion, including motor pattern, rate, rhythm, posture, affect, and evaluative factors” (Slobin 2004: 255). For other theorists, this notion goes beyond lexicalized patterns (Stosic 2009 and this volume).<sup>3</sup>

The terminological variation in this domain explains why researchers adopt different strategies when taking coding decisions for linguistic and non-linguistic data. With respect to Manner, for example, some may refer generally to Manner verbs (e.g. Papafragou, Massey, and Gleitman 2006) when coding very heterogeneous events such as *walking, running, driving, rolling, limping, swimming, or floating*, while others (e.g. Soroli 2011b; Slobin et al. 2014) make specific distinctions taking into account the means used to carry out motion such as the involvement of an instrument (e.g. *skiing, riding a bike*), the posture of the figure (as in *crawling*), the motor pattern (*rolling*), the rate of the action (*jumping*) and other parameters related to the effort (as in *clambering*) or the attitude of the moving figure (*limping*).<sup>4</sup> Others group together lexicalized concepts to semantically coherent sub-wholes, identifying hierarchical Manner relations (e.g. superordinate: “to move”; subordinate: “to walk”, “to stumble”, see Fellbaum 2002: 24). With respect to Path, underspecification is also common. Some researchers (e.g. Papafragou et al. 2008) refer to Path verbs including different types of trajectories (i.e. *enter, cross, ascend, pass, approach*), while others (e.g. Soroli 2011b) make explicit distinctions, e.g. between vertical Paths (e.g. *ascend/descend*); one-boundary crossings (e.g. *enter/exit*); double boundary crossings (e.g. *cross*).

3. For further information on Manner expression (e.g. syntactic, lexical, morphological, grammatical, suprasegmental), see also Comrie (1985) and Stosic and Amiot (2011).

4. For a first binary classification of different Manner types across languages, see also Slobin (1996) who suggests that “languages seem to have a “two-tiered” lexicon of Manner verbs” (Slobin 1996: 459): neutral, everyday verbs (*walk, fly, climb*), and more expressive or exceptional verbs (*dash, swoop, scramble*).

In the domain of visual behavior, coding decisions are also often inconsistent. Some researchers may refer generally to Path fixations when they only code endpoints or goals (e.g. Papafragou, Hulbert, and Trueswell (2008), choosing to code only looks to final phase areas with or without endpoints), while others (Soroli 2011b; Soroli et al. 2015) make specific distinctions between “narrow” Path fixations (corresponding to the intermediate part of a trajectory); “broad” Path fixations (that include initial, intermediate and final phases); “source” and “goal” fixations (corresponding to initial and final phases respectively). Detailed coding in relation to visual data may be more useful and theoretically unbiased since it takes into account not only the two main theoretical approaches for Path but also recent theories about modes of attentional processing (cf. Helo et al. 2014; Vincent et al. 2018):<sup>5</sup> (a) a *focal* approach according to which Path can be considered as the sum of its local parts (e.g. initial+intermediate+end); and (b) a *global* approach according to which Path can be viewed as a global process with vectorial roles.

Similarly, with respect to the coding of Manner, some researchers (e.g. Soroli 2011b; Soroli et al. 2015) refer to Manner fixations without excluding simultaneous fixations to Path areas (acknowledging the difficulty to distinguish pure Manner fixations from fixations to Path areas), whereas others refer to Manner fixations as the fixations to instruments, spatially separable from endpoints (as in Papafragou, Hulbert, and Trueswell 2008).<sup>6</sup>

Despite differences in definitions previously proposed, Path and Manner components are largely treated as homogeneous domains (also see Section 3). In the domain of motion events, there is consensus that the languages of the world show clear Path-Manner asymmetries. All languages provide linguistic means for the expression of the core component of motion – the Path or Trajectory of a moving figure in relation to a ground (e.g. *monter* ‘to ascend’, *to cross*, *to leave*) – while this is not the case for Manner, which in some languages is not obligatory and often omitted (Slobin 1996). Additionally, utterance conflation for Path and Manner can be very different from one language-type to another. For example, in French the core Path information is typically encoded in the main verb, Manner omitted or relegated to an optional peripheral modifier (1). In contrast, English speakers

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5. Attentional processing has recently been distinguished into two modes: (a) a *focal* mode that appears beyond the first 2 seconds of viewing and which is characterized by long fixations surrounded by saccades of short amplitude; and (b) an ambient mode that appears early in the viewing process (during the first 2 seconds of scene exploration) and which is characterized by short fixations and saccades of large amplitude (e.g. Pannasch and Velichkovsky 2009; Tatler and Vincent 2008).

6. See also Section 3.2.1.



typically encode both components in a complementary distribution: Manner in the main verb and Path in a particle or prepositional phrase (2).<sup>7</sup>

(1) Verb-framed pattern

*Un homme traverse la rue (en marchant).*

FIGURE PATH GROUND (MANNER)

'A man crosses the street (by walking)'

(2) Satellite-framed pattern

*A woman is walking across the street.*

FIGURE MANNER PATH GROUND

Such systematic cross-linguistic differences in lexicalization and in the functional distribution of the main motion components has led to an initial binary typological classification of the languages of the world into *verb-framed* (e.g. Romance) and *satellite-framed* (e.g. Germanic) systems (Talmy 1991).<sup>8</sup> Languages of the first type lexicalize the core Path information in the verb, while languages of the second type express it in the periphery of the verb. This main inter-type classification based on lexicalization patterns (encoding information in verbs vs. satellites) has been largely criticized for ignoring other important language-specific properties such as their morphosyntactic complexity, utterance structure constraints, number of arguments, types of spatial complements, or lexeme preferences (e.g. Skopeteas 2008; Beavers, Levin, and Wei Tham 2010; Soroli and Verkerk 2017).

### 2.1.1 *Inter-type, intra-type and intra-language variation: Some theoretical and methodological issues*

In addition to cross-linguistic variability in lexicalization and conflation, languages that belong to the same type may differ in some other respects: they may provide different ways of focusing linguistically on specific types of motion components

7. According to Sinha and Kuteva (1995) languages also differ with respect to their *degree of explicitness*: In some cases only some aspects of motion are explicitly lexicalized while others are inferred from context. For example, Manner, such as *en marchant* 'by walking' in (1) is contextually inferable and easily omitted or replaced by a Path or light verb in verb-framed languages, whereas it is systematically lexicalized in satellite-framed languages. Path can also be inferred from context in some cases (e.g. *over* in *The boy jumped over the fence*), due to knowledge of the figure (boy as agent), of the ground (verticality, limited height of the fence, association *jump-fence*) or of the specific Manner co-event (*jumping* involves propulsion). Such cases have been described as *covert* encodings (as opposed to *overt, explicit, encodings*).

8. Talmy defines satellites as belonging to "the grammatical category of any constituent other than a noun-phrase or prepositional phrase complement that is in a sister relation to the verb root". According to this definition, satellites can be particles (e.g. English, German), prefixes (e.g. Russian), or verbal complements (e.g. Chinese).

(e.g. pay greater attention to specific types of Path or Manner), encode information that is perceived as salient, as a function of their lexematic system (i.e. deixis, boundary crossing), and organize this information in discourse differently (e.g. in compact vs. distributed structures, with variable morphosyntactic complexity).

In a revised version of his work on typology and taking into account both inter-type and intra-type variation, Talmy (2000) extends his framework and proposes additional classes of languages. For example, he distinguishes systems with *Parallel conflation* (e.g. Greek) and with *Split conflation* (e.g. Spanish as a *zero-conflation* system for static/locative encoding and as a verb-framed system for dynamic motion encoding), taking into consideration intra-language variation. These distinctions motivated other researchers to propose additional classes, for example Slobin's (2004) *Equipollent* languages or Croft et al.'s (2010) *Symmetric constructions* accounting for serial-verb systems (e.g. Thai, Mandarin Chinese), systems with coordinated verb constructions (e.g. Japanese) and complex stems (e.g. Kiowa, Kalmath).

One main difficulty with these typological distinctions occurs when *double framing* is possible. For example, when a language such as French allows speakers to encode Path both in the verb and in the periphery in equivalent ways, the system cannot be classified as *satellite-framed* or as *verb-framed* (3). One way to remedy this problem is to measure the relative weight (e.g. frequency of occurrence in terms of types and/or tokens) of each component or construction to classify the system.

- (3) a. French verb-framed construction  
*Il longe la rue (en courant).*  
 PATH MANNER  
 'He is going.along the road (by running)'
- b. French satellite-framed construction  
*Il court le long de la rue.*  
 MANNER PATH  
 'He is running along the road'

Path-Manner asymmetries as well as variation across and within language types have led researchers to progressively abandon binary typologies and to focus rather on the relative weight of these two components, proposing to characterize languages along two continua: one based on Manner-salience and the other on Path-salience. According to Slobin (2004), Path (but not Manner) is present in most descriptions of motion events, particularly those implying a change of location. Some systems present low Manner salience (Manner typically optional or underspecified as in verb-framed systems), while others prefer to co-express Manner together with Path (typical in satellite-framed systems). Therefore, according to

Slobin (2006), languages should be classified according to their degree of Manner-salience, which constitutes the critical parameter differentiating distinct encoding patterns across particular languages.

According to Ibarretxe-Antuñano (2009), even if Path is present in most motion descriptions, the degree of Path encoding may differ across languages. In some systems, Path is more frequent, more accessible, and easily encodable than in other systems. She therefore proposes a continuum of Path-salience. Along this line of research, the continuum ranges from high-Path-salient languages to low-Path-salient languages, where “the former offer rich and frequent descriptions of Path, while the latter provide poor elaboration of this component” (Ibarretxe-Antuñano 2009: 410).

Apart from these theoretical challenges, cases of intra- and inter-type variability raise important methodological questions for linguistics and typology as well as for cognitive psychology. It is crucial for psycholinguistic research to opt for a systematic and fine-grained identification of all motion components as encoded at different loci of utterance (e.g. verbs and their arguments, voice, affixation). Typically, this is a problem encountered by the distributed semantics approach. Sinha and Kuteva (1995), for example, acknowledge that identifying and localizing all motion information conveyed in the utterance within particular morphemes is a difficult operation. However, making accurate classifications largely depends on the coding of language data. When experimentally investigating how people encode motion information in their language and how they conceptualize its different components non-verbally, focusing on the prototypical encoding patterns of the system is necessary but clearly not sufficient. To better understand what input individuals have in their language(s), or what patterns become entrenched over time, one must explore the complete set of options offered by the system in order to measure how often a verbal pattern occurs, what other complementary options are available in the language, and in what usage conditions (written/oral modalities; controlled/free modes) these options become available. Furthermore, we argue that one must also examine speakers’ representations at a deeper level, for instance investigate in parallel speakers’ verbal and non-verbal behaviour, the patterns as well as the particular contexts in which they occur, e.g. which languages are compared, what type of stimuli are used (dynamic/static), what motion components are involved in the experimental items, and whether these parameters affect the typological characterization of the systems before drawing any conclusions about a potential impact of language on cognition.<sup>9</sup>

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9. Previous typological studies (e.g. Dahl 1985; Nichols 1992) also suggest the need (a) to establish correlations rather than to presuppose global types; (b) to collect data on the level of particular languages rather than language families; (c) to account for cross-linguistic diversity

### 2.1.2 *Typological status and variation in French: A brief overview*

Pursuing work started in the 1940's and 1950's (Malblanc 1944; Vinay and Darbelnet 1958; Tesnière 1959 among others), more recent typological descriptions have classified French as a verb-framed system (Talmy 1983, 1991, 2000). Motion descriptions such as *Une fille traverse la rue (en courant)* 'A girl crosses the street (by running)' are typical in this language which most often lexicalizes Path within the main verb, leaving Manner in the periphery or unexpressed. However, further research in the domain of Romance languages has demonstrated that satellite constructions are also possible in verb-framed systems (cf. Aske 1989; Slobin 1997) suggesting that structural descriptions are not sufficient to account fully for the typological characteristics of a language (cf. Example (3) above).

Following this line of research and based on diachronic evidence, Kopecka (2006) shows that French encodes information related to motion events in many different ways underlying the fact that this system presents intra-language morphological variation: beyond the general tendency to express Path information in the main verb as in (4a) (verb-framed pattern), French can also encode Path in lexicalized forms fused with Manner as in (4b) (hybrid pattern) or even in the periphery of the verb root with a preverb as in (4c) (satellite-framed pattern).

- (4) a. Verb-framed pattern  
*Le petit garçon est parti en courant.*  
 FIGURE PATH verb MANNER gerund  
 'The little boy left by running'
- b. Hybrid pattern  
*Un ours a grimpé sur un arbre.*  
 FIGURE PATH+MANNER fused  
 'A bear climbed.up on a tree'
- c. Satellite-framed pattern  
*Un oiseau s'est envolé.*  
 FIGURE PATH prefix + MANNER root  
 'The bird away.flew'

Comparing experimental (oral) and corpus (written) data, Soroli and Verkerk (2017) aimed to determine the extent to which this kind of intra-language variation influences the typological status of languages such as French (which allows for some hybrid patterns), and Greek (with a parallel system of conflation), in comparison to a clear satellite-framed language (English). They compared verbal descriptions of motion events produced by English-, French- and Greek-speaking

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by considering languages from all continents; and (d) to investigate structural features in more functional domains.

adult native speakers to translations of English texts into French and Greek respectively. The following features were coded in relation to the expression of Manner and Path: the number of times these components were expressed in each utterance (“global utterance density”) and which components were expressed (“focus” of the utterances); the distribution of Path information in different loci (verb roots vs. other devices such as prefixes, particles, participles, prepositional phrases, gerunds and adverbials); the morphosyntactic features in the organization of the lexical and functional categories (i.e. with case marking or with their variable distribution in the sentence and the flexibility of linguistic elements such as in *Manner-first* patterns – e.g. *en sautillant il traverse la rue* ‘by jumping he’s crossing the street – etc.). This study demonstrated that data type, coding decisions and type of analysis all have an impact on the typological characterization of a given language that can make a difference for its classification. For instance, in their data, Greek indeed presented parallel verb- and satellite-framed patterns in both experimental and corpus-based analyses: fused lexicalisation of Manner and Path together in the verb; Manner-first constructions, and extensive use of peripheral complements such as preverbs and adverbials. As for French, the system massively prefers Path-only lexicalization in the verb despite some occasional fused (Path+Manner) verbs (as noted by Kopecka) and some forms of prefixation that are not productive synchronically (see also Fagard’s chapter in this volume).<sup>10</sup> These reported patterns were not sufficient to support any claim of *parallel conflation* in the French language.

Despite some debates on the different parameters (morphological, semantic, syntactic, pragmatic) that should be taken into account for a full characterization of the languages of the world (cf. Soroli and Verkerk 2017, for a discussion), Path and Manner continue to be the most important spatial components to account for typological distinctions. Their functional weight presents different degrees of salience and has differential effects on how speakers organize spatial information in discourse, and thus Path and Manner remain at the center of typological classifications. The question addressed here goes beyond classifications and aims to investigate the extent to which such linguistic differences guide how people conceptualize and represent motion cognitively, and inversely, whether the study of cognitive processes can offer a more fine-grained typological view, especially for systems that present intra-type language variation.

10. In Modern French only two prefixes are still productive (*re-* and *dé-*).

## 2.2 The language-cognition interface

The idea that language is closely related to thought is found already among the Greek philosophers. Plato suggests that thought and language stem from abstract definitions or concepts called “forms” in which all the “entities and qualities designated thereby can be subsumed” (in Gill 1997: 132). Descartes (1662) and Pascal (1670) advocate this hypothesis, both arguing that language obligatorily reflects thought and that one cannot fully conceive and refer to an entity (abstract or concrete) without having previously learned its form. Reciprocity between language and thought has preoccupied philosophers since the 18th century. Herder (1772), von Humboldt (1792) and Hegel (1894) all claim that we cannot think outside of language and that humans need to express their inwardness in an external system to be able to think.

In the early 20th century, Wittgenstein writes: “*The limits of my language mean the limits of my world*” (1922: 149, 5.6), while Vygotsky (1934) specifies the nature of what he calls “the inner relation” between language and thought. He notes that there is no “primary bond” between language and thought mechanisms during early development but that the interaction between the two starts when the child is able to use social tools, such as verbalization (generally by age two) and when “egocentric speech” becomes social through internalization mechanisms.<sup>11</sup>

Whorf extends the idea that language and thought are interrelated. According to him (Whorf 1940: 213–214), “we cut nature up, organize it into concepts, and ascribe significances as we do, largely because we are parties to an agreement to organize it in this way – an agreement that holds throughout our speech community and is codified in the patterns of our language”. This principle was also discussed by Sapir: the “real world” is [...] unconsciously built upon the language habits of the group” (Sapir 1941, as cited by Whorf 1956: 75) further underlining the idea that linguistic constraints guide to a large extent how we perceive, interpret, and conceptualize the world.

In the last decades researchers have revived Whorf-Sapir’s writings, mostly from a psycholinguistic perspective. For instance, Slobin (1996) proposed a *thinking-for-speaking hypothesis*, exploring the extent to which our conceptualization mechanism depends on linguistic constraints. He argues that linguistic variation in the spatial domain has cognitive implications, e.g. speakers of different languages do not attend to the same components of motion events. Some components are objective, thus very frequently present (e.g. Path), others are more subjective (e.g. Manner); some are highly salient and others less (see also *Manner-cline* in

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11. *Egocentric speech* results from internalization processes whereby children’s cognitive capacities derive from externalized speech used in communication with others.

Section 2.1.1 above). Because all motion components are not equally salient across languages, observers follow the patterns of their language and attend to different components of motion scenes.

A different point of view is adopted by those who suggest that –although language is one of the main human behaviors that is indispensable for many higher cognitive functions (e.g. communication, mental planning, reasoning, categorization, memory)– it neither shapes nor determines how people conceptually perceive or understand their environment. For Chomsky (1975), the forms, contents, and properties of particular languages derive, to a large extent, from a universal, independently specified cognitive system. According to this view, even though language-specific properties can reflect some facets of our cognitive functions, they neither mould nor guide thought (1975: 4). This rationalist view according to which thought is prior to language, stems from earlier ideas proposed by Locke (1690). According to Locke, concepts need to be generated first in thought before one acquires the “names of simple ideas or substances”. More recently, Pinker, inspired by Locke and Chomsky, further suggests that “language is not necessary for concept acquisition nor does it “pervad[e]” thought” (Pinker 1995: 17). Thoughts “are merely clothed in words whenever we need to communicate them to a listener” (Pinker 1995: 56), but they do not depend on language otherwise.

The debate sketched above has witnessed a revival in recent decades, especially in cognitive science. In this context, there have been several attempts to connect language production (conceptualization, formulation, and articulation processes)<sup>12</sup> with cognitive mechanisms underlying event representation (for reviews see Gentner and Goldin-Meadow 2003; Gleitman and Papafragou 2005). Some neo-Whorfian theories (e.g. Boroditsky 2001; Majid et al. 2004) suggest strong connections between language and cognition. According to this view, languages filter incoming information inviting speakers to pay more attention to some aspects of reality than to others, thereby influencing event construal in discourse and in non-verbal cognition. Others assume that variation in production is superficial and has no deep implications for cognition: speakers are equipped with a set of general (universal) concepts for representing events that are independent of language particulars. Therefore, when using a specific language, speakers need only to map the output onto this set of pre-existing categories (Pinker 1989; Gleitman 1990 among others).

12. According to Levelt (1989), the process of language production consists of three successive stages: (a) a conceptualization stage (activating relevant concepts for communication); (b) a formulation stage (combining and organizing linguistically the relevant concepts); and (c) an articulation stage (executing the linguistic plan through speech).

Recent psycholinguistic research has explicitly contributed to this debate by testing the following hypotheses:

- i. If language only impacts language-related experiences, then it is rather unlikely that the building blocks of event representation are language-specific.
- ii. If language does impact our non-linguistic representations (e.g. as reflected in specific patterns of attentional processing), then it is unlikely that only universal pre-existing mental categories play a role in event representation and/or that the cognitive system functions independently of language.

Psycholinguistic studies have proposed a variety of methods to investigate these issues. Such methods include experiments using multimodal tasks, i.e. non-verbal tasks and/or co-verbal behavior that involves language to different extents, such as categorization, priming, memory tasks, often coupled with other non-verbal measures such as reaction times, gestures or eye tracking (Casasanto and Jasmin 2012; Engemann et al. 2015; Gennari et al. 2002; Hickmann et al. 2017; Soroli 2012a; Trueswell and Papafragou 2010 among others). The following sections offer an overview of such experimental studies that investigate the specificities of linguistic systems, their typological status, and most importantly the cognitive implications of language-specific features for human behavior, particularly for visual attention.

### 3. Experimental studies

The studies discussed in this section provide insights into these issues based on cross-linguistic off-line and on-line data. We first discuss empirical evidence from production tasks (free narration, controlled narratives, controlled productions), and then turn to studies that use both verbal and non-verbal tasks coupled with eye tracking and other on-line measures.

#### 3.1 Production measures

The ways in which space is conceptualized in discourse and represented in the mental lexicon have preoccupied cognitive psychologists and psycholinguists since the early nineties. One line of research concerns narratives based on picture books representing motion events. Among others Slobin and collaborators (Berman and Slobin 1994; Slobin 1996, 2003, 2004; Slobin and Hoiting 1994; Özçalışkan and Slobin 2000) updated typological research by using controlled



paradigms to test Talmy's framework. Using "Frog Stories",<sup>13</sup> they examined how speakers of 21 languages narrated motion events, testing the validity of previous typological classifications based on lexicalization patterns (Berman and Slobin 1994). Indeed, speakers of Romance languages prefer to express Path information in verbs downplaying Manner or not mentioning it at all, whereas speakers of Germanic languages lexicalize mostly Manner in the verb root, systematically combining it with one or more Path satellites. These patterns support the distinction between verb-framed and satellite-framed patterns (see Examples 5a and 5b respectively). However, important within-language variation was also observed and led to the conclusion that it is possible for either of the two language types to use the lexicalization pattern typically associated with the other type. One aspect of variation involves the type of constructions in which lexical elements can enter. With respect to Manner and Path lexicalization, most languages have equivalents of verbs that encode these components. For example, in French it is possible to use Manner verbs such as *voler* 'to fly' or *ramper* 'to crawl' with Path adjuncts (e.g. *voler jusqu'au nid* 'to fly to the nest'), and English does not exclude the possibility of lexicalizing Path in the verb (e.g. in verbs such as *enter* or *leave*). However, depending on the context and on the typological properties of the language, the frequency and diversity of such verbs in the lexicon are extremely variable (see also Stosic 2009 and this volume, Verkerk 2015 and Slobin 2017).

- (5) a. French verb-framed pattern  
*D'un trou de l'arbre sort un hibou.*  
 PATH GROUND      PATH FIGURE  
 'From a hole of the tree exits an owl'
- b. English satellite-framed pattern  
*An owl popped out.*  
 FIGURE MANNER PATH

Similar cross-linguistic findings are also reported by Hickmann (2003). In a controlled production protocol involving two short story-tellings,<sup>14</sup> Hickmann tests how children and adult speakers of English, German, French, and Chinese encode and package spatial information in discourse with particular attention to Talmy's (1983, 2000) distinction between satellite- vs. verb-framed languages.

13. The Frog story is a wordless picture book of 24 pages (*Frog, where are you?* Mayer 1969) that shows the story of a boy and his dog searching for their pet frog which has escaped from its jar.

14. The elicitation material consisted of two picture stories ("horse" and "cat" stories). Participants were invited to tell the stories to a listener who had not seen the pictures. The aim was to investigate person reference as well as spatial and temporal-aspectual organization in discourse from a cross-linguistic perspective.

Her findings support this typological distinction and show the early acquisition of relevant language-specific features. For example, from four years on in French, children already show a strong preference for encoding Path in verbs as opposed to speakers of the other languages tested.

Another line of research concerns controlled narratives based on dynamic stimuli, mostly film extracts or video-clips. In an experiment that involved animated cartoons showing voluntary motion events of human animal figures, Hickmann (2006) and Hickmann, Taranne and Bonnet (2009) observe that English-speaking participants (children and adults) compactly encode Manner (in the verb) and Path (in particles, prepositions, and adverbials), while French-speaking participants clearly prefer to lexicalize Path in the verb. These data are in line with other controlled experiments such as those conducted by Pourcel (2009) on written and spoken narratives based on a short movie. She assessed the frequency of Path and Manner expression in English vs. French. The results show that Path is encoded equally often in both languages, while Manner encoding is clearly preferred by English-speaking participants (see similar results with motion events involving real people in Soroli 2011b).

Finally, Choi (2011) and Choi and Bowerman (1991) report results from a longitudinal study of spontaneous speech from English- and Korean-speaking children in home settings. When children describe voluntary motion events (i.e. when they describe actions, or comment on their own changes of posture or location), they lexicalize motion components following the properties of their language: English-speaking children typically conflate Motion with Manner or deixis, and express Path separately in the periphery of the main verb. Choi (2017) also finds that from early on, the density of children's motion expression is higher in Korean than in French or English. As early as 17 to 20 months, Korean-speaking children prefer to conflate motion with Path+deixis (frequently in serial verb constructions) and adding Manner adverbials (including mimetics).

Similar cross-linguistic differences are reported by Hickmann, Hendriks and Champaud (2009) in a corpus-based longitudinal study examining spontaneous speech produced by French- and English-speaking children between two and four years. Results show that language-specific features appeared as early as 2 years. In English, children showed a preference for lexicalizing Manner within "verb+satellite" constructions, while in French they preferred to encode Path in the verb and expressed Manner less frequently.

Hohenstein, Naigles and Eisenberg (2004) claim that such typological differences do not appear in children's speech before the end of the third year. They report no lexico-semantic differences in a comparison between English (satellite-framed) and Spanish (verb-framed), highlighting an early universal bias towards expressing Path. For example, both Spanish- and English-speaking children at

first tend to use “light” verbs expressing motion per se (e.g. *to go*) and it is only after the age of 3 or 4 that their discourse shows language-specific patterns. One possible explanation is that, as reported earlier (cf. Section 2.1.1), Spanish is not a typical verb-framed language. According to Talmy (2008: 103), Spanish should be viewed as a *Split conflation* system: for locative relations and static situations (including posture or general path localizations with an underlying BE<sub>Loc</sub>), Spanish is classified as a *zero-conflation* system, whereas for dynamic situations it mostly lexicalizes Path in the verb, like verb-framed languages.

Slobin (2000, 2003) elicited spontaneous narratives without stimuli from adults, reporting that typology affects not only lexicalization preferences but also speakers’ mental imagery. For example, when participants had to imagine a scene after reading a text and then describe the scene in a narrative setting, Slobin found that speakers of satellite-framed languages had a much richer mental imagery for Manner than speakers of verb-framed languages: English-speaking participants described Manner more precisely than Spanish-speaking ones, who were more focused on Path information.

These findings from off-line production measures strongly suggest that language specificities affect how spatial components are encoded at the formulation level in discourse. However, the data discussed until now rely exclusively on linguistic responses elicited in linguistic contexts (e.g. free narration, story-telling, descriptions of pictures or of film clips) and thus may be considered as circular: one can only narrate in language X using means provided by language X (cf. Pourcel 2004). Reporting language effects in linguistic tasks does not necessarily inform us about on-line processing and the underlying cognitive mechanisms involved. For this reason, researchers are now interested in coupling linguistic data with non-linguistic measures.

### 3.2 Eye tracking paradigms and on-line measures

The coupling of language and non-linguistic data (e.g. visual perception tasks, categorization) offers the possibility to treat conceptualization in a broader sense, including both its linguistic and cognitive facets. The aim of such coupling is twofold: to determine (1) whether language has an impact on on-line processing and (2) whether on-line measures can explain variation thereby further informing typology. In order to better validate language effects on event construal, it is necessary to combine both verbal and non-verbal stimuli in tasks that involve linguistic and non-linguistic responses.<sup>15</sup>

15. For a similar argument, cf. Slobin (2003) on a full research program on *thinking-for-speaking* in which he calls for the consideration of three time-frames: experience time = testing

### 3.2.1 *Production tasks and eye tracking: Exploring visual scenes while preparing to speak*

One option is to test how people explore non-linguistic stimuli (e.g. pictures, video-clips or animated cartoons) while preparing to speak (Slobin's "experience time") and whether language has an impact on how speakers allocate visual attention to such events, particularly to specific motion components.

One example of language effects on eye movements during production can be found in Griffin and Bock's (2000) study in which participants viewed and described line drawings depicting events that involved an agent and a patient (e.g. a girl spraying a boy). The rationale was that if language has an impact on visual processing then there should be a significant correlation between the early visual processing (the first 300 milliseconds of the event), i.e. the fixations on the figures (the agent or the patient), and the figure the speaker chooses to mention first. If no such effect is observed, then the initial conceptualization of the scene would rather depend on universal sensory processes, while language would play a role only later in the process. Their findings showed indeed a language effect on the eye movement patterns but only after the first 300 milliseconds of visual exploration.

Gleitman et al. (2007) did observe a language effect during the first 200 milliseconds of the display. The study examined how manipulating visual attention (by adding a short subliminal cue –a black square– of up to 80 msec before the event display) would affect speakers' linguistic descriptions of motion events in picture scenes (e.g. a dog chasing a man). Gazes were indeed directed to particular figures (e.g. focus on the dog/man), following the subliminal cue position, increasing the likelihood that this particular figure would be the sentence subject in the verbal description. Findings show a strong and early relationship between eye fixations and choice of subject referent, suggesting an interaction between on-line visual event processing and construction of verbal responses.

However, despite the fact that these studies investigate the impact of language on the perception of dynamic events and the role of subliminal visual cues on the formulation level, they suffer from two problems: they all use static representations of motion events and importantly they do not address the question from a cross-linguistic perspective.<sup>16</sup>

In a production task coupling eye tracking measures with dynamic stimuli, Papafragou, Hulbert and Trueswell (2008) investigated how speakers of English and Greek describe animated motion events involving agents and how they

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of anticipatory effects (as in eye tracking); speaking time = language production; and testing time = testing for effects such as categorization, recall, etc.

16. See Flecken, von Stutterheim, and Carroll (2013) for a discussion of differences between English and German in the domain of verbal aspect coupled with an attention allocation paradigm.

allocate their visual attention during the exploration of a scene with and without endpoints (e.g. *A wolf roller-skating [into a cage]*) while preparing to speak. Results show that when speaking, participants of both language groups do not differ in how they encode motion events, except that a significant language difference was observed for events that involved an endpoint (e.g. a cave, a bridge): English-speaking participants prefer to use Manner verbs (e.g. *walk, slide*), whereas Greek-speaking ones mostly prefer Path verbs (e.g. *enter, ascend*). With respect to eye movements, they report: (a) an overall Path-bias, in that all participants mostly focused on endpoints; and (b) no difference across language groups with respect to the time spent overall inspecting Path or Manner. However, a language effect in eye movement patterns occurred: English-speaking participants were more likely to first fixate Manner areas while Greek-speaking participants first allocated their attention to endpoints. In addition, after the end of the video-clips, participants tended to look at those aspects of motion that are not typically encoded in their language (fixations on Path by English-speaking participants versus Manner by Greek-speaking ones). The authors claim that language effects arise when speakers pick up the specific linguistic forms for verbalization at the formulation level, while attention allocation is not affected by their native language during articulation. They conclude that non-verbal cognition is not language-dependent: the specificities of each language “do not affect the global allocation of attention to event components, but simply the order in which these components are attended to by observers when they prepare to speak”. They further argue that their results are consistent with accounts emphasizing universal aspects of event perception and cognition (Papafragou, Hulbert, and Trueswell 2008: 180).

This interpretation of the data is somewhat surprising. In particular, the cross-linguistic differences reported in this study (i.e. different verbalization patterns with boundary-crossing events and different visual patterns during the exploration of the scenes) are either minimized or interpreted as evidence of prior, subsequent, or differential linguistic encoding. At the same time, the similarities between the two groups (i.e. a general Path bias in eye fixations) are interpreted as “evidence against linguistic relativity” without considering the multiple variables that could have affected the outcomes.<sup>17</sup> A closer look at this study reveals that both linguistic and non-linguistic findings during this task may be attributed to factors that have little to do with universal aspects of cognition.

First, the choice of the language pair does not seem adequate to argue for or against relativity effects on cognition. While English can be viewed as a satellite-framed system, Greek is hybrid or mixed (cf. Section 2.1.1 above). Ideally, the study should have compared clearly verb-framed and satellite-framed languages

17. See Pavlenko (2014: 152) for similar comments.

in order to test the impact of language type. In addition, even if we accept the idea that Greek is a verb-framed language, the Greek-speaking participants of this study were all bilingual students (all tested at universities in the Philadelphia area, United States), fluent in English. Comparing English-speaking natives and Greek-English bilinguals can add a linguistic bias and explain many of the common patterns observed across these two groups. The absence of language effects might be the consequence of the initial assumption that English and Greek are typologically different. Such a binary typological distinction is debated in the literature (cf. Section 2.1.1 above), and contested for Greek (cf. Talmy 2000; Soroli 2012a; Soroli and Verkerk 2017). Papafragou et al. themselves (2008: 168) note a rather atypical pattern, i.e., the fact that “Greek speakers were equally likely to produce either a path or a manner verb”. This result further supports the idea that Greek is a mixed system or at least not a typical verb-framed system and thus not a good choice to compare with satellite-framed English.

The eye tracking data constitute another argument showing the complexity of uncovering motion construals. Findings based on fixation patterns clearly reveal that Greek should be characterized as having a mixed typological status: in comparison to English-speaking participants, speakers of Greek were more likely to look at Path during the initial phase of the motion event. They were interested in Manner, mostly from the middle till the end of the motion clips, and they even performed significantly more Manner fixations than English-speaking participants during the verbalization phase. In addition, no language-specific differences in eye tracking were found for what the authors call “unbounded events”. The latter finding is completely predictable since, in these cases only the agent and the instruments used to carry out motion (e.g. a bicycle) were visible on the screen. Fixations from English- and Greek-speaking viewers did not differ with these types of stimuli because there was nothing to differentiate them whilst looking at these particular scenes. A more complete design would require three types of items in order to be able to make the distinction between bounded and unbounded events: (a) items involving Manner and a Bounded Path (e.g. roller-skating into a cave); (b) items involving Manner and an Unbounded Path (e.g. roller-skating down a hill) and (c) a series of control items involving only Manner (e.g. roller-skating along a road with no endpoint).

Further methodological points should be noted. The cartoon clips involved unnatural displacements (e.g. a wolf roller-skating, a rabbit sailing in a boat, a cowboy riding a camel), while the design only partially depicted varied Manners and Paths. The main motion components were not equally salient in some cases. First, Manner was limited to instrumental and sometimes very salient motion displacements: riding a hot air balloon, a magic carpet, flying an airplane, sailing a boat, skiing and skating. These Manner types have very different properties and

relate in very different ways to the figure performing the movement (e.g. very different motor patterns for skating and skiing when compared to other means of transportation, such as riding a hot air balloon). Voluntary Manners without instruments such as walking and jumping were completely excluded from this design presumably because of the difficulty in separating them (visually) from Path, always present when a figure moves. All instruments were tangible objects that did not overlap with endpoints, and therefore could be easily separated from the Path area for the eye movement analysis.

Fixations that fell into the areas of instruments were counted as Manner-only, suggesting that Path and Manner are considered as distinct and separable components. However, when observing a figure performing a motion event (e.g. skating across a frozen lake), the fact that the viewers are looking at the skates does not necessarily mean that they do not simultaneously process information about the trajectory (the Path component). Looking at the instrument obligatorily also provides the viewer with information about Path (the initial, intermediate and/or final part of the trajectory). Therefore, the assumption that an area covering the instrument only provides information about Manner is at best incomplete.<sup>18</sup> Similarly, Path was narrowed down to endpoints, which is not compatible with previous theoretical views and experimental findings (cf. previous Sections 2.1 and 3.1).

Soroli (2011a) presents a related study with the following aims: (a) to replicate previous findings and explore whether language has an impact on visual attention patterns; and most importantly (b) to investigate the extent to which non-verbal behavior can reflect across- and within-type language variation. Dynamic stimuli were used to test English, French and Greek-speaking participants in a production task coupled with eye tracking. The stimuli involved motion events performed in different Manners (e.g. cycling, walking, crawling) and along different Paths (e.g. upward, across, into).

The predictions were that if language has an impact on verbal and non-verbal behavior, then language effects should be found not only in speakers' verbal descriptions but also in their eye fixations, providing further insights into the typological characteristics of the languages as well as the distance across- and within-types: while there is consensus about the typological status of English (satellite-framed) and French (verb-framed, despite some hybrid patterns), a language such as Greek does not fit into either of these types. Greek is either considered to be a *parallel system of conflation* (cf. Talmy 2000) or a *verb-framed* language (cf. Papafragou and Selimis 2010). Thus, the aim was not only to explore if speakers of different languages differ in their lexicalisation and visual exploration strategies but also to explore whether English, on the one hand, and French and Greek, on the other,

18. See also Section 2.1 on underspecifications of Manner and Path.

belong to clear-cut distinct typological categories. If this is the case, as previously claimed by Papafragou, Hulbert and Trueswell (2008) for English and Greek, differences should occur between English and French as well as between English and Greek, but not between French and Greek.

The results show that verbalizations differed substantially across languages: English-speaking participants used compact structures that expressed both Manner in verbs and Path peripherally, mostly in particles (typical satellite-framed pattern); French verbalizations were characterized either by Path verbs without any other motion encoding or in some utterances by Path verbs together with Manner expressed peripherally –mostly in gerunds (typical verb-framed pattern). In comparison, Greek speakers produced equally frequent verb- and satellite-framed utterances: apart from constructions with Path-only lexicalization, they also used Manner verbs together with peripheral devices to encode Path –mostly in prepositional phrases, adverbials, or preverbs– as well as several Manner-first constructions (see also Soroli 2012a). Furthermore, eye movements shed light on this typological variation: although all speakers overall allocated more attention to Path areas, the focus and order of visual exploration varied across language groups. French speakers focused significantly more on Path-only areas (covering initial, intermediate and final parts of the event) than the other two groups, and this was the case during the entire timeline from stimulus onset until the end of event processing. In contrast, the gazes of English- and Greek-speaking participants showed no preference for Path±Manner areas (that covered feet, legs, and instruments) over Path-only areas, at least until the middle of the scene (0–2000ms). No language difference was found with respect to the time spent looking at Path±Manner areas. With respect to scanpaths, French fixations were “ballistic” (*Global/Ambient scanning strategy*), going back and forth from Source to Goal areas. In contrast, English-speaking viewers adopted a linear strategy (*Focal scanning*) following the figure’s motion step by step and Greek-speaking participants showed a mix of the two strategies depending on the specific components of the dynamic events they had to explore (see also Soroli 2018). For example, when Manner was salient (i.e. *riding a bike*), focal scanning was preferred in contrast to items that involved less salient Manners of motion, such as *walking*.

These patterns (a) point to differences across English, French and Greek that directly correspond to the typological properties of these languages; and (b) provide highly relevant information about both within-type and across-language variations, further informing typology by supporting the idea of a salience cline rather than clear-cut category-based classifications. Although Greek is sometimes viewed as a verb-framed language, both the verbal and non-verbal data of this study support the idea of an intermediate/mixed system of conflation that borrows properties from both verb- and satellite-framed languages for verbalization but



is closer to a satellite-framing pattern than generally thought when it comes to exploring visual events.

This study further suggests that the choice of languages under investigation is crucial when the language-cognition interface is at play. Comparing a mixed system with either a satellite-framed or a verb-framed system can bias the results and their interpretation. One must ensure that the languages under investigation are clear typological types, or at least distant enough, in order to argue for or against typological implications on cognition.

In a similar study, involving this time verb-framed French and satellite-framed English, Soroli (2011b) and Soroli and Hickmann (2011) examined how people explore and describe dynamic motion events in two different scene settings: videotaped motion events involving real humans and animated cartoons. In order to control for different degrees of Path and Manner salience the video-clips involved: six different types of Manners either with instruments (roller-skating, riding a bike or a scooter) or without instruments (walking, jumping, running, crawling), combined with six different types of Path, resulting in bounded (into, out of, across) and unbounded events (up, down, along). Participants had to explore and then describe what happened in the clips which showed a figure (human or animal) performing a displacement with a certain Manner and along a certain Path. With respect to the eye tracking measures during the exploration phase, the number, duration and scanpaths of fixations falling into Path vs. non-Path areas were analyzed. Path areas of fixation included the initial, intermediate, and final parts of the motion events, excluding the most Manner-relevant moving parts of the figure (i.e. legs, feet, instruments). Since Manner is by definition indissociable from Path, eye movements to the moving parts of the figures (legs/feet) and to instruments were coded as Path±Manner fixations. For the production part, the analyses compared what components were expressed, in what part of the utterance (verb or other) and in what type of linguistic structure.

Verbalization measures showed clear typological differences between the English- and French-speaking groups, with stronger language effects when items involved boundaries and no instruments. English-speaking participants used semantically and syntactically dense structures combining a Manner verb with Path peripheral devices, while French speakers focused mostly on Path, lexicalized in the verb and sometimes in the periphery, i.e. with additional prepositional phrases. However, some important variation was observed with items involving very salient Manners with an instrument (i.e. a bicycle) and some gradual unbounded scenes (mostly vertical displacements) that invited even French speakers to focus on both Path and Manner in two ways: by using either a verb that conflates Path and Manner (i.e. *grimper* 'to climb-up'), or periphrases (i.e. with a gerund: *Elle traverse les rails en faisant du vélo* 'She crosses the rails by doing bicycle').

These results support the idea that variation may stem from items involving Manner and Path types with different degrees of salience and their combinations, suggesting that both Manner and Path salience are relevant parameters in order to account for variation across and within language types. When the events involve Manner, English-speaking participants systematically use Manner verbs even for the lowest-Manner-salient scenes (i.e. walking), while the French-speaking participants most often omit this information when it is not relevant and/or can be inferred. Instead, French speakers tend to double-mark Path in the verb and in the periphery, especially with crossing events that show low Manner salience (e.g. *Elle est passée de l'autre côté de la rue* 'She passed to the other side of the street'). So, despite variation, Manner was found overall to be more salient in English and Path more salient in French.

With respect to eye tracking, some findings show no language effects and others indicate that motion components are processed in different ways not only verbally but also visually. Both groups showed an overall Path bias and no language differences with respect to fixations on areas that involved feet, legs, and instruments (areas that covered simultaneously Path±Manner). In addition, no language effect was found with respect to the duration of fixations (consistent with previous findings reported by Papafragou, Hulbert and Trueswell 2008). However, in comparison, the French group fixated significantly more often broad Path areas (including initial, intermediate, and final parts of the scene) ignoring Manner parts (feet, legs, instruments). At the same time, they showed an early interest in sources (initial) and goals (final parts) of the event during processing (from stimulus onset on). In contrast, when fixating Path, participants in the English-speaking group were most often attracted by the intermediate part of the event (P-narrow, cf. Section 2.1) but overall fixated these intermediate parts less frequently than the French group. The intermediate areas of the events were probably more attractive for the English-speaking observers because these parts provided more information about the Manner of displacement. However, this language effect on number of fixations did not stem from a difference in Manner salience, but rather from a difference in Path salience, following predictions based on Talmy's (2000) and Ibarretxe-Antuñano's (2009) hypotheses.

Finally, irrespective of language, scanpaths showed again a general preference for Path over Manner fixations during the participants' visual exploration of the events, also providing further on-line information concerning the real-time processing of components: global processing (with "ballistic" fixations successively on goal and source areas) for the French group, as opposed to focal (step-by-step) processing for the English-speaking group, suggesting again language-specific strategies during visual exploration of motion.

In conclusion, apart from strong typological effects on verbalization, the on-line measures reported here show that when preparing to speak, speakers' behaviour partly shows similar patterns and partly follows the typological properties of their language: (a) people mainly rely on Path information (the central defining feature of motion irrespective of language), but (b) they do not fixate Path areas equally frequently since this component is more salient in verb-framed languages than in satellite-framed languages, and (c) they follow different scanpaths during the exploration of those same events showing a preference for global strategies in verb-framed languages, for focal strategies in satellite-framed languages, and for mixed strategies in hybrid systems.

### 3.2.2 *Similarity judgment tasks and eye tracking*

Another option to capture fine inter- or intra-type variation and measure language effects on cognition is to ask participants to provide non-verbal responses. In these types of experiments, it is possible to manipulate variables linked to language-specific properties and to measure whether/how they influence non-verbal behavior, avoiding any linguistic input and only providing visual material in a similarity judgment paradigm that elicits non-verbal responses.

Naigles and Terrazas (1998) published one of the first experiments testing language effects on spatial cognition using this type of methodology. Using a similarity judgment task, they investigated whether language-specific properties can impact categorization. Participants had to learn new (nonsense) motion words that were expected to be associated either to Manner or to Path, depending on language properties. During a training phase, a target video-clip depicting a motion event (e.g. a woman skipping toward a tree) was auditorily associated to a short intransitive sentence consisting of a subject pronoun followed by a novel verb presented auditorily (e.g. English "*Look, she's kradding!*"; Spanish "*¡Mira, ella está mecando!*"). After a familiarization phase, participants saw simultaneously two videos to be compared to the initial target scene: in video 1 Manner was the same but not Path (e.g. a woman skipping away from a tree), and in video 2 Path was the same but not Manner (e.g. a woman walking towards a tree). Participants had to point to the video that depicted the motion event described by the novel verb (e.g. "Point to kradding"/"Apunta a mecando"). It was expected that speakers would associate the novel verb with different scenes: the Manner-congruent scene in English (video 1), and the Path-congruent scene in Spanish (video 2). Surprisingly, results show that both language groups largely preferred to choose the Manner-congruent scene to interpret the novel verb. Methodologically this result could be due to the great salience of Manner in the experiment (i.e. leap, crawl, crab-walk) or, more likely, to the construction of the intransitive sentence ("*Look, she's kradding!*") that was associated to the target video. In order for the

novel verb to refer to Path, it should appear together with some information about the ground, the trajectory or the endpoint (e.g. *kradding a tree*). Manner verbs can occur without a ground object (Slobin 1997) but Path verbs cannot, and this is true for both languages (ground objects are always present, even though they can be implicit, see Aurnague's chapter in this volume). As a consequence, no language effect was found in this first experiment since Spanish speakers had little chance to interpret novel verbs as referring to Path.

In a second experiment based on the same target events, Naigles and Terrazas (1998) associated the novel verb either with a canonical Path construction (e.g. Path condition: *She's kradding the tree*) or with a canonical manner construction (e.g. Manner condition: *She's kradding toward the tree*). This time, although all participants showed an overall preference for Path videos in the Path condition and a preference for Manner videos in the Manner condition, a language effect was also observed, in that English-speaking participants chose Manner videos significantly more often than Path videos in the Manner condition, while those in the Path condition showed no preference for either video. Participants in the Spanish group chose significantly more often Path videos in the Path condition, while those in the Manner condition showed no preference.

This research assessed directly the influence of verb- vs. satellite-framed constructions on participants' interpretation of novel motion verbs. The findings suggest that participants were sensitive to the semantic implications of the different constructions in the second experiment and followed the patterns of their language when making their choices. The fact that the Path condition elicited more Path responses, irrespective of language group, probably means that Path, which is the core universal component of motion, is a more accessible criterion for categorization than Manner.

In a developmental study, Hohenstein (2005) coupled a similarity judgment task with a preferential looking paradigm. Children (ages 3.5 and 7) first saw target videos showing a motion event performed in a certain Manner and along a certain Path, together with an audio description of this event. Participants then saw two variants of the target video: one Manner-congruent (same Manner, different Path) and the other Path-congruent (same Path, different Manner), and had to make a similarity judgment by pointing to the variant that was most like the target. The children's choices as well as their eye movements to one or the other variant were recorded. The results show that the responses of young (3.5-year-old) English- and Spanish-speaking children did not differ, but differences were observed at age 7, when English-speaking children clearly preferred the Manner-congruent variant and looked significantly longer at it than same-aged Spanish children. These results correspond to the typological properties of English and Spanish.

In an additional experiment, Hohenstein tested how children learn new verbs presented in different syntactic constructions (as in Naigles and Terrazas 1998). Participants saw a target video of a figure performing an activity accompanied by a voice that described what the figure was doing in specific syntactic frames containing a novel verb. They then had to find the video variant (Path or Manner congruent) where the figure was performing the same action. The aim was to test whether children, at age 3.5 and 7 years, had a preference for the lexical typological patterns of their language. The prediction was that English-speaking children should interpret the novel verbs more often as Manner verbs and Spanish children more often as Path verbs, as also previously reported for adults by Naigles and Terrazas (1998). This cross-linguistic difference again only occurred with older children (7 years) showing effects at both lexical and syntactic levels. In contrast, younger children (3.5-year-olds) used only the sentence construction as the basis for learning novel verbs, thus indicating that they had not completely acquired the lexical properties of their language.

In a study investigating both verbal and non-verbal behavior, Soroli (2012a,b) tested how adult speakers of English, French and Greek performed three tasks involving voluntary motion events, coupled with an eye tracking paradigm: (a) a non-verbal similarity judgment task during which participants first saw a target video stimulus (e.g. a man running out of a house), then two visual variants that differed from the target with respect to either Path or Manner and were asked to press a button as quickly as possible to indicate which one looked most like the target; (b) a production task during which speakers had to describe the target scenes (cf. 3.2.1 above), and finally (c) a task similar to the first similarity judgment task, during which participants heard a target sentence that described a Manner+Path displacement (e.g. *There is a man running out of a house*) and then had to decide which of two visual variants of the previously described event best matched the target sentence (e.g. a Manner congruent or a Path congruent video).<sup>19</sup> The results from the visual (non-verbal) similarity judgment task showed that French participants chose the Path variant significantly more often than English- and Greek-speaking participants. Although the English and Greek groups showed no significant difference between Manner and Path choices, Greek participants preferred the Manner-congruent videos significantly more often than the French participants. Recall that in the verbal version of the similarity judgment task (condition c), participants had to process verbal descriptions of the events (encoding Path+Manner). In this condition, although all groups increased their Manner-congruent choices during categorization, French participants continued to prefer the Path-congruent choice significantly more than the other two groups,

19. For similar designs see also Gennari et al. (2002) and Papafragou and Selimis (2010).

while English-speaking and Greek-speaking participants overall preferred the Manner-congruent variants. Manner information in the verbal version made this component salient even for speakers of languages that do not necessarily encode this information (i.e. French), but most importantly guided visual attention to the areas that included information about Manner. Although Manner responses and fixations increased in all groups during the verbal categorization task, Path-congruent variants continued to attract the eye movements of the French participants significantly more than those in the English and Greek groups who watched the Path variants less frequently.

Testing speakers of typologically different languages during their exploration of motion scenes within a production task or during similarity judgment tasks that explicitly elicit or involve linguistic material may provide interesting on-line information but as such does not constitute sufficient evidence to claim that language has an impact on non-verbal behavior. For several authors, the challenge is to demonstrate whether differential “attention may also have long-term and pervasive effects on mental representation and conceptual processes” (Slobin 2003: 179), particularly when language is minimally or not at all involved in the task. One option involves testing how people behave and what decisions they make when language is maximally excluded from processing, using for instance an interference task.

Interference tasks are typically used within “dual-task paradigms” which may involve finger tapping, repetition of non-words, syllables, or numbers meant to interfere with higher-level processing in one or another modality. For example, having participants repeat syllables while exploring events (“articulatory suppression”) supposedly prevents them from internally verbalizing descriptions of these events, thereby allowing researchers to investigate non-verbal processing.

Gennari and colleagues (2002), for example, investigated the effect of language processing on non-linguistic performance during recognition and similarity judgment tasks performed by English- and Spanish-speaking participants in three conditions: a “shadow” condition, during which participants had to repeat nonsense syllables while watching motion videos; a “free encoding” condition during which they performed the task without interference; and a “naming first” condition during which they produced a verbal description of the event prior to its categorization. Results show language effects in recognition and similarity judgment tasks only when language was explicitly involved (in the “free” and “naming first” conditions) but not when participants had to repeat syllables during the main task. In this condition, the only language effect observed shows a significant decrease in same-Path choices for the Spanish-speaking group but not for the English-speaking group. In addition, while shadowing led overall to fewer Path-congruent choices in both languages, participants in the Spanish group, but

not in the English-speaking group, showed significantly more choices for the Path-congruent alternates after the “naming first” condition.

Similar evidence has been reported by Papafragou and Selimis (2010), and by Trueswell and Papafragou (2008) for English and Greek, suggesting even more strongly that language effects disappear with a dual task paradigm. Manner and Path are equally available to speakers of different languages when performing “purely” non-linguistic tasks (i.e. similarity judgments and memory tasks) “regardless of whether these components are prominently and systematically encoded in the language” (Papafragou and Selimis 2010: 229). However, while language effects disappear in tasks involving verbal interference such as counting, they are preserved in tasks involving non-verbal interference, such as tapping (but see also Toplu 2011).

More recently, Hickmann et al. (2017) compared how English and French-speaking participants performed three tasks involving motion events: a *non-verbal categorization task* within a dual task paradigm involving articulatory suppression; a *verbal categorization task* involving target sentences; and a *production task* based on dynamic cartoon stimuli. They showed that although more language effects occur in tasks involving language use or processing, subtle and complex language effects also occur in non-verbal tasks. Clear language effects are observed in production: more Manner expression in English, in addition to an effect of event properties in both groups. During categorization, Path-congruent choices are generally more basic and accessible than Manner-congruent ones for both language groups. However, Manner-choices were overall more frequent in the non-verbal condition (with articulatory suppression) as well as for participants in the English-speaking group who were more sensitive to both Manner and Path properties than participants in the French group, particularly when categorization involved verbal input.

Soroli et al. (2015) report results for English and French based on additional on-line measures including similarity judgements on naturalistic events (video-clips), combined with eye tracking and reaction times. Similar categorization strategies were observed in both language groups, particularly no difference in reaction times or choices of Manner vs. Path-congruent videos when the task involved articulatory suppression (nonsense syllable repetition). However, significant language differences occurred in the verbal tasks. In particular, in line with previous results for Spanish and English (Gennari et al. 2002), the French group in the “naming first” condition preferred the Path-congruent alternates to which they responded significantly faster than participants in the English-speaking group. With respect to eye tracking during categorization, no difference in the numbers of fixations was found between English- and French-speaking groups in the “shadow” (non-verbal) condition. However, French-speaking participants

showed overall much shorter fixations across conditions and significantly fewer fixations in the “naming-first” (verbal) condition. Both groups paid equal attention to the video alternates, even though French viewers made overall shorter fixations during the exploration of the scenes. While no overall difference was found between Manner- vs. Path-congruent variants, the duration of French fixations was significantly shorter for the Manner-congruent alternates, particularly in the verbal condition, as compared to those of English-speaking viewers.

In a recent cross-linguistic study involving similarity judgment tasks with interference (repeating numbers) and a preferential-looking scheme, Ji and Hohenstein (2017) investigated how adult and child participants (English- and Chinese-speaking) process and respond to visual event stimuli in a similarity judgment task that involved one target and two variants. Results show no language effect overall for categorization choices (with interference) or for attention allocation, but an age effect was observed: while the younger group (3-year-olds) chose Path-congruent variants during categorization and performed longer fixations on Path, older children (8-year-olds) and adults, irrespective of language group, showed no preference for Path or Manner. The only language effect observed in this study was related to the reaction times of Chinese-speaking 8-year-olds and adults, who were quicker than their English-speaking peers in making similarity judgments, independently of Manner or Path similarities in the stimuli.

The authors suggest that the absence of language effects in similarity judgments might be attributed to the fact that English (satellite-framed) and Chinese (equipollent) are partly similar, since Chinese is also satellite-framed (for voluntary motion). Thus, this comparison was probably not sufficient to capture fine categorical differences at the cognitive level (see similar remarks above about Papafragou, Hulbert, and Trueswell 2008). As mentioned by the authors, the language effect on reaction times reveals that the two groups differ culturally and do not share the same reasoning patterns. Previous research on reasoning suggests that Western (English-speaking) cultures tend to favor an “analytical” way of thinking, whereas East Asians (i.e. Chinese, Japanese) privilege a more “holistic” way of processing (i.e. Nisbett et al. 2001; Han and Northoff 2008). Such a difference might explain how a holistic processing of motion events invites a contextual incorporation of the scenes, thus explaining the shorter reaction times of Chinese participants in this study. Similar results were found by Masuda and Nisbett (2001) who compared English and Japanese, and in Soroli’s (2018) comparisons (within the Western European culture) showing *focal* vs. *global* ways of processing for English and French, respectively.



## 4. Discussion

As shown in this paper, typological research in production alone cannot fully account for similarities and differences across and within linguistic systems. Experimental evidence involving verbal tasks is necessary to detect subtle variation in usage-based data not only across language types but also within languages. Unlike spontaneous speech data, controlled experiments eliciting verbal descriptions of motion events constitute an appropriate paradigm to induce uses of linguistic devices with enough context for a fine-grained investigation of specific spatial constructions. However, although observing language effects when language is explicitly involved provides some insights about the process of verbal conceptualization when speakers prepare to encode spatial information in discourse, it cannot fully answer questions about how the cognitive system functions and processes different motion events on-line.

Recent psycholinguistic studies have proposed a variety of methods measuring the impact of language-specific variation on non-verbal spatial cognition. These methods include experiments using multimodal tasks, such as similarity judgments, priming, memory tasks often coupled with other non-verbal measures such as reaction times, gestures or eye tracking (see also Casasanto and Jasmin 2012; Engemann et al. 2015; Fibigerova and Guidetti this volume; Gennari et al. 2002; Hickmann et al. 2017; Ji and Hohenstein 2017; Soroli 2017; Trueswell and Papafragou 2010).

The present paper aimed to show not only how language interacts with non-verbal cognition but also how different cognitive measures can provide indirect evidence about the prototypicality of a particular system under investigation.

The use of indirect behavioral measures (e.g. similarity judgments, categorization), reaction times, and eye tracking, was central in the present paper. As demonstrated, this line of research offers useful insights to the cognitive implications of cross-linguistic and within-type language variation and is a rich domain that can contribute to a more accurate typological characterization of linguistic systems.

The previous sections offered a non-exhaustive overview of such experimental cross-linguistic findings and revealed an overall complex picture due to some divergent results. In all studies verbal measures show striking differences in the patterns observed across language types (e.g. verb-, satellite-, parallel-framed, equipollent), as well as within these types, following directly from the characteristics of motion expressions in these systems. However, while some researchers find language effects on non-verbal behavior, others do not. Language effects emerge for instance with some measures (reaction times, duration of fixations, number of fixations and/or Path/Manner choices) but very rarely with all of the above

simultaneously. As reviewed in Section 3, this great discrepancy in findings can be attributed to a variety of factors.

From a linguistic perspective, one of the main factors to take into account when investigating the language-thought interface is the specific typological status of the system(s) under investigation. Several dimensions (semantic, morphosyntactic, lexical, discourse-related parameters such as Manner vs. Path salience, event types etc.) are crucial for the characterization of systems and cannot be ignored. The choice of language types, the typological distance between the compared languages, their within-system or within-type prototypicality, as well as the cultural environment within which the languages are used, are some of the main factors that were reported to be crucial and in some cases to bias results, leading to erroneous conclusions about the typological status of given systems and/or their possible interactions with the cognitive system.

Other methodological factors are related to the choice of stimuli. The specific types of motion events presented to the participants as well as their visual format (i.e. static pictures vs. dynamic videos, bounded or unbounded situations) may lead to differences in the findings (see also Hickmann et al. 2017 for a discussion).<sup>20</sup>

In addition, several other factors that play a crucial role are related to how the data are collected, coded, and analyzed. With respect to data collection, age and linguistic background contribute to the possible influence of language on cognitive processing. For instance, it is problematic to compare monolingual with bilingual speakers when the main research question focuses on prototypical structures of the target systems that are supposed to belong to distinct (and distant) linguistic types. But distinct or distal systems must be further examined with verbal tasks that provide a full exploration of the typological characteristics of languages and ideally should be completed with non-verbal measures.

With respect to coding, researchers adopt very different strategies, especially with respect to decisions concerning the linguistic definition of Path and Manner as well as the definition of the visual areas of interest. Some take into account different types of Path and Manner for the definition of their categories, while others underspecify them. Some assume that Path is only related to one part of the trajectory (e.g. the goal), while others divide the event into its constituents, taking into account different theoretical views proposed in the linguistic literature (i.e. site/place, initial-intermediate-final phases of Path), assuming that Path is always conflated with Manner in dynamic events (at least for events visually displayed

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20. Temporal-aspectual factors such as boundedness, duration and simultaneity of events, as well as cross-linguistic differences in aspectual morphology can further induce variation in patterns of attention (cf. Aksu-Koç and von Stutterheim 1994; Slobin 1996; Flecken, von Stutterheim, and Carroll 2013 among others).

and thus contextualized), and that Manner-only attention allocation is unlikely, if not impossible, to measure (with artificial stimuli only and after abstracting any background information).

Another factor that can explain divergent results is related to the use, utility, and nature of interference tasks frequently proposed in psycholinguistic paradigms. For some authors, interference in dual-task paradigms has become a necessity to investigate language-thought relations. Of course, in an ideally designed lab paradigm, and to best control the relevant variables, one should investigate whether and how language and cognitive processes potentially interact with each other, for instance, by isolating these two mechanisms through manipulation of the different variables: One idea would be to test how cognitive mechanisms, in isolation, process information without language, as well as how people encode information without any cognitive involvement.

While verbal encoding has never been tested independently of any cognitive involvement (apart from cases of speakers with cognitive or language deficits), researchers systematically try to isolate cognitive mechanisms, particularly in so-called dual-task paradigms. According to such research, any difference observed in the patterns within non-verbal tasks without articulatory suppression can be attributed to a potential internal verbalization of depicted events, and is therefore generally considered to be a verbal “bias” that merely reflects superficial language effects. For others, the utility of a dual task paradigm is questionable. The absence of language effects reported by several authors using non-verbal tasks with articulatory suppression may be due to the fact that this paradigm disrupts the interaction between linguistic and cognitive mechanisms, reflecting nothing about “pure” cognitive functioning (“non-contaminated” by language). In addition, if cognitive mechanisms are independent of any involvement of language, the use or non-use of interference tasks should not make any difference across language groups. Nevertheless, researchers do find differences when comparing the same tasks with and without interference. For example, language effects emerge systematically in categorization tasks without interference but disappear with articulatory suppression, suggesting that in normal conditions, language is always solicited during cognitive tasks. This interaction between linguistic and cognitive processing is rather inevitable and (for some) it is a natural process that must not be erased artificially or overcharged with dual-task paradigms.

## 5. Conclusion

Languages differ in the morphological, syntactic and lexical means they provide for the encoding of motion events. One main question addressed here was

whether such language-specific properties are strong enough to influence or even guide differentially viewers' cognitive mechanism when exploring visual scenes showing motion events and whether potential on-line processing differences can contribute to the characterization of linguistic systems.

The review of some recent experimental evidence showed that controlled production-driven approaches, while extremely useful for the investigation of the available linguistic patterns of particular systems, are not sufficient by themselves to shed light on the language-thought debate. In order to further investigate the extent to which language properties function as filters for cognition during non-verbal processing, researchers started coupling language data with non-verbal on-line measures. This paper proposes that psycholinguistic techniques are useful for capturing real-time (on-line) processing but can also begin to address some questions related to typology.

We focused on both off-line (production, similarity judgments) and on-line measures (eye fixations, reaction times), raising a number of theoretical and methodological questions about the possible impact of language on non-verbal cognition, the type of tasks and measures that best address questions about their relation, as well as the challenges to be faced when addressing such complex issues. The data show that typological variation has a great impact on how people interact with the external world or how they understand the events that occur in their environment. Language-specific properties directly interact with high-level and, to some extent, with low-level processing mechanisms, and are actively involved not only when speaking but also when perceiving, comprehending, and categorizing motion events, as evidenced by eye tracking patterns, number and duration of fixations, reaction times, and similarity judgments.

A number of methodological problems have arisen and will need to be solved in future research, for example concerning the use and interpretation of interference tasks or the different ways in which to define motion components visually. Given the great discrepancy among studies that combine off-line and on-line data, more experimental research is needed in order to expand such investigations. Specifically, more studies are necessary to shed light on language-specific properties and on how speakers deal non-verbally with the visual world. However, some care is necessary with respect to methodological decisions, which can have theoretical implications as well as bias the results and interpretation of the data. Depending on the level of granularity (behavioral, cognitive, neurophysiological) of the research, methods have to be adapted to specific variables and to main factors of impact: the types of stimuli, the experimental design but also the types of participants, the languages chosen, and the elicitation procedure may all have implications for the findings.

The question of whether language influences cognitive mechanisms and whether these mechanisms directly reflect language variation continues to be most relevant in several disciplines. Our aim was to underline the importance of complementary methodologies and data when investigating the relation between language and thought in the context of some practical information concerning the setting-up of psycholinguistic studies, in order to better understand how human event conceptualization operates. It remains to be seen how different non-verbal measures can inform this issue, how to interpret the effect of different measures, as well as how to define motion components visually. A complete understanding of the relation between language and thought will await further research and systematic conceptual clarification.

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# Structure of French expression of motion

## Gesture-speech relation, between-language comparison and developmental perspective

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This chapter contributes to the present discussion about the expression of motion in French by presenting a psycholinguistic study that focuses on how information about motion is structured not only in speech but also in co-speech gesture. Interested in developmental and cross-linguistic perspectives, we included adults as well as 5- and 10-year-old children and compared French with a typologically different and less commonly studied language – Czech. Using data from narrations of short video clips featuring various motion events, we found that, in French, gestural expression of motion is organized more similarly to verbal expression of motion than in Czech. We also observed an age-related increasing tendency to include more information about motion into fewer clauses and gestural strokes.

**Keywords:** motion, gesture, speech, French, Czech, development

### 1. Introduction

The aim of this chapter is to contribute to the debate about the expression of motion in French. Motion is understood here in terms of a deliberate *change of placement* (Aurnague 2011) or *translocation* (Levinson and Wilkins 2006) that can eventually be accompanied by a change of basic locative relation (see Aurnague's contribution in this book). For the purpose of our study, the former notions are subsumed under the general category of *path* and we focus on the combination of path with *manner* (Talmy 1985, 2000).

The question about the expression of motion can be split – and often actually is in the literature (see e.g. Gullberg, Hendriks, and Hickman 2008 in comparison to Özyürek et al. 2008) into two complementary sub-questions. The first concerns

the content of the expression. What is expressed about motion: path, manner or both? The second concerns the structure of the expression. How are path and manner presented: separately in two different syntactic units or jointly in a single unit? As will be shown below, the content has been extensively studied in the literature. That is why we wish to pay more attention to the structure in the present chapter.

The present book is dedicated to the French language and primarily investigates how motion is expressed in French. However, it will be seen later that comparative studies are very frequent and very beneficial for this particular research topic. The specificities of one language are easily highlighted and more clearly evidenced if another – presumably different – language is observed along with it. That is why we decided to approach French by comparing it to Czech. The Czech language fits the purpose of this study perfectly because, as will be detailed below, its characteristics make it typologically completely opposite to French. Moreover, although Czech is not the only language that satisfies the condition of being typologically different from French, it is one of the most marginally explored languages in this field.

Considering the overall organization of the present book, our study complements and enriches a purely linguistic analysis with some psychological observations in view of a better understanding of underlying cognitive structures and cognitive processes that constitute the (back-)ground for human language capacities and allow, in this instance, the expression of motion. More specifically, we will emphasize the role of non-verbal – or more precisely co-verbal – behavior in first language acquisition and the impact of cognitive development.

The psycholinguistic section of the present book contains two studies, both of which observe more than just the verbal modality of motion expression. While Soroli, Hickmann and Hendriks' contribution chose to investigate tracking eye movements, we decided to focus on hand and body gestures. As will be evident later in this chapter, gestures are a very convenient tool and are actually very frequently used for description of motion. This makes them a highly suitable and interesting object of analysis in the field of the expression of motion. We will see that gesture can reveal similarities or differences between populations that speak different languages, differences that are not reflected, and therefore would not be observed, in speech.

Often, analyses of the expression of motion are first based on adult data. Developmental studies often appear as the next step in response to questions of how the adult language-typical verbal pattern has been acquired by young speakers, how early it appears in children's speech and/or what the stages of its progressive acquisition are (see e.g. Özyürek et al. 2005 – where only adult data were presented – in comparison to a similar study three years later by Özyürek et al. 2008 – that already contained children's data as well). In order to map developmental trajectories of the verbal and gestural expression of motion in

French and Czech, we included not only adults but also two children's groups. To enable comparison with other similarly designed studies, we opted for the ages of 5 and 10 years.

## 2. Gesture-speech relation

### 2.1 Gesture, language, and speech

After a long period in the history of scientific research during which the study of language was largely predominant while interest in non-verbal, pre-verbal and/or co-verbal forms of communication was marginal, modern science has finally started to consider those forms as well and to discover their roles in and relations to purely verbal communication (Guidetti, Fibigerova, and Colletta 2014; Kendon 2004; McNeill 1992, 2005, 2012). Spoken language is considered as “misconstrued if not as seen as a unity of language and gesture” (McNeill 2012: 2).

Gestures are classified as one of several types of non-verbal behaviors, typically realized by hands, but also by other body parts (Argyle 1972). In gesture, hands become a symbolic instrument (McNeill 1992). Gesture is “a visible action when it is used as an utterance [...] an attempt by the actor to give information of some sort” (Kendon 2004: 7). Therefore, gesture is not just any bodily action, but a bodily action that has a semiotic value, or is a sign (Nespoulous and Lecours 1986).

In the broadest understanding, the term of gesture covers a whole spectrum of hand/body movements going from sign languages, through emblems, pantomime, language-like gestures, to gesticulation or co-speech gesture (Kendon 2004). Co-speech gestures are the least language-like type of gesture because they lack all propositional characteristics of language and are qualified in terms of analogic, image-like, global-synthetic, non-combinatoric, and idiosyncratic signs that gain their meaning from the speaker's ongoing (here-and-now) mental representations and communicative intentions, and need to co-occur with speech to be successfully interpreted by the listener (McNeill 1992).<sup>1</sup>

Gesture strokes are synchronized with the corresponding phonetic segments of speech (Condon and Ogston 1967). Co-occurring gesture and speech utterances share the same semantic referents and pragmatic functions; they are co-expressive (McNeill 1992). Co-expressivity however does not mean redundancy. A gesture stroke is about the same thing – referent – as the simultaneous segment of speech but this does not imply that verbal and gestural information – semantic

1. As our study focuses on co-speech gestures (gesticulation) exclusively, we will hereafter refer to co-speech gestures (gesticulation) in terms of *gesture*.

content – are the same. The observed synchrony and co-expressivity suggest the idea that gestures and speech should be “regarded as two sides of a single underlying verbal-gestural process of constructing and presenting meaning” (McNeill 1992: 24).

## 2.2 Gesturing, speaking, and thinking

When humans think, they think not only in concepts and propositions, but also in mental images (e.g. Paivio 1986). As suggested by McNeill (1992), there is a profound link between the multimodality of thinking and the multimodality of how thoughts are expressed. The digital quality of speech reflects propositional thinking, while the analogue quality of gesture reflects imagistic thinking. Both qualities are important; they are different but complementary.

In such a perspective, an interesting methodological possibility in the cognitive research domain emerged. A more complex and more complete picture of the process of thinking might be obtained if more attention were paid to both modalities of thinking that manifest themselves through two different modalities of expression. In other words, studying both speech and gesture can teach us more about mental processes than focusing exclusively on the verbal modality: “we consider speech and gesture jointly as an enhanced ‘window’ onto thinking” (McNeill and Duncan 2000: 142). Just as speech analysis is used to map the propositional characteristics of thinking, gesture analysis can reveal more about the imagistic aspects of thinking.

## 2.3 Impact of language and age

As gesture and speech work so closely together, the question of a possible impact of language on gesture through speech arose. The reasoning is the following: if gesture is synchronized and co-expressive with speech that is, in turn, naturally determined by the properties of the language in which it is realized, then gesture might be influenced by the particular language properties too. This idea is a continuation and a prolongation of the long-standing discussion on the language-mind relation that is associated with the original theory of language relativity by Whorf (1956) and continues nowadays in a more moderate and dynamic version by Slobin (2000), known as thinking-for-speaking.

The opposite alternative to relativism – which emphasizes the role of language and culture – is universalism which holds that human cognition and the general principles of human behavior are shared by all humans, across cultures. For example, the use of cognitive energy in organisms is influenced by the principle of *cognitive economy* that describes a general tendency to gain/produce maximum

benefit for minimal cognitive costs/investments (e.g. Collins and Quillian 1969; Rescher 1989; Rosch 1978). When applied to the speech-language relation, out of all the lexical and syntactic possibilities that exist in a given language and fit the speaker's intention, the speaker will always prefer those that are more easily available, i.e. those lexical items that are more frequent in the language community and those verbal structures that are less difficult to construct. When applied to the speech-gesture relation, what is hard to express in speech is expressed in gesture, and vice versa (McNeill 1992).

Another typical universal determinant is the biological process of maturation that manifests itself through an age-related increase in cognitive capacity and efficiency that constitutes the foundation of cognitive development (e.g. Bruner, Olver, and Greenfield 1966; Piaget and Inhelder 1966; Rosch 1978; Vygotsky 1962). There is evidence in the literature that speech development and the development of gesture are closely linked. During the transition from the preverbal to the verbal period, gesture precedes and facilitates the onset of speech (e.g. Capirci et al. 2005). As in speech, gestures with abstract reference appear later in age than gestures with concrete reference (McNeill 1992). Semantic mismatch in gesture-speech combinations reflects developmental changes at the cognitive level (e.g. Alibali and Goldin-Meadow 1993).

### 3. Verbal and gestural expression of motion

#### 3.1 Speaking about motion in different languages

Research into the expression of motion across languages was initiated by Talmy (1985, 2000). In his deep conceptual analysis, motion events are seen as combinations of a core event – typically corresponding to the path of a given motion – and an eventual co-event – that can be the cause or the manner of a particular motion. As our own study defined motion in terms of a voluntary change of placement, for the purpose of this chapter, we reduce the complexity of Talmy's analysis by focusing on the path element and the manner element only. Thus, path corresponds to the direction and trajectory of a given motion (e.g. 'up', 'down', 'into') and constitutes the core information about motion while manner provides additional information about how this motion is performed (e.g. 'walking', 'running', 'flying').

In spite of endless specificities in how motion can be expressed, Talmy identified two repetitive patterns across languages. In the first one, the core event – path – is encoded in the main verb while the co-event – manner – appears typically in an adverb or gerund. This pattern is typical of Romance languages (except for Romanian), and of languages as Turkish, Greek, Zulu, and others, altogether



called verb-framed languages. In the second one, path is encoded in the verbal satellite (particle, prefix or preposition) while the verbal root carries information about manner. This pattern is typical of Germanic and Slavic languages as well as many others, altogether referred to as satellite-framed languages.

The way expression of motion is realized in a language naturally impacts on how speakers of that language express motion. Numerous studies on speech patterns were realized by Slobin (2000, 2004, 2006). Speakers of verb-framed languages prefer to express path, omitting manner completely. However, when they do verbalize both elements they mostly separate them into two clauses, typically using the main verb of the first clause for path and the verb in gerund form of the second clause for manner. Speakers of satellite-framed languages systematically indicate both path and manner and they include them in a single clause where the verb root encodes manner while the verbal satellite encodes path.

Since this language classification was established, it has been submitted to many critical analyses (see e.g. Kopecka 2006 for French; Papafragou, Massey, and Gleitman 2002 for Greek; Slobin 2004, 2006 for some Asian, Australian and West African languages). With growing research, intra-typological differences started to emerge. Variety inside the verb-framed language group resulted from a study of Italian, French and Spanish (Hijazo-Gascón and Ibarretxe-Antuñano 2013) as well as from the comparison of French to Bantu languages (Kunene Nicolas, Guidetti, and Colletta 2016).

Variety inside the satellite-framed language group was reported by Slobin (2006) who mentioned differences between Slavic and Germanic languages. Russian speakers verbalize both path and manner of a motion almost systematically and more frequently than English speakers because of a lack of verbs expressing path but not manner. Similar observations were reported by Kopecka (2006) who focused on another Slavic language, Polish. Fibigerova, Guidetti and Šulová (2012) as well as Fibigerova and Guidetti (2018) found an extremely low frequency of path-only verbs in Czech and suggested differences between (under-studied) Czech and (over-studied) English. In Polish, Latkowska (2011) counted 11 non-manner motion verbs.

### 3.2 Interest of gesture in motion research

As already mentioned, oral expression in general is a multimodal phenomenon. Motion is expressed through motion-related verbs, adverbs, nouns, prepositions and other lexical items as well as through motion representing hands, arms, legs, heads or whole bodies. By observing only one of the modalities we lose part of the information about what is expressed as well as about what is thought. The interest of co-verbal gesture is that it can (1) display speakers' mental contents and

intentions that are not necessarily verbalized or (2) emphasize those elements of verbalized contents that are actually the core ideas of speakers' intentions (Kendon 2004; McNeill 1992).

Motion itself is a concrete physical event that can be very easily expressed in gesture. Typically three types of co-speech gesture can be used. In Ekman and Friesen's terminology (1969), these are (1) *deictics* or pointing gestures, (2) *pictographs* or gestures that convey a kind of picture of motion (e.g. drawing a trajectory in the air with the index finger or modeling two moving legs by moving two fingers), and (3) *kinetographs* or gestures that imitate real motion (e.g. arms swimming in the air to imitate real swimming in the water); all three being sub-categories of so-called *illustrators* or gestures that illustrate what is being expressed in co-occurring speech.

In this perspective, gesture can also be useful in comparative studies where the aim is to determine whether speakers of different languages not only express (exteriorize and communicate) but also conceive (understand and mentally represent) motion differently or not. The idea is the following one. If the gestural patterns used by speakers of verb-framed languages are identical to their verbal patterns and different from the gestural patterns used by speakers of satellite-framed languages, then gesture and the related thinking processes are language-type specific. Otherwise, universalist explanations hold.

### 3.3 Gesturing about motion in different languages

Although this chapter focuses on the structure of the expression of motion, we open this section by first discussing the content of expression. Content refers to what information about motion is conveyed and generally three options are considered: (1) only path is expressed, (2) only manner is expressed, (3) both path and manner (path+manner) are expressed.

From the literature quoted above on the purely verbal expression of motion, we know that speakers of verb-framed languages tend to verbalize path over manner and also over path+manner while speakers of satellite-framed languages prefer to verbalize path+manner rather than either manner or path. These results have been confirmed by studies on the multimodal expression of motion as far as speech is concerned (e.g. Fibigerova and Guidetti 2018; Fibigerova, Guidetti, and Šulová 2012; Gullberg, Hendriks, and Hickman 2008; Hickmann, Hendriks, and Gullberg 2011).

Reports from these same multimodal studies but concerning the gestural expression of motion are different. Gullberg, Hendriks and Hickmann (2008) observed French speakers who predominantly gestured about path. Hickmann, Hendriks and Gullberg (2011) compared French and English gesturing and found no difference, path-only gestures being most frequent. In similar conditions, Fibigerova, Guidetti

and Šulová (2012) as well as Fibigerova and Guidetti (2018) did not observe any difference in gestural patterns produced by French and Czech speakers, path being again the preferred component of motion expressed in both populations. To sum up, in spite of the evident differences in speech, speakers of verb-framed languages as well as speakers of satellite-framed languages gesture mostly about path alone. Gestural representations of both path and manner are less frequent in both language types. The least used practice is gesturing about manner only.

After this brief insight into the content of gestural expression of motion, we can now go one step further and focus on the structure of gestural expression of motion. In fact, when considering gesture, the term of structure is not the most appropriate one because, unlike language, co-speech gesture lacks compositionality, which means that two successive gestures do not create a kind of complex gesture sentence carrying a more complex idea (McNeill 1992). They still remain two different gestures, expressing two different ideas at two different moments. However, one can still ask what happens in cases when both path and manner are expressed. Are they expressed simultaneously, being included in one complex path-and-manner gesture? Or are they expressed separately in two successive gesture strokes, one carrying only path and the other carrying only manner? Actually, we should be able to consider a kind of gestural version of the double possibility in speech: (1) the situation when path and manner are included in one clause, and (2) the situation when path and manner are separated into two clauses (Kita and Özyürek 2003; Özyürek et al. 2005; Özyürek et al. 2008).

The information packaging hypothesis (Kita 2000) and interface hypothesis (Kita and Özyürek 2003) suggest that the way information is organized – packaged – in gesture corresponds to the way information is organized in speech. From the literature on the purely verbal expression of motion (mentioned previously), it is known that speakers of verb-framed languages tend to separate path and manner in two different clauses while speakers of satellite-framed languages prefer to include them in a single clause. These results are replicated by studies on the multimodal expression of motion as far as speech is concerned (e.g. Kita and Özyürek 2003; Özyürek et al. 2005; Özyürek et al. 2008).

Reports from these same multimodal studies but concerning gesture are, at first glance, also very similar. A comparison of English, Turkish, and Japanese speakers narrating a cartoon carried out by Kita and Özyürek (2003) showed that gesture reflects the language-specific structural pattern produced in speech in the sense that English and Japanese natives tended to include path and manner in one gesture while Turkish natives preferred to separate path and manner into two different gestures. These results were confirmed by Özyürek et al. (2005) in a more complex study of English and Turkish speakers.

However, a deeper analysis of gesturing in English and Turkish by Özyürek et al. (2008) revealed that gestural pattern – separated vs. conflated path and manner – depends not so much on the language type itself but rather on the verbal pattern used by a speaker. For example, the typical English pattern is to conflate path and manner in speech. But English speakers also produce the atypical pattern. When the authors compared the two situations in English, they found that *conflated gestures* (path and manner in one gesture) are more frequent with *conflated speech* (path and manner in one clause) while separated gestures (path and manner in two gestures) are more frequent with separated speech (path and manner in two clauses). Inter-language differences even disappeared when the authors compared the proportions of separated gestures in English separated speech and in Turkish separated speech.

### 3.4 Gesturing about motion in children

However, different findings are reported concerning the universality vs. relativity of developmental trajectories in the expression of space and motion. Some results indicate that children adopt adult-like (verbal or/and gestural) patterns very early and that developmental changes are less important (e.g. Allen et al. 2007; Choi and Bowerman 1991; Gullberg, Hickmann, and Hendriks 2008; Hickmann 2006; Özyürek et al. 2008; Papafragou, Massey, and Gleitman 2002). Other results show some interesting similarities across children speaking different languages, which disappear with age as the child's (verbal and/or gestural) expression becomes adult-like and therefore language-specific (Allen et al. 2007; Gullberg, Hickmann, and Hendriks 2008; Hickmann 2006; McNeill 1992, 2005; Özyürek et al. 2008).

In conformity with the general ontogenetic principles discussed previously in this chapter, the information density of an utterance increases with age which means that in contrast with children, adults convey more information and concentrate it in fewer units. Developmental studies (e.g. Allen et al. 2007; Gullberg, Hickmann, and Hendriks 2008; Hickmann 2006; Hickmann, Hendriks, and Gullberg 2011; McNeill 2005; Özyürek et al. 2008) report a general cross-language increase in path-and-manner expressions with age, in speech as well as in gesture. The ages of 3, 5–6 and 9–10 years are mostly covered.

Two different explanatory hypotheses are found in the literature. According to the first one (Collins and Quillian 1969), since working memory is limited in young children, it is difficult for a child to handle more than one dimension of motion at a time. The alternative explanation is McNeill's (2005) suggestion that as a child discovers that the language is discrete and compositional, his/her practice is to divide information about path and manner of motion into separate pieces rather than to convey it all at once. Results obtained by Özyürek et al. (2008) in

a comparative study of English and Turkish 3-, 5- and 9-year-old children and adults support the latter hypothesis.

## 4. The present study

### 4.1 Content and structure of expression of motion in French and Czech

From research on the *content* of *verbal* expression, we know that French and Czech native speakers, children as well as adults, use – in accordance with the verb-framed vs. satellite-framed classification – typologically different patterns so that Czech systematically verbalizes both path and manner while French prefers path over manner (Fibigerova and Guidetti 2018; Fibigerova, Guidetti, and Šulová 2012). Here we will focus on cases where both path and manner are expressed, which is a typical pattern in Czech but atypical in French, and we will inquire how path and manner are organized across clauses.

French lexicon has at its disposal numerous and frequent path-only verbs (e.g. *monter* ‘to ascend’, *traverser* ‘to cross’) and manner-only verbs (e.g. *marcher* ‘to walk’, *courir* ‘to run’), but is poor in path-and-manner verbs (e.g. *grimper* ‘to climb up’, *dévaler* ‘to hurtle down’). Therefore, French speakers are likely to produce two separate clauses, one for path, one for manner. Czech lexicon is rich in manner-only verbs (e.g. *jít* ‘to walk’, *běžet* ‘to run’) and path-and-manner verbs (e.g. *přejít* ‘to walk across’, *seběhnout* ‘to run down’) – where path is encoded in the prefix (*pře-* ‘across’ in *přejít* ‘to walk across’, *se-* ‘down’ in *seběhnout* ‘to run down’) and manner is carried by the verb root –, but lacks path-only verbs (Pokorný 2010; for Czech prefixes see e.g. Hrstková 2007). There is no equivalent of *to ascend* or *to cross* and path is almost always systematically encoded in a verbal prefix or preposition. Therefore, Czech speakers are likely to produce a single clause containing both path and manner.

Unlike previous studies on verbal structure, we split this question into two parts. First, we ask about the *number* of clauses produced: one or more? Then, in cases where more than one clause was produced we ask about the *complexity* of every single clause: is there at least one complex clause (containing both path and manner)? In the literature, the *conflation* vs. *separation* opposition is almost always identified with the *single-clause* vs. *multiple-clauses* opposition. Our two-step questioning will help to handle even situations that are often omitted or marginally treated where, although two clauses were produced, path and manner were not (completely) separated but (partially) conflated in one of the clauses produced. Examples will follow in the coding section of this chapter.

From research on the *content* of *gestural* expression, we know that French and Czech native speakers, children as well as adults, use – independently of the verb-framed vs. satellite-framed classification – an identical pattern that is gesturing about path only while omitting manner (Fibigerova and Guidetti 2018; Fibigerova, Guidetti, and Šulová 2012). A closer look into couples of co-occurring gesture strokes and speech segments confirmed what might already be guessed, i.e. the fact that French speech and gesture are semantically mostly redundant (path in speech and path in gesture), while Czech speech and gesture are mostly different in what they convey as information (path and manner in speech but only path in gesture). These findings are in line with McNeill and Duncan's (2000) idea that omitting manner in gesture allows speakers of highly manner-oriented languages to downplay over-verbalized manner. Here, we will focus on cases where both path and manner are expressed – which is a less frequent practice for both Czech and French speakers – and we will ask how path and manner are organized across gesture strokes. Applying the same reasoning as we did in speech, we distinguish the *number* of gestures produced and the *complexity* of individual gestures that a speaker produced in order to express the path and the manner of a given motion. Examples will follow in the coding section of this chapter.

## 4.2 Design and hypotheses

The questions, data and results presented in this chapter are part of a more complex study focusing on verbal and gestural expression of motion in French and Czech (typologically different languages) 5-year-old children, 10-year-old children and adults (Fibigerova 2012). This larger study investigated in detail both the content and structure of speech and gesture. In this chapter we will focus more on the latter, while nevertheless considering the former as a necessary background.

Inspired by the information packaging hypothesis (Kita 2000) and the interface hypothesis (Kita and Özyürek 2003), our research question concerns the impact of language and age (2 independent variables) on how path and manner are packaged inside/across verbal units (first dependent variable) and gestural units (second dependent variable). In cases where gesture and speech were produced simultaneously, we also observed whether the gestural packaging matched the verbal packaging (third dependent variable). To answer these questions, six main hypotheses were formulated.

The first hypothesis concerns the impact of language on how information about motion is verbally organized in terms of the number and complexity of speech units (clauses) produced. We expect that, in order to verbalize both path and manner of a given motion, French speakers will need to produce more clauses than Czech speakers because they tend to break up complex information into

several simpler chunks. In other words, a typical French response will be one path-only (P-only) clause and one manner-only (M-only) clause rather than a single path-and-manner (P-and-M) clause.

Moreover, even in the case of multiple-clause description of motion, we expect that there will be a difference between French and Czech speakers such that the former will be less likely than the latter to include path and manner in at least one of the clauses formulated because they have fewer lexical possibilities to produce a path only clause. In other words, a typical Czech response will be one P-and-M clause and one M-clause rather than one P-clause and one M-clause.

The second hypothesis concerns the impact of age on the number and complexity of clauses produced. We assume that in French, both child and adult speakers will typically produce more than one clause to describe path and manner of a motion. However, adult speech will contain more single-clause descriptions than child speech because of an increasing maturation-related cognitive capacity to combine more semantic elements into one speech unit. Therefore, a single-clause description of path and manner together should be easier to construct for adults than for children.

The same reasoning applies to cases of multiple-clause description of motion. Even if both French adults and children tend to produce more than one clause, it will be more likely that there will be at least one P-and-M clause in adult speech than in child speech.

The third hypothesis relates to the role that language plays in the way information about motion is organized in gesture. Analogically to speech, two different levels are considered: the number and the complexity of gesture units produced, whether gesture strokes or simply gestures. We expect that in spite of inter-language differences in speech, there will be no language effect on gesture. More precisely, French and Czech speakers will share the preference for a single gesture while describing both path and manner because of the notion that, in contrast to linguistic representation, gestural representation of objects and events is analogic. Therefore, if a given path and manner is related to one and the same motion, they should be included in a single gesture. Even if more gestures are produced, at least one should be a P-and-M gesture while other P-gestures or M-gestures might just be a specification of a given path or manner.

The fourth hypothesis focuses on the role that age plays in the quantity and complexity of gestures produced. We assume that the general tendency to produce a single gesture in which path and manner are expressed jointly will become even stronger with age. And we also expect that in the case of multiple gestures, adults are more likely to create at least one path-and-manner gesture than children.

The last two hypotheses approach the question of resemblance of information organization in temporally co-occurring speech and gesture: Is the organization

of verbally conveyed path and manner similar to the organization of gesturally conveyed path and manner, or are they different?

The fifth hypothesis considers the impact of language on this question. We expect that the answer to the question will not be the same in the French and Czech language contexts. French speakers will separate path and manner into different clauses but they will tend to include them in one gesture stroke and thus the verbal and gestural packaging patterns will differ from each other, whereas Czech speakers will tend to include path and manner in one clause as well as in one gesture stroke.

The sixth hypothesis finally concerns the impact of age on our research question. We assume that age will increase the frequency of cases where verbal and gestural information are organized the same way. In other words, although there will be fewer similarities between co-occurring speech and gesture in French than in Czech, the proportion of similarities will be higher in French and Czech adults than in French and Czech children.

### 4.3 Participants, procedure, and materials

Our study is based on 144 participants including 6 same-sized (48 participants) language/age groups: French 5-year-old children, 10-year-old children and adults aged between 20–35 years and Czech 5-year-old children, 10-year-old children and adults aged between 20–35 years. All participants were monolingual native speakers living in their respective countries (the Czech Republic and France) with no cognitive, speech or physical (mobility and motricity) disabilities.

The data collection itself took place in educational institutions (kindergarten, school and university), in a separate room with a fixed camera, table, three chairs (for the experimenter, her assistant and a participant) and a laptop. Sessions were individual and consisted in the narration of short video clips showing various motion events. Each participant was presented with all the clips (the order of presentation being different for each participant). After a clip had been presented, the laptop display turned black and the experimenter asked the participant to tell the story to the assistant who was sitting on the other side of the table so that he/she could not see the display. No specific instructions concerning motion events or gesturing itself were given. The participants' narrations were videotaped for further analysis. Sessions varied from 1/2 hour to more than 1 hour depending on the participant's age, personality and attitude to the task. To take concentration capacity limits into account, one or more breaks were included for children during



which the children stayed in the experimental room but did another activity (coloring, drawing, origami, picture book) with the experimenter and assistant.

The video clips were from 6- to 12-second long cartoons, created especially for different purposes of different motion event studies.<sup>2</sup> There were 40 in total, organized in 4 separate sets:

- the *Humans and Animals with Background* set (Hickmann 2006) contains 1 training clip and 12 experimental clips;
- the *Humans and Animals without Background* set (Hickmann 2006), contains 1 training clip and 12 experimental clips;
- the *Redman and Greenman* set (Allen et al. 2007) includes 2 training clips and 10 experimental clips; and finally
- the *Pixi* set (Fibigerova 2012) contains 1 training clip and 10 experimental clips.

The design of the clips is similar across the sets: a character arrives, makes a targeted motion (two motions in several clips) and leaves the screen. Each targeted motion involved a combination of specific path ('up', 'down', 'across', 'around', and 'through') and manner (that varied from common 'running' or 'swimming', to more specific 'rolling' and 'spinning', and even an unspecified kind of 'sliding/gliding/flying').

#### 4.4 Coding

The verbal and gestural data collected were transcribed and annotated using the computer software *ELAN Linguistic Annotator*.<sup>3</sup> We coded speech, gesture, and the gesture-speech relation separately. A portion (20%) of the data was coded by two different raters, and gave a satisfactory 80% inter-rater agreement.

##### 4.4.1 Coding of speech

Once all the collected narrations had been transcribed, we identified the sections of speech related to description of the targeted motions. We excluded descriptions in which the targeted event was totally omitted in speech or the targeted event was misinterpreted or described in other than path/manner terms as well as those cases where only path or only manner was expressed. Thus, only those

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2. The qualitative specificities of each set and their possible effect on the expression of motion will be treated in a separate paper.

3. The software and further information are available at the following URL: <https://tla.mpi.nl/tools/tla-tools/elan/>

descriptions containing both path and manner information about the targeted motion were kept.

Annotation of the internal structure of the descriptions was carried out in two steps. First, we took all the preselected path-and-manner descriptions and categorized them according to the number of clauses that each description contained. A single-clause description consisted of one clause, which necessarily included both path and manner. A multi-clause description contained more than one clause, regardless of the distribution of path and manner across the clauses. Second, after having identified all multi-clause verbal descriptions, we took a closer look at the packaging of path and manner across individual clauses within those descriptions. We distinguished cases where at least one of the clauses contained both path and manner and cases where clauses contained either path or manner but never both of them jointly. For French and Czech illustrations, see Examples (1)–(3).

- (1) a. Single-clause path-and-manner verbal description in French:  
*Il a roulé jusqu'en bas de la colline.*  
 he has rolled until in down of the hill  
 'He rolled down the hill'
- b. Single-clause path-and-manner verbal description in Czech:  
*A pak šlezla zas.*  
 and then climbed.down again  
 'And then it climbed down again'
- (2) a. Multiple-clause verbal description with at least one path-and-manner clause in French:  
*Il a descendu la colline en roulant jusqu'en bas.*  
 he has descended the hill by rolling until in down  
 'He descended the hill by rolling down to the bottom'
- b. Multiple-clause verbal description with at least one path-and-manner clause in Czech:  
*Zeleňák vyšel na kopec a točil se přitom.*  
 greenman walked.up onto hill and spinned itself at.the.same.time  
 'Greenman walked up the hill, spinning as he went'
- (3) a. Multiple-clause verbal description without any path-and-manner clause in French:  
*Le Vert a monté la colline en tournant sur lui-même.*  
 the greenman has ascended the hill by spinning on himself  
 'Greenman went spinning up the hill'

- b. Multiple-clause verbal description without any path-and-manner clause in Czech:

*Točíce se z útesu, spadl.*

rolling itself from cliff fell

‘He rolled off the cliff’

#### 4.4.2 Coding of gesture

A gesture was defined as a gestural stroke, sometimes in conjunction with a post-stroke hold. For the purpose of our study, we introduced the term *gestural description* that we use as a kind of correlate to *verbal description*. In the same way as a verbal description refers to all (one or more) clauses related to a given targeted motion, a gestural description will refer to all (one or more) gestures related to a given targeted motion. After having applied an analogical filter as used before speech coding, we obtained a pre-selection of only those gestural descriptions in which both path and manner of the targeted motion were conveyed. These descriptions were then coded.

First, we considered the number of gestures produced. A single-gesture description consisted of one gesture, which necessarily included both path and manner. A multi-gesture description contained more than one gesture, regardless of the distribution of path and manner across the gestures. Second, after having identified the multi-gesture descriptions, we took a closer look at the packaging of path and manner across individual gestures within those descriptions. We distinguished cases where at least one of the gestures contained both path and manner and cases where gestures contained either path or manner but never both of them jointly. Examples (4)–(6) – related to the *running across* targeted motion – illustrate the different cases.

- (4) Single-gesture path-and-manner gestural description:  
Wriggling fingers while the hand moves from the left to the right.
- (5) Multiple-gesture gestural description with at least one path-and-manner gesture:  
Index finger moving from the left to the right + Wriggling fingers while the hand moves from the left to the right.
- (6) Multiple-gesture gestural description without any path-and-manner gesture:  
Wriggling fingers + Index finger moving from the left to the right.

#### 4.4.3 Coding of gesture-speech relation

Once all path-and-manner verbal and gestural descriptions had been identified and annotated independently, we coded their relation. For this purpose, we naturally had to exclude all the verbal descriptions that were not accompanied by any

gesture, keeping only couples of co-occurring verbal and gestural descriptions. The annotation consisted of determining whether the information conveyed in gesture was packaged in the same way, or not, as the information conveyed by speech.

A speech-gesture couple was labeled as identically organized if one of the following three situations held. First, path and manner were expressed by a single clause and a single gesture stroke (the single clause and single gesture stroke were therefore conflated). Second, path and manner were expressed by multiple clauses and multiple gesture strokes, and were conflated in at least one of the clauses and gesture strokes. Third, path and manner were expressed by multiple clauses and multiple gesture strokes, and were separated into different clauses and different gesture strokes. In all other situations a couple was called non-identically organized. Examples (7) and (8) illustrate these opposite possibilities in French and Czech.

- (7) a. Identical verbal and gestural packaging patterns in French:  
*Le Vert a monté la colline en tournant sur lui-même.*  
 the greenman has ascended the hill by spinning on himself  
 ‘Greenman went up the hill while spinning’  
 + Path gesture whose stroke is synchronized with *monté*.  
 + Manner gesture whose stroke is synchronized with *tournant sur lui-même*.
- b. Identical verbal and gestural packaging patterns in Czech:  
*Zeleňák vyšel na kopec a točil se přitom.*  
 greenman walked.up onto hill and spinned itself at.the.same.time  
 ‘Greenman walked up the hill, spinning as he went’  
 + Path-and-manner gesture whose stroke is synchronized with *vyšel*.  
 + Manner gesture whose stroke is synchronized with *točil se*.
- (8) a. Different verbal and gestural packaging patterns in French:  
*Le Vert a monté la colline en tournant sur lui-même.*  
 the greenman has ascended the hill by spinning on himself  
 ‘Greenman went up the hill while spinning’  
 + Path-and-manner gesture whose stroke is synchronized with *en tournant sur lui-même*.
- b. Different verbal and gestural packaging patterns in Czech:  
*Zeleňák vyšel na kopec a točil se přitom.*  
 greenman walked.up onto hill and spinned itself at.the.same.time  
 ‘Greenman walked up the hill, spinning as he went’  
 + Path gesture whose stroke is synchronized with *vyšel*.  
 + Path-and-manner gesture whose stroke is synchronized with *točil se*.

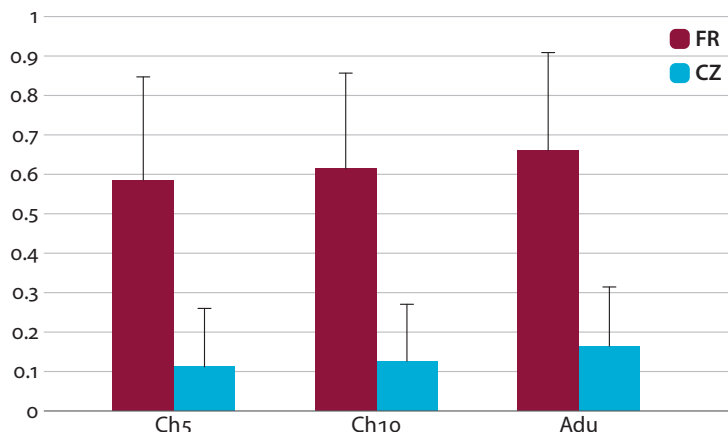
## 4.5 Results

### 4.5.1 Results for speech

Our first two hypotheses concerned the impact of language and age on path and manner packaging in speech. Path-and-manner descriptions were found in both language groups as well as in all three age groups. However, they were much less frequent in French (30%) than in Czech (79%) and their frequency increased steadily from 5-year-old children (42%) through 10-year-old children (52%) to adults (70%).

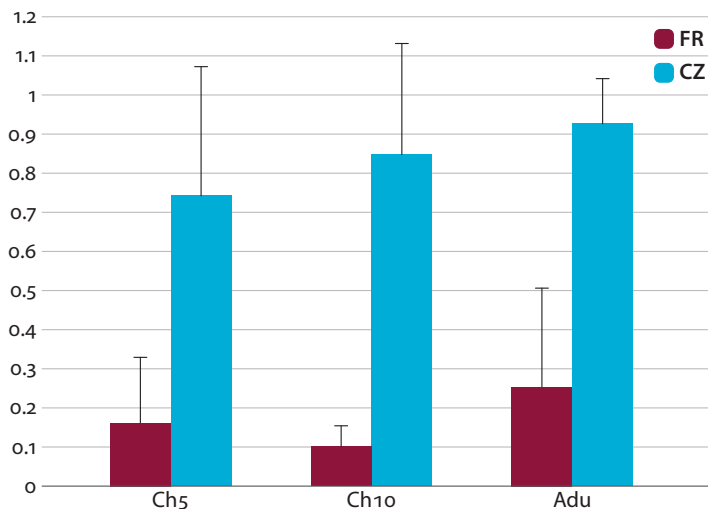
The first dependent variable we were interested in was the number of clauses in a path-and-manner verbal description. We conducted a 2 (languages) x 3 (ages) ANOVA on the mean proportions, in French and Czech adults and children, of those path-and-manner descriptions that contained multiple clauses (versus those that corresponded to a single clause).

Figure 1 shows the main results. First, French participants used multiple clauses much more (62%) often than Czech speakers (13%) and this difference was statistically significant  $F(1,138) = 333.605, p < .001$ . Second, the frequency of multi-clause descriptions was slightly higher in older participants than in younger ones (5 years: 35%, 10 years: 37%, adults: 41%) but this increase was not significant. Third, language and age did not interact so that the difference between French and Czech participants was present at all three ages. There was no evolution in any of the two language contexts considered separately.



**Figure 1.** Mean proportions, in French (FR) and Czech (CZ) adults (Adu) and children (Ch5 and Ch10), of multi-clausal path-and-manner descriptions

The second dependent variable analyzed was the complexity of individual clauses within a multi-clause path-and-manner description. This time, a 2 x 3 ANOVA



**Figure 2.** Mean proportions, in French (FR) and Czech (CZ) adults (Adu) and children (Ch5 and Ch10), of multi-clausal path-and-manner descriptions that contain at least one path-and-manner clause

was applied on the mean proportions, in French and Czech adults and children, of those multi-clause path-and-manner descriptions that contained at least one clause with both path and manner conveyed (versus those descriptions that contained only clauses where either path or manner was conveyed).

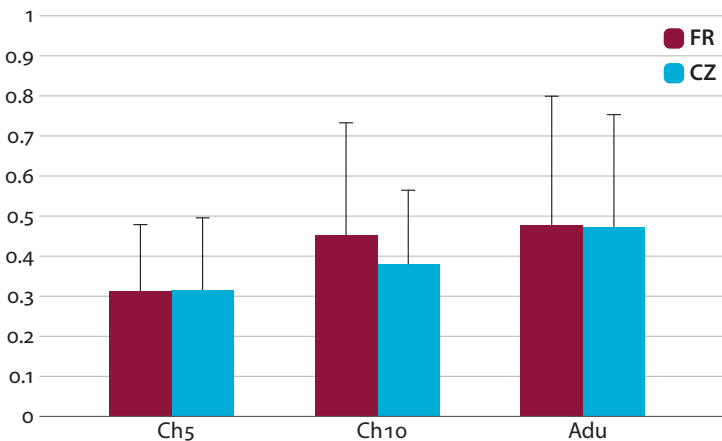
The results are displayed in Figure 2. First, in comparison to Czech participants (83%), French participants (17%) had a significantly lower ( $F(1,138)=408.435$ ,  $p < .001$ ) tendency to express path and manner jointly. Second, significant differences were also observed between the age groups ( $F(2,138) = 6.638$ ,  $p < .005$ ). Tukey's *post hoc* tests revealed a significantly higher proportion of path-and-manner clauses in adults (59%) than in the two children groups (5 years: 45%, 10 years: 47%) ( $p < .05$  for both comparisons: adults vs. 5-year-olds and adults vs. 10-year-olds). Third, no interaction between language and age was observed. The difference between French and Czech participants was maintained at all three ages. No evolution was observed in any of the two language contexts.

#### 4.5.2 Results for gesture

Our next two hypotheses concerned the impact of language and age on path and manner packaging in gesture. Path-and-manner descriptions were found in both language groups as well as in all three age groups. There was absolutely no difference between French (19%) and Czech (19%) participants in terms of their frequency. However those descriptions were more frequent in adults (26%) than in age 5 (17%) and age 10 (14%) groups.

The first dependent variable we were interested in was the number of gestures in a path-and-manner gestural description. We conducted a 2 (languages) x 3 (ages) ANOVA on the mean proportions, in French and Czech adults and children, of those path-and-manner descriptions that contained multiple gestures (versus those that corresponded to a single gesture).

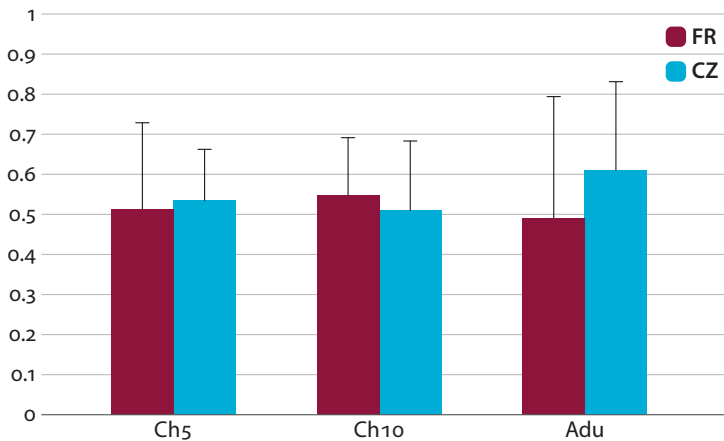
Figure 3 displays three main results. First, French participants created multiple gestures slightly more often (41%) than Czech participants (39%) but this difference was not statistically significant. Second, the frequency of multi-clause descriptions was also slightly higher in older participants than in younger ones (5 years: 31%, 10 years: 42%, adults: 47%) and this time the increase was significant ( $F(2,138) = 8.943, p < .001$ ). Tukey's *post hoc* tests situated this significant increase ( $p < .05$ ) between the age of 5 and the age of 10. Third, language and age did not interact. The same developmental trend was observed in the French group as in the Czech group. No significant inter-language difference emerged at any of the three ages observed.



**Figure 3.** Mean proportions, in French (FR) and Czech (CZ) adults (Adu) and children (Ch5 and Ch10), of multi-gestural path-and-manner descriptions

The second dependent variable investigated was the complexity of individual gestures in a multi-gesture path-and-manner description. This time, a 2 x 3 ANOVA was applied on the mean proportions, in French and Czech adults and children, of those multi-gesture path-and-manner descriptions where at least one gesture expressed path and manner jointly (versus those descriptions where each gesture expressed either path or manner).

The results are shown in Figure 4. First, in comparison to Czech participants (55%), French ones (52%) had a slightly but still significantly lower tendency ( $F(2,138) = 4.17, p < .05$ ) to express path and manner jointly. Second,



**Figure 4.** Mean proportions, in French (FR) and Czech (CZ) adults (Adu) and children (Ch5 and Ch10), of multi-gestural path-and-manner descriptions that contain at least one path-and-manner gesture

the proportion of path-and-manner gestures remained very similar in all three age groups (5 years old: 52%, 10 years old: 53%, adults: 55%); no significant difference was identified. Third, an interaction of language and age was found ( $F(2,138) = 7,793$ ,  $p = .001$ ) and Student  $t$ -tests revealed that the significant difference identified between French and Czech participants did not exist in 5-year-old children, but was already present at the age of 10 ( $p < .05$ ) and became stronger in adults ( $p < .05$ ). Moreover, at the age of 10, the score was slightly higher in French than in Czech while in adults, the situation reversed completely.

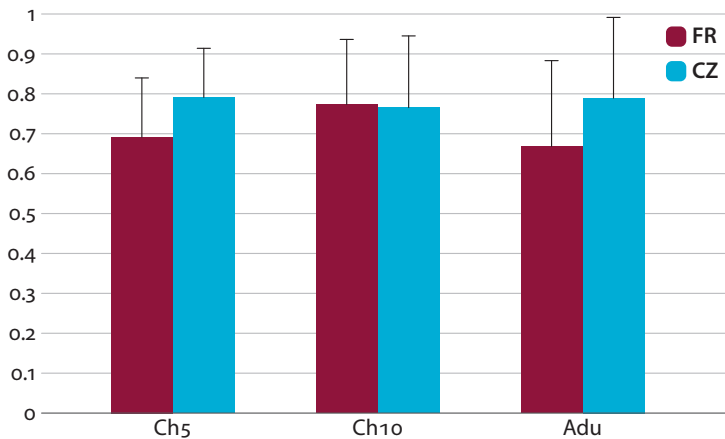
#### 4.5.3 Results for gesture-speech relation

The last two hypotheses inquired into the impact of language and age on the similarity of packaging patterns in co-occurring speech and gesture. For this purpose, we created a data subsample containing couples of verbal and gestural descriptions in which both path and manner of the same targeted motion were conveyed in each modality (path and manner in speech and path and manner in gesture).

A 2 (languages) x 3 (ages) ANOVA was conducted on the mean proportions in French and Czech adults and children of those couples in which verbal packaging and gestural packaging were identical (versus those couples where verbal packaging and gestural packaging were not identical, as explained in the coding section).

The results are given in Figure 5. First, couples of identically organized gesture and speech were significantly less frequent ( $F(1,138) = 10.999$ ,  $p = .001$ ) in the French sample (71%) than in the Czech sample (78%). Second, the proportion of identical couples remained very similar in all three age groups (5 years old: 74%, 10 years old: 77%, adults: 73%) with no significant differences. Third, there was an





**Figure 5.** Mean proportions, in French (FR) and Czech (CZ) adults (Adu) and children (Ch5 and Ch10), of gesture-speech couples where verbal packaging and gestural packaging of path and manner were identical

interaction between language and age ( $F(2,138) = 3.477, p < .05$ ). Student *t*-tests revealed that the significant difference identified between the French and Czech samples existed at the age of 5 ( $p < .05$ ), then disappeared at the age of 10 and finally reappeared ( $p < .05$ ) with its original intensity in adults (i.e. did not differ from 5-year-old children).

## 5. Discussion

We chose to tackle the question of motion in French by focusing on structure of expression of motion. We adopted a multimodal conception of expression and observed how speakers use verbal tools – speech – in conjunction with non-verbal tools – co-verbal gesture – in order to describe motion. Interested in cross-language differences as well as in development related to the cognitive process of first language acquisition, we conducted a comparative study between French and Czech, adults and children. The obtained results – for speech, for gesture, and for gesture-speech relation – are discussed in the following three subsections.

### 5.1 Discussion of speech results

At the outset of the study, two two-step hypotheses were formulated and tested in order to map the structure of verbal expression of motion in French and Czech speakers aged 5 years, 10 years and adults.

### 5.1.1 *Impact of language type*

The first hypothesis concerned the impact of language on how information about motion is verbally organized in terms of the number and complexity of clauses produced. Our expectations were confirmed at both levels. French speakers typically produced two clauses and separated path and manner into one path-only and one manner-only clause. Czech speakers mostly described a motion event by a single clause in which path and manner were expressed together. However, even when Czech speakers produced more clauses, they tended – in contrast to French speakers – to include path and manner in at least one clause.

Our results confirm the original language typology by Talmy (2000) and are in line with previous studies (Allen et al. 2007; Choi and Bowerman 1991; Fibigerova, Guidetti, and Šulová 2012; Gullberg, Hickmann, and Hendriks 2008; Hickmann 2006; Hickmann, Hendriks, and Gullberg 2011; Özyürek et al. 2008; Papafragou, Massey, and Gleitman 2002; Slobin 2000, 2004, 2006).

The predominant structural pattern in French for the expression of motion matches the pattern typical for verb-framed languages and is different from the predominant pattern in Czech that represents here satellite-framed languages.

### 5.1.2 *Impact of age*

The second hypothesis concerned the impact of age on the number and complexity of clauses produced. Different results were obtained for the two parts of our hypothesis. As far as the number of clauses was concerned, contrary to our expectations, no universal age-related effect was observed. In all three age groups, French speakers used multiple clauses more than Czech speakers who preferred a single clause also at all three ages. We did not find any progressive tendency – especially in French – to reduce the number of clauses needed for the expression of path and manner. However, a closer look at multi-clausal descriptions of motion revealed an age-related development in favor of the complexity of individual clauses. Although, in all age groups, French speakers conflated path and manner much less than Czech speakers did, the frequency of conflation increased with age, both in general as well as in each language group.

This result shows that the cognitive capacity to handle path and manner at the same time, which is related to working memory (Collins and Quillian 1969), increases with age but depends on the quantity of clauses that speakers need, which is related to the lexical limits and syntactic rules of a given language. These findings support previous studies (Allen et al. 2007; Fibigerova, Guidetti, and Šulová 2012; Gullberg, Hendriks, and Hickmann, 2008; Hickmann 2006; Hickmann, Hendriks, and Gullberg 2011; McNeill 2005; Özyürek et al. 2008).

## 5.2 Discussion of gesture results

We also formulated and tested a couple of two-step hypotheses in order to compare the structure of the gestural expression of motion in French and Czech speakers aged 5, 10 and adults.

### 5.2.1 *Impact of language type*

The third hypothesis related to the role that language plays in the way information about motion is organized in gesture. Analogically to speech, two different levels were considered: the number and the complexity of gestures produced. For each level, different results were obtained.

As expected, no difference between French and Czech participants was observed in the way that they both produced single-gesture as well as multiple-gesture descriptions of motion, with a slight preference for single gestures however. This result indicates the presence of universal characteristics in gesture.

Two possible explanations can be suggested for the slight preference that French and Czech participants shared for single gestures over multiple gestures. First, in terms of cognitive economy (e.g. Collins and Quillian 1969; Rescher 1989; Rosch 1978), it might simply be more effective to produce one path-and-manner gesture than two gestures, regardless of whether these are (A) a combination of one path-only and one manner-only gesture or (B) a combination of one path-and-manner gesture and one either-path-or-manner gesture. Second, when considering the image-like nature of gestures as signs and the analog relation between gestures and their referents (McNeill 1992), a *single* gesture might be cognitively more appropriate to globally represent a *single* motion event than multiple gestures.

At this point, it is interesting to compare the results for the number of gesture strokes and the results for the number of clauses. Note that we are not comparing couples of synchronized speech and gesture segments here (this will be dealt with in the following section) but only speech on its own and gesture on its own. In the French sample, multiple gestures were less frequent than multiple clauses. In the Czech sample, multiple gestures were more frequent than multiple clauses. The differences in speech not only disappear in gesture but it seems that gesture plays different roles in French and Czech.

In French, gesture might play a kind of compensatory role to overcome the difficulty or even impossibility of expressing path and manner of motion with a single clause. Such an explanation resonates with the comment by McNeill and Duncan (2000) when it came to explaining why, in highly manner-oriented satellite-framed languages, speakers omit manner in gesture. The authors suggested that speakers of those languages might use their gesture as a tool to downplay the over-verbalized manner.

In Czech, our reasoning is different. We have learnt that Czech speakers tend to express the path and manner of a motion by a single clause; this logically implies that such a clause includes the given path and manner. A deeper qualitative analysis of the internal structure of Czech path-and-manner clauses shows that manner is typically encoded in the root of the verb, while path is first encoded in the verb prefix and then also often repeated in the preposition that follows the verb and is related, in Talmy's terms, to the *ground*. A closer look into the speech-gesture relation also shows that Czech participants sometimes produced more than one gesture stroke during one clause, with one gesture being synchronized with the verb, and the other gesture co-occurring with the preposition. This synchronic timing between gesture and speech could explain why Czech speakers also produce multiple-gesture descriptions of motion even though they use mostly single-clause descriptions of motion.

Concerning the complexity of gestures, the expected language-independent character of gesture was not confirmed. French and Czech gestures differed from each other when speakers produced more than one gesture. In French multiple gestures, the frequency of path-and-manner gestures was lower than in Czech multiple gestures. It seems that at this point, gesture is partially influenced by language type in that in verb-framed languages path and manner are expressed separately while in satellite-framed languages they are expressed jointly. This observation supports the previous studies of language impact on gestural packaging by Kita and Özyürek (2003) and Özyürek et al. (2005, 2008).

### 5.2.2 *Impact of age*

The fourth hypothesis focused on the role that age played in the quantity and complexity of gestures produced. Adults and children aged 10 expressed path and manner with more gestures than children aged 5. In cases of multiple gestures, we did not observe any development in favor of gestures where path and manner were conflated. The only expected result related to age was an interaction of the age effect and the language effect. In the discussion of the results related to the third hypothesis, we said that in French multi-gestural descriptions, the frequency of path-and-manner gestures was lower than in Czech multiple gestures. In fact, this inter-language difference was observed in 10-year-old children and adult participants, but not in 5-year-old children. From the developmental perspective, we can reformulate this interaction of age effect and language effect in the following way. The frequency of path-and-manner gestures in multi-gestural descriptions increased with age in the Czech group but not in the French group. On a more general level, our observations suggest that the complexity of gestures increases with age but more, or only, in speakers of satellite-framed languages than in

speakers of verb-framed languages, which is totally in line with a similar study of language and age impact on gestural packaging by Özyürek et al. (2008).

### 5.3 Discussion of gesture-speech results

After having observed speech and gesture independently, our last two hypotheses approached the question of the similarity of information organization in temporally co-occurring speech and gesture produced by French and Czech speakers aged 5, 10 and adults.

#### 5.3.1 *Impact of language type*

The fifth hypothesis concerned the impact of language on this question. Before even having tested this hypothesis, simply by observing the results obtained for speech and the results for gesture jointly, we were able to predict the result for gesture-speech relation. First, we knew that the typical pattern in Czech is to express path and manner jointly and mostly in a single clause. We also knew that the typical pattern of Czech gesture was to express path and manner jointly and mostly in single gesture stroke. This already suggested that when speech and gesture co-occurred, they would tend to be identically organized. Moreover, we knew that the typical pattern in French was to express path and manner in two clauses and mostly separately. We also knew that the two typical patterns in French gesture were to express path and manner either separately in two different gesture strokes or together in a single stroke. This already suggested that when speech and gesture co-occurred, they would tend to be differently organized. Both these predictions were confirmed. We observed fewer similarities between French gesture and French speech than between Czech gesture and Czech speech.

This structural non-redundancy in verb-framed languages might be explained in terms of gestural compensation of some language difficulties or even impossibilities. We refer again to the work by McNeill and Duncan (2000) who hypothesized that speakers of some highly manner-oriented satellite-framed languages may downplay the over-expressed manner in speech by omitting manner in gesture – which explains the *semantic* non-redundancy in those satellite-framed languages. If we apply the compensatory idea to our situation, i.e. *structural* non-redundancy in verb-framed languages, it may be the case that speakers of these languages overcome the need to separate path and manner in speech by integrating them at least in gesture.

#### 5.3.2 *Impact of age*

The sixth and last hypothesis concerned the impact of age on the similarity of information organization in temporally co-occurring speech and gesture. In

contrast to our expectations, the frequency of cases where verbal information and gestural information were packaged in the same way did not increase with age. No age effect at all was observed.

Despite this absence of any general effect of age, however, an interaction between age effect and language effect was observed. The difference found between Czech and French participants concerned 5-year-old children and adults, but not 10-year-old children. This fact suggests us think about studies where results observed in participants aged between 6 and 9 – always a middle age group – indicated a transition from children's pattern to adults' pattern (Gullberg, Hendrix, and Hickmann 2008; Özyürek et al. 2008). Taken together, these observations might reveal some undergoing developmental changes in cognitive functioning, as the period in question (between 6 and 10 years) coincides with important transitions in the development of logic and operational thought (Piaget and Inhelder 1966).

## 6. Conclusion

To sum up, the purpose of this chapter was to contribute to the debate on the expression of motion in French by showing what happens not only in speech but also in co-speech gesture, and not only in adults but also in 5- and 10-year-old children. To highlight the specificities of French, we used a typologically different and less commonly studied language, Czech, for comparison. As the content of French and Czech verbal as well as gestural expression of motion has already been explored in previous studies, we focused on structure. Using data collected during narrations of short video clips displaying various motion events, we confirmed, deepened, and/or discovered the following characteristics of the development of the structure of verbal and gestural expression of motion in French.

Based on speech data, we confirm that French is a typical verb-framed language in that when speakers describe motion by indicating both path and manner – which is not often the case –, they tend to use two clauses rather than a single one, with one clause encoding path and the other one encoding manner. In fact, it is very rare in French to express path and manner jointly, regardless of the number of clauses produced.

These characteristics are already present in child speech at the age of 5 and remain unchanged into adulthood. This being said, the frequency of expression of path and manner jointly starts to increase after the age of 10. While adults still produce two clauses instead of one, they tend to insert a path-and-manner clause in their two-clause descriptions of motion more than children do.

Based on co-speech gesture data, we showed that, in French, gesturing about motion is not the same as speaking about motion. Speakers have a slight preference

for capturing path and manner by a single gesture. This is especially true at the age of 5. Older speakers increase the number of their gestures. These observations are not French-specific because they were also observed in Czech speakers whose language is typologically opposite to French.

When French speakers use more gestures to describe a motion, they sometimes conflate path and manner in one of the gestures, and sometimes not. However French adults choose conflation less frequently than French children as well as less frequently than Czech adults. This reveals some specificities of French adult gesturing about motion.

Finally, based on the observation of couples of co-occurring gesture strokes and speech segments, we discovered that the packaging of information about motion in gesture mostly corresponds to the structure of speech. This finding itself is not specific for a French population speaking a verb-framed language because the same result was obtained for a Czech population speaking a satellite-framed language. However, the resemblance between gesture and speech is smaller in French than in Czech. This is true for children aged 5 and for adults but not for the period in between. At the age of 10, French children differ from the younger ones and also from adults, and are similar to Czech same-aged children. In other words, the resemblance between gestural and verbal ways of packaging path and manner first increases between the age of 5 and 10 and then decreases back to its initial level between the age of 10 and adulthood. Further studies will have to disentangle the developmental issues associated with this debate.

To conclude, our decisions (1) to observe not only speech but also co-speech gesture, (2) to compare French with a typologically opposite and understudied language, Czech, (3) to include in our sample adults as well as 5- and 10-year-old children, and (4) to split the large question of packaging of path and manner into two sub-questions, helped us to gain deeper, more complex and more complete insight into the structure of expression of motion in French and have hopefully shown the interest and the potential of a psycholinguistic approach to purely linguistic topics.

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PART IV

# Formal and computational aspects of motion-based narrations



# A computational account of virtual travelers in the Montagovian generative lexicon

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This chapter deals with the automated formal analysis of a specific interpretation of fictive motion named the “virtual traveler”, involved for instance in the French equivalents of a sentence like *The path descends for two hours* where it is possible that no-one actually descends. Our analysis in computational semantics yields the intended logical formula in the framework of the Discourse Representation Theory. It relies on a framework, the Montagovian Generative Lexicon that integrates lexical semantics into compositional semantics.

**Keywords:** computational semantics, Discourse Representation Theory, lexical semantics, Montague semantics, type theory

## 1. Introduction

The theme of this chapter is the application of the semantic framework known as the Montagovian Generative Lexicon (that naturally uses categorial syntax) to the analysis of a historical French corpus of itineraries in the Pyrenees. Our research will focus on how type coercion can help us give a correct account of some cases of the so-called “virtual traveler”, often involved in the analysis of “fictive motion”, which is evidenced by sentences like (1) and (2).

(1) *The road runs along the coast for two hours.*

(2) *The path descended abruptly.*

These cases are peculiar in that an entity (which is considered immobile and which, in the context, defines a “path”) is the subject of a motion verb while the combination is interpreted as a generic statement about the nature of this path, without

any motion necessarily taking place. Phenomena like this fall into the category of “virtual motion” (Talmy 1983; Langacker 1999), also called “subjective motion”, or “abstract motion” (Langacker 1986), or even “non-actual motion” (Blomberg and Zlatev 2014). “Fictive motion” (Talmy 1996) is, in any case, the the most widely used term in the literature when people refer to this kind of descriptions. Various experiments and interpretations have been proposed to give an account of fictive motion, including the “virtual traveler” (see Cappelli’s chapter in this volume). Interpreting fictive motion by means of a virtual traveler seems to be the most appropriate for a first formalization regarding our corpus and the examples treated.

The present work is developed in the context of type-logical grammar and Montague semantics, taking advantage of the fact that this formal combination constructs logical formulas representing the meaning of sentences. This kind of formalization may be criticized as being too simplistic with respect to the level of analysis required to analyze natural language expressions, but it has important positive points as well: first, it gives a fully precise account of the syntax-semantics interface, and second, it gives a simple account of the interaction between lexical semantics and formal semantics in the tradition of Montague. The meaning of a sentence is represented by a set of logical formulas, each representing a different possible reading of the sentence. The rules of our logical system describe a finite, computable mapping from sentences to their meaning.

This work updates and significantly extends earlier development of these ideas (Moot et al. 2011a,b).

## 2. Lexical information and compositional semantics

Standard Montague semantics doesn’t include an account of lexical semantics, and is therefore ill-equipped to deal with selectional restrictions and meaning transfers, that is, contextually appropriate type coercions. In (3) for instance, despite its grammaticality, the object *a chair* does not fit as the subject of *barked*:

(3) # *A chair barked.*

To illustrate the intricate nature of such coercions, let’s consider the three following statements.

(4) *Barcelona is sprawling.*

(5) *Barcelona won the cup.*

(6) *Barcelona voted for independence.*

Individually, the examples above are syntactically and semantically correct. However, the two following combinations of these sentences produce copredications which are felicitous for the first (7) and infelicitous for the second (8).

(7) *Barcelona is sprawling and voted for independence.*

(8) *#Barcelona won the cup and voted for independence.*

*Barcelona* is a complex object, it is a town, with all the attributes of a town as we can see in Examples (4) to (6) (for example being a geographical region and a political entity). It can also be a football club, like in Example (5), but it can't be considered simultaneously as a sports team and a political entity like in Example (8). These problems are addressed by adding types to the different linguistic items, furthermore, this lead us to a *rich type system*.

Bassac et al. (2010) first developed the general formal framework, known as the Montagovian Generative Lexicon, that will be used in the paper. Since then, various classes of linguistic phenomena – including generalized quantifiers, plurals, mass nouns and deverbals (Moot and Retoré 2011; Mery et al. 2013, 2015; Real and Retoré 2014) – have been analyzed in this same setting.

We will develop here the extension of this framework to treat the particular phenomenon of the virtual traveler (9), that combines both quantification and some kind of meaning transfer.

(9) *The path descends for two hours.*

This example is rather complex from the point of view of lexical semantics, since generally immobile objects like paths, by definition, cannot move. We will first present the standard type-logical grammar account of meaning with a fairly simple example.

### 3. Standard compositional semantics

#### 3.1 The Lambek calculus

Our choice for using the Lambek calculus is motivated by the simplicity of the syntax-semantics interface, even though nothing in our treatment is dependent on type-logical grammar and the Lambek calculus, and a similar treatment to the one provided here would be possible in other grammar formalisms. For a more detailed introduction to the Lambek calculus and its relation to formal semantics we refer the reader to Moot and Retoré (2012).



Formulas of the Lambek calculus (Lambek 1958) are inductively defined from a set of atomic formulas  $np$  (noun phrase),  $n$  (common noun),  $s$  (sentence) and  $pp$  (prepositional phrase).<sup>1</sup> A formula in the Lambek calculus is:

- an atomic formula
- if  $A$  and  $B$  are formulas, then  $A/B$  (pronounced “ $A$  over  $B$ ”, it looks for a  $B$  formula to its right to produce an  $A$ ) and  $B \setminus A$  (pronounced “ $B$  under  $A$ ”, it looks for a  $B$  formula to its left to produce an  $A$ ) are formulas.<sup>2</sup>

Figure 1 shows the proof rules for the Lambek calculus.

$$\begin{array}{c}
 \frac{A/B : f^{U \rightarrow T} \quad B : x^U}{A : (fx)^T} /E \\
 \dots [B : x^U] \\
 \vdots \\
 \frac{A : t^T}{A/B : \lambda x^U t} /I
 \end{array}
 \qquad
 \begin{array}{c}
 \frac{B : x^U \quad B \setminus A : f^{U \rightarrow T}}{A : (fx)^T} \setminus E \\
 [B : x^U] \dots \\
 \vdots \\
 \frac{A : t^T}{B \setminus A : \lambda x^U t} \setminus I
 \end{array}$$

**Figure 1.** Proof rules and corresponding  $\lambda$ -term operations

The elimination rule for ‘/’, labeled ‘/E’ states that if we have a proof with conclusion  $A/B$  which is assigned term  $f$  (of type  $U \rightarrow T$ ) and a proof with conclusion  $B$  which is assigned term  $x$  (of type  $U$ ), then we can combine these two proofs to form a proof of  $A$  which is assigned  $\lambda$ -term  $(fx)$ .

The introduction rule, labeled ‘/I’, states that if we have a proof of  $A$  with  $\lambda$ -term  $t$  of some type  $T$ , which we have derived while using a hypothesis  $B$ , which is assigned a variable  $x$  of type  $U$  and which is the rightmost undischarged hypothesis of this proof, then without this  $B$ , we can derive  $A/B$  of type  $U \rightarrow T$  with term  $\lambda x.t$ .

The correspondence between natural deduction proofs and  $\lambda$ -terms is the well-known Curry-Howard correspondence (it is not an isomorphism for the Lambek calculus).

Consider the sentence given in (10).

(10) *Some statements speak about themselves.*

If we forget about the semantic content for the moment, the Lambek calculus proof for this sentence looks as follows:

1. The set of atomic formulas used is slightly more detailed than this, see Moot (2015) for details. However, for the current discussion, this set of atomic formulas will suffice.

2. We will not consider the product formulas  $A \bullet B$  in this paper.

$$\frac{\frac{\text{some}}{(s/(np\s))/n} \text{Lex} \frac{\text{statements}}{n} \text{Lex} \frac{\text{ speak\_about}}{(np\s)/np} \text{Lex} \frac{\text{ themselves}}{((np\s)/np)\(np\s)} \text{Lex}}{s/(np\s)} \quad \frac{\quad}{np\s}}{s}$$

To keep the proof readable, we have indicated the words in the lexicon above the formulas to which they correspond. In the example above, *speak about*, which for simplicity we treat as a single lexical entry, might be viewed as transitive verb: it selects an object *np* to its right, then a subject *np* to its left. The word *themselves* is more complicated: it is looking for a transitive verb to its right to produce an intransitive verb (as we will see later, this choice of formula helps get the semantics right). The noun *statements* is simply assigned the formula *n*. Finally, the quantifier *some* first selects a noun *n* to its right, then an intransitive verb *np\s* (this is correct for a quantifier in subject position but not elsewhere; we need a more complicated logic than the Lambek calculus for a sufficiently general theory of quantifiers, but introducing such a logic would take us too far afield).

**Table 1.** Lexicon entries for the example *Some statements speak about themselves*

word	<i>semantic type</i> $u^*$ <i>semantics:</i> $\lambda$ -term of type $u^*$ $x^v$ the variable or constant $x$ is of type $v$
some	$(e \rightarrow t) \rightarrow ((e \rightarrow t) \rightarrow t)$ $\lambda P^{e \rightarrow t} \lambda Q^{e \rightarrow t} (\exists^{(e \rightarrow t) \rightarrow t} (\lambda x^e (\wedge^{t \rightarrow (t \rightarrow t)} (P x)(Q x))))$
statements	$e \rightarrow t$ $\lambda x^e (\text{statement}^{e \rightarrow t} x)$
speak_about	$e \rightarrow (e \rightarrow t)$ $\lambda y^e \lambda x^e ((\text{speak\_about}^{e \rightarrow (e \rightarrow t)} x) y)$
themselves	$(e \rightarrow (e \rightarrow t)) \rightarrow (e \rightarrow t)$ $\lambda P^{e \rightarrow (e \rightarrow t)} \lambda x^e ((P x) x)$

### 3.2 A semantic lexicon

To each syntactic formula  $u$  in the lexicon corresponds a semantic type  $u^*$ . This type constrains the semantics: each lexical entry must get a  $\lambda$ -term of the correct type. The mapping ‘ $*$ ’ from syntactic to semantic types is defined as follows:

$$\begin{aligned} np^* &= e \\ n^* &= e \rightarrow t \\ s^* &= t \\ (A/B)^* &= B^* \rightarrow A^* \\ (B \setminus A)^* &= B^* \rightarrow A^* \end{aligned}$$

For the moment, we use the simple, extensional Montagovian fragment with type  $e$  for entity and  $t$  for truth value; terms of type  $t$  correspond to formulas (Moot and Retoré 2012). We translate noun phrases to entities, nouns to functions from entities to truth values (this is the characteristic function of a set), and sentences to truth values. For the recursive cases we translate both  $A/B$  and  $B \wedge A$  as functions from the translation of  $B$  to the translation of  $A$ .

Table 1 sets out the lexicon associated to every linguistic item composing Example (10). Let's start with the simplest word entry needed to assign a meaning to this utterance. The word *statements*, of syntactic type  $n$  gets the semantic type  $(e \rightarrow t)$ , in other words, a function from an entity  $e$  to truth values  $t$  that indicates true or false for each entity in the domain (this is the characteristic function of a set).<sup>3</sup> The corresponding  $\lambda$ -term uses the atomic term 'statement', which is a function taking an individual as an argument and indicating whether or not it qualifies as a statement. This seems like cheating: we are defining the meaning of the word *statements* by assuming the existence of a function which decides which entities are statements, thereby shifting the problem of what really qualifies as a statement somewhere else, but we need at least *some* atomic terms and it seems reasonable to assume that using a word like *statements* presupposes a way of determining what qualifies as a statement (even though, arguably, this need not be a strict yes/no question as is generally assumed in formal semantics).

To simplify a bit, we use *speak\_about* as a single lexical entry; its syntactic type is  $(np \setminus s) / np$  and therefore its semantic type is  $(e \rightarrow (e \rightarrow t))$ , that is a relation between two entities  $x^e$  and  $y^e$ .

Now, the quantifier *some* gets the type  $(e \rightarrow t) \rightarrow ((e \rightarrow t) \rightarrow t)$ . If we look again at the left side of the central arrow, it means that this item needs a property  $(e \rightarrow t)$ , such as *statement*, to output a set of properties  $(e \rightarrow t) \rightarrow t$ . Another way of looking at this function is that it is a relation between two sets (or rather, their characteristic functions), as is standard in the theory of generalized quantifiers (Barwise and Cooper 1981). Following Church (1940), we use term constants to represent logical connectives. The constant ' $\wedge$ ' of type  $t \rightarrow (t \rightarrow t)$  represents the logical conjunction ' $\wedge$ ' (we use the same symbol). Given that terms of type  $t$  correspond to formulas, the constant ' $\wedge$ ' therefore takes two formulas to produce a new formula, just like a binary logical connective. The constant ' $\exists$ ' of type  $(e \rightarrow t) \rightarrow t$  similarly represents the existential quantifier ' $\exists$ '; we interpret the term  $\exists(\lambda x.P)$  as the formula  $\exists x.F$ , where  $F$  is the formula corresponding to  $P$  (since  $P$  is a term of type  $t$ , it corresponds to a formula, note that free occurrences of  $x$  in  $P$  and  $F$  are bound in the full term and in the formula). The full term assigned to *some*, which in more familiar notation would look like  $\lambda P \lambda Q \exists x.(Px) \wedge (Qx)$ , takes

3. To keep the example simple, we won't give a semantic treatment of the plural here.

two properties  $P$  and  $Q$ , then returns the formula indicating that there exists an  $x$  satisfying both  $P$  and  $Q$ .

Finally, *themselves*, takes a binary relation  $P$  (just like *speak\_about* of type  $e \rightarrow (e \rightarrow t)$ ), and an individual  $x$  and it outputs a truth value (the final  $t$ ) which is the value of the binary relation  $P$  between  $x$  and itself (that is, that binary relation  $P$  is given the same variable  $x$  as both its arguments, much like mathematically defining the unary squaring function using multiplication).

### 3.3 Semantic analysis

Based on the syntactic analysis given above, the  $\lambda$ -term assigned to the proof is the following:

$$((\text{some statements})(\text{themselves speak\_about})) \text{ of type } t$$

Then one gets the following  $\lambda$ -term after substitution of the lexical terms and normalization:

$$(\exists^{(e \rightarrow t) \rightarrow t} (\lambda x^e (\wedge (\text{statement}^{e \rightarrow t} x) ((\text{speak\_about}^{e \rightarrow (e \rightarrow t)} x) x))))$$

This term represents the more familiar formula:

$$\exists x : e (\text{statement}(x) \wedge \text{speak\_about}(x, x))$$

In other words, there exists at least one entity  $x$  ( $\exists x : e$ ) which is a statement ( $\text{statement}(x)$ ) and speaks about itself ( $\text{speak\_about}(x, x)$ ), this is a (simplistic) semantic representation of the analyzed sentence.

### 3.4 Overall architecture

An interesting feature of the standard view above is the nice combination of two logical systems. The “observable” logic consists of the (partial) formulas of first or higher order representing the meaning of linguistic expressions, such as  $(\exists^{(e \rightarrow t) \rightarrow t} (\lambda x^e (\wedge (\text{statement}^{e \rightarrow t} x) ((\text{speak\_about}^{e \rightarrow (e \rightarrow t)} x) x))))$  (for the sentence *Some statements speak about themselves*) and  $\lambda x^e . \text{loves}(x, \text{Elisabeth})$  (for the verb phrase *loves Elisabeth*). The less visible logic consists of the simply typed  $\lambda$ -terms (proofs of propositional logic) with propositional variables  $e$  and  $t$ : this logic specifies how we need to compose the meanings of the partial formulas of the observable logic e.g. the ones associated to words in the lexicon.<sup>4</sup> To compute the meaning of phrases, we combine these two logics, by substituting the logical meaning assigned

4. In the LFG literature, the term *glue logic* is used for this second logic see e.g. Dalrymple et al. (1995).

in the lexicon into the terms derived for the proofs by means of the Curry-Howard terms and then reducing the resulting term to a normal form term representing the meaning of the input phrase.

This architecture is sound and elegant, but it has some limitations. As discussed above, we would like to reject examples like:

(11) *#The chair barked.*

According to the dictionary definition, *barks* requires a subject of type *dog*, at least an *animal*, which suggests we need to consider many different types of entities, even though it is not a priori clear how many types we need.

If we want keep the number of semantic operations limited, we need some way of refactoring<sup>5</sup> similar operations, mainly at the level of types. One powerful way of refactoring is by using abstraction over *type* variables in addition to abstraction over term variables. To do this formally, we need another level of abstraction, this time over types. The second order  $\lambda$ -calculus, also known as Girard's System F, allows such type abstraction. One of our main claims, following Bassac et al. (2010), is that the second order abstraction of System F, together with lexically specified optional type coercions, allows us to give a simple account of lexical semantics.

## 4. The Montagovian generative lexicon

### 4.1 Principles of the lexicon

Our lexicon is organized in order to provide the following advantages.

- We remain within the realm of Montagovian compositional semantics (for compositionality), which makes it compatible with any syntax/semantics interface based on this principle, like categorial grammar.
- We introduce a system of optional modifiers whose use is triggered by type mismatches:  $f^{A \rightarrow B} u^T$  with  $T \neq A$ . When types prevent us from composing meanings, we use optional terms that can fix the mismatch.
- Both function and argument may provide lexical information to the compound. As usual, we can directly apply the function to its argument(s), but

---

5. The term “refactoring” comes from software engineering. When we create a new procedure by using copy-paste followed by some editing, we make our program harder for humans to understand and harder to change (since we need to decide for each copy whether and how to change it). Refactoring restructures the code and uses programming language features like polymorphism to generalize and simplify existing code. As we will see, our motivation for applying refactoring to semantics is essentially the same.

this standard picture is extended by allowing both functor and argument to specify allowed coercions and meaning transfers.

- Our formal semantics can be integrated within existing discourse models such as  $\lambda$ -DRT, something we will exploit later in this chapter.

#### 4.1.1 Main or standard terms

In the present system, a standard  $\lambda$ -term is attached to the main meaning for different reasons. First, we maintain the principle of compositionality, which allows us to keep the lexicon to a reasonable size: we do not have to specify each entry for each possible sort, for example. Moreover, this effect is not limited to the extension from one kind to many-sorted individuals, the refinement of the typing system is far more expressive than what we have used in our examples so far, and we will exploit some of this extra power in the next sections.

#### 4.1.2 Optional morphisms of the terms

Every morphism is a specific meaning of the word, they are lexically specified as functions associated with the corresponding lexical entry. Such a function takes exactly one argument as input (the main type for this entry) and returns exactly one argument as output (matching the coerced type expected in the context). The first morphism is the function *Id* for *identity*, the other morphisms characterize the different possible meanings of the entry. These optional morphisms are type coercions and are used to repair type mismatches. They are all associated with a constraint, either  $\emptyset$  or *rigid*, depending on whether or not they allow co-predication.

In other words, every lexeme is associated with one main  $\lambda$ -term (written first, with the expected semantic type) and a finite number, possibly zero, of optional  $\lambda$ -terms (with functional types and written after the first one):

$$\left( \text{Barcelona}^T \mid \frac{\lambda x^T . x^T}{\emptyset}, \frac{\lambda x^T . (f_L^{T \rightarrow L} x)}{\emptyset}, \frac{\lambda x^T . (f_P^{T \rightarrow P} x)}{\emptyset}, \frac{\lambda x^T . (f_S^{T \rightarrow S} x)}{\text{rigid}} \right)$$

For the entry *Barcelona*, the  $\lambda$ -term is  $\text{Barcelona}^T$ , where  $T$  is the type for for *town*. Its first morphism is the identity as explained before:  $\frac{\lambda x^T . x^T}{\emptyset}$  for an  $x$  of type  $T$ , we get the same  $x$  of the same type, and the constraint allows a flexible use of this morphism. The second and third optional modifiers,  $\frac{\lambda x^T . (f_L^{T \rightarrow L} x)}{\emptyset}$  and  $\frac{\lambda x^T . (f_P^{T \rightarrow P} x)}{\emptyset}$  return respectively a *location* (that we called *geographic region* type  $L$ ) and a *political entity* (type  $P$ ) for the *town* (type  $T$ ). It is possible to combine them as we saw with the *Barcelona* example, the constraint is  $\emptyset$  for both. The last morphism given

in this example is *rigid* because it cannot be combined with other meanings, it is the morphism for sports team:  $\frac{\lambda x^T. (f_s^{T \rightarrow S} x)}{\text{rigid}}$ .

We will now show in detail the advantages of discriminating flexible from rigid constraints on morphisms.

#### 4.2 Girard's system F of type polymorphism

We present a brief introduction to system F in this section, noting especially where it differs from the simply typed system used by Montague (1974).

**Definition 1 (Types)** *Types of system F are inductively defined as follows.*

- Constants types  $e_i$  and  $t$ , as well as any type variable  $\alpha, \beta, \dots$ , are types.
- Whenever  $T_1$  and  $T_2$  are types,  $T_1 \rightarrow T_2$  is also a type.
- Whenever  $T$  is a type and  $\alpha$  a type variable which may but need not occur in  $T$ ,  $\Pi\alpha. T$  is a type.

The definition above extends Montague's two types  $e$  and  $t$  (we don't use the type  $s$  in this article, since we are only interested in the extensional fragment of Montague semantics) by allowing many different types  $e_p$  for persons, eventualities, etc. We will usually choose a mnemonic name for such variables instead of using  $e_1, e_2, \dots$

The second difference is an operation of universal quantification over types. Universal quantification over formulas/types is already used for the treatment of coordination in categorial grammar (Moortgat 1997).<sup>6</sup> In what follows, we will extend the standard treatment of using second-order quantification for coordination in order to account for different facts of lexical coercion and the virtual traveler.

**Definition 2** *The terms of system F are inductively defined as follows.*

- A variable of type  $T$  i.e.  $x : T$  or  $x^T$  is a term.  
Countably many variables of each type.
- A constant of type  $T$  i.e.  $c : T$  or  $c^T$  is a term.
- $(f t)$  is a term of type  $U$  whenever  $t : T$  and  $f : T \rightarrow U$ .
- $\lambda x^T. t$  is a term of type  $T \rightarrow U$  whenever  $x : T$ , and  $t : U$ .
- $t\{U\}$  is a term of type  $T[\alpha := U]$  whenever  $t : \Pi\alpha. T$ , and  $U$  is a type.
- $\Lambda\alpha. t$  is a term of type  $\Pi\alpha. T$  whenever  $\alpha$  is a type variable, and  $t : T$  without any free occurrence of the type variable  $\alpha$  in the free variables or constants of  $t$ .

The definition of terms above extends the simply typed system by adding application of a term to a *type*, provided this term is of a universally quantified type (this corresponds to the instantiation of this quantified type), and by adding abstraction

6. Emms (1993) provides several other possible applications.

over a type. We need the restriction of  $\alpha$  not occurring in the type of a free variable when we abstract over  $\alpha$ , since otherwise we would get into trouble computing the type of the free variable  $x$  in  $\Lambda\alpha.x^\alpha$ . On the other hand, terms like  $\Lambda\alpha\lambda x^\alpha.x$  (polymorphic identity) or  $c^{\Pi\alpha.\alpha}$  (a constant of the empty type) make sense and are well-formed terms.

**Definition 3 (Reduction)** *The reduction relation is defined as follows.*

- $(\Lambda\alpha.t)\{U\}$  reduces to  $t[\alpha := U]$  (remember that  $\alpha$  and  $U$  are types).
- $(\lambda x.t)u$  reduces to  $t[x := u]$  (usual reduction).

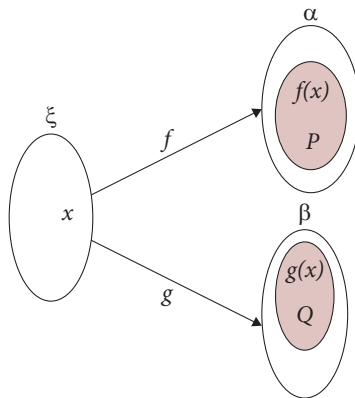
A many-sorted first (or higher) order language (constants, predicates, possibly functions), can be viewed as a set  $L$  of properly typed constants of  $\lambda$ -calculus: if loves applies to a human being and any entity, it is a constant of type  $human \rightarrow e \rightarrow t$ . Every normal term of type  $t$  with free variables  $L$  and the logical connectives and quantifiers of first (or higher) order logic corresponds to a formula of this first (or higher) order logic (Moot and Retoré 2012).

### 4.3 Co-predication

#### 4.3.1 Polymorphic conjunction

Given types  $\alpha$  and  $\beta$ , and two predicates  $P^{\alpha \rightarrow t}$ ,  $Q^{\beta \rightarrow t}$  over entities of respective kinds  $\alpha$ ,  $\beta$ , for any  $\xi$  with two morphisms from  $\xi$  to  $\alpha$ , and from  $\xi$  to  $\beta$ , we can coordinate the properties  $P$ ,  $Q$  of (the two images of) an entity of type  $\xi$ :

$$AND2 = \Lambda\alpha.\Lambda\beta.\lambda P^{\alpha \rightarrow t}.\lambda Q^{\beta \rightarrow t}.\Lambda\xi.\lambda x^\xi.\lambda f^{\xi \rightarrow \alpha}.\lambda g^{\xi \rightarrow \beta}.\langle \wedge(P(fx))(Q(gx)) \rangle$$



**Figure 2.** Polymorphic conjunction  
 $(\wedge (P (f x))(Q (g x)))$  with  $x : \xi, f : \xi \rightarrow \alpha, g : \xi \rightarrow \beta$ .



The definition of the polymorphic conjunction is illustrated by Figure 2. In (7), repeated below as (12), the variable  $x$  of type  $\gamma$  may actually be instantiated by *Barcelona* of type *town*.

(12) *Barcelona is sprawling and voted for independence.*

In this example,  $\alpha$  and  $\beta$  are instantiated by the types of *geographical\_regions* and *populations* respectively, and the two predicates  $P^{\alpha \rightarrow t}$  and  $Q^{\beta \rightarrow t}$  are instantiated by *sprawling* and *cosmopolitan* over entities of respective kinds  $\alpha$ ,  $\beta$ . Here,  $\xi$  may be the type  $T$  of *towns*, with two morphisms from  $\xi$  to  $\alpha$  (transforming *town* to *geographical region*), and from  $\xi$  to  $\beta$  (transforming *town* to *population*). Taken together, this allows us to coordinate the properties *sprawling* and *cosmopolitan* of (the two images of) an entity of type *town*.

#### 4.3.2 Rigid vs. flexible use of optional morphisms

Let's consider the pseudo-term  $P^{V \rightarrow W} t^U$ .<sup>7</sup> The application of  $P^{V \rightarrow W}$  to  $t^U$  is ill-typed because  $U \neq V$ , hence this is not a well-formed typed  $\lambda$ -term. When  $f$  is an optional term associated with one of the subterms (in the case above, either of  $P$  or of  $t$ , both of which are typable as indicated, and hence terms), we can use this optional term to transform the ill-typed pseudo-term above into the well-typed term below as follows:

$$P^{V \rightarrow W} (f^{U \rightarrow V} t^U)$$

In the term above,  $f$  applies once to the argument  $t$ . This means that if  $(P (f t))$  is a beta redex, that is,  $P$  is of the form  $\lambda x.P'$ , then beta reduction will replace all occurrences of  $x$  uniformly by  $(f t)$ . As an example, conjoining two predicates  $P$  and  $Q$ , yields  $\lambda x^V.(P^{V \rightarrow W} x) \wedge (Q^{V \rightarrow W} x)$ , we can apply the same optional transformation  $f$  to  $t$ .

$$(\lambda x^V.(P^{V \rightarrow W} x) \wedge (Q^{V \rightarrow W} x))(f^{U \rightarrow V} t^U)$$

Here, after substitution,  $(f t)$  is substituted for both occurrences of  $x$ . Second order typing is not needed, the type  $V$  of the argument is known and it is always the same for every occurrence of  $x$ . This procedure for transforming pseudo-terms into terms is called a *rigid* type coercion.

Let us look at the schematic pseudo-term, assuming  $P$ ,  $Q$  and  $t$  are correctly typed terms:

7. Remember that according to the definition of terms in Section 4.2, Definition 2 all terms are well-typed. We use the word “pseudo-term” for a term which need not respect the type restrictions on terms.

$$(\lambda x^2. (\dots P^{A \rightarrow X} x^2) \dots (Q^{B \rightarrow Y} x^2) \dots) t^U$$

The problem raised by this pseudo-term is to assign a type to  $x$ . Thus, for  $P$   $x$  to be correctly typed, we need  $x : A$ , whereas for  $Q$   $x$  to be correctly typed, we need  $x : B$ . This is only the case when  $A = B = ?$  (in standard Montague grammar all are assigned  $e$ ).

For our *flexible* type coercion, we use the following operation:<sup>8</sup>

$$(\Lambda \xi. \lambda f^{\xi \rightarrow A}. \lambda g^{\xi \rightarrow B} \lambda x^{\xi}. (\dots (P^{A \rightarrow X}(f x^{\xi})) \dots (Q^{B \rightarrow Y}(g x^{\xi})) \dots)) \{U\} f^{U \rightarrow A} g^{U \rightarrow B} t^U$$

Reducing the redexes of the solution above produces:

$$\begin{aligned} & (\Lambda \xi. \lambda f^{\xi \rightarrow A}. \lambda g^{\xi \rightarrow B} \lambda x^{\xi}. (\dots (P^{A \rightarrow X}(f x^{\xi})) \dots (Q^{B \rightarrow Y}(g x^{\xi})) \dots)) \{U\} f^{U \rightarrow A} g^{U \rightarrow B} t^U \rightarrow \\ & (\lambda f^{U \rightarrow A}. \lambda g^{U \rightarrow B} \lambda x^U. (\dots (P^{A \rightarrow X}(f x^U)) \dots (Q^{B \rightarrow Y}(g x^U)) \dots)) f^{U \rightarrow A} g^{U \rightarrow B} t^U \rightarrow \\ & \lambda g^{U \rightarrow B} \lambda x^U. (\dots (P^{A \rightarrow X}(f x^U)) \dots (Q^{B \rightarrow Y}(g x^U)) \dots) g^{U \rightarrow B} t^U \rightarrow \\ & \lambda x^U. (\dots (P^{A \rightarrow X}(f x^U)) \dots (Q^{B \rightarrow Y}(g x^U)) \dots) t^U \rightarrow \\ & (\dots (P^{A \rightarrow X}(f x^U)) \dots (Q^{B \rightarrow Y}(g x^U)) \dots) \end{aligned}$$

Here, different occurrences of  $x$  can use different types  $A, B, \dots$  and different optional terms  $f, g, \dots$  to transform a pseudo-term into a term. Second order typing is used 1) to anticipate the yet unknown type of the argument and 2) for refactoring the different optional functions. The types  $A, B, \dots$  and the associated morphisms  $f, g, \dots$  are inferred from the original formula  $(\lambda x^V. (P^{V \rightarrow W} x)) t^U$ .

#### 4.4 Standard behaviour

In the simplest case, everything works as it would in the standard Montague framework, only with more refined basic types. In the Example (13), instead of assigning *stone* the standard Montague type  $e \rightarrow t$ , we use a type  $\varphi$  for physical objects. This means that stones are physical objects and can therefore serve as arguments for predicates requiring physical objects. This includes the object argument of verbs such as *kick* and *throw* in their standard meaning as well as adjectives such as *small* and *heavy*, which default to predicating over physical objects (meaning *small in size* and *heavy in weight* respectively and in contrast to *small problem*, where *small* means something like *of little consequence* and *heavy traffic*, where *heavy* means something like *difficult to move through*).

8. The flexible coercion principle is more general than the given example and it encompasses both  $e$  (Barcelona, see (12)) and  $e \rightarrow t$  (tuna, see (14)). In general, flexible coercion operates on types of the form  $\vec{a} \rightarrow e$  and  $\vec{a} \rightarrow t$  (types with any number of arguments producing result  $e$  or  $t$ ). Those two different cases unify when individual concepts (properties that are hold of a unique entity) are used for proper nouns.

The standard formal semantics treatment of a subjective adjective adj is  $\lambda P^{e \rightarrow t} \lambda x^e. ((\text{adj}; (e \rightarrow t) \rightarrow (e \rightarrow t) P) x) \wedge (P x)$ . Specializing this for physical objects  $\phi$  and the adjective *small* produces the expression in (13) for *small stone*.

(13) small stone

$$\overbrace{(\lambda P^{\phi \rightarrow t} \lambda x^\phi. ((\text{small}^{\phi \rightarrow t \rightarrow (\phi \rightarrow t)} P)x) \wedge Px)}^{\text{small}} \quad \overbrace{t^{\phi \rightarrow t}}^{\text{stone}}$$

$$\lambda x^\phi. (((\text{small } t)x) \wedge (tx))^{\phi \rightarrow t}$$

The reduced term in (13) indicates that a small stone is the set of physical objects that, first of all, are stones (see the second conjunct  $t x$  and the definition of subsectivity) and furthermore are small within the class of stones. Processing adjectives this way, we can correctly handle objects which are, say, small menhirs while at the same time being large stones.

#### 4.5 Qualia exploitation

So far, we have not moved beyond the standard Montague grammar of adjectives. A somewhat more complicated example shows where coercions are required. For instance, a tuna can refer both to an animal<sup>9</sup> and to food obtained from this animal. When we speak of *delicious tuna*, we generally mean the *food* obtained from the fish is tasty. Similarly, *raw tuna* refers to the way this food has been prepared. Given a coercion  $f_a$ , specifying lexically that some animal words in the lexicon can be transformed into food, we can derive *delicious, raw tuna* as in (14).

(14) delicious, raw tuna

$$\overbrace{(\lambda P^{f \rightarrow t} \lambda x^f. ((\text{delicious}^{f \rightarrow t} x) \wedge ((\text{raw}^{f \rightarrow t} x) \wedge (tx))))}^{\text{delicious, raw}} \quad \overbrace{t^{a \rightarrow t}}^{\text{tuna}}$$

$$(\lambda P^{f \rightarrow t} \lambda x^f. ((\text{delicious}^{f \rightarrow t} x) \wedge ((\text{raw}^{f \rightarrow t} x) \wedge (tx)))) (f_a^{(a \rightarrow t) \rightarrow (f \rightarrow t)} t^{a \rightarrow t})$$

$$\lambda x^f. ((\text{delicious } x) \wedge ((\text{raw } x) \wedge (tx)))$$

The top line in (14) is ill-typed since  $a \neq f$  (that is, animals and food are different types). However, the word *tuna* has a lexical transformation  $f_a$  transforming it into food. Applying this coercion produces the middle line, which is a well-typed term that can be reduced to the last line in (14). The latter states that the meaning of *delicious, raw tuna* is a predicate over food which is true if the food is delicious, raw and prepared from a tuna as an animal.

If we assume that *lightning fast* is an adjective applying to animals, using the standard subjective adjective lexical entry (like the one we used for *small* above,

9. We suppose for this example that the type system does not need to distinguish between different types of animals, such as fish, birds and mammals.

since a lightning fast sloth is probably not a lightning fast animal) produces the formula in (15).

$$(15) \text{ lightning fast} \\ \lambda P^{a \rightarrow t} \lambda x^a. ((\text{lightning\_fast}^{(a \rightarrow t) \rightarrow (a \rightarrow t)} P)x) \wedge (Px)$$

Given the preceding lexical entries, we correctly predict that sentence (16) is odd.

$$(16) ?? \text{The tuna we had yesterday was lightning fast and delicious.}$$

This follows automatically, since the coercion  $f_a$  from *animals* to *food* can only apply directly to tuna and not to any other term.

#### 4.6 Facets: Correct co-predication

Going back to our Barcelona example, we have seen that, in the lexicon, *Barcelona* is assigned the standard lexical term  $b^T$  with optional transformations  $f_l^{T \rightarrow L}$  (from *town* to *location*) and  $f_p^{T \rightarrow P}$  (from *town* to *population*).

Let us look at a correct copredication, such as that in (17), where the predicate *sprawling* applies to locations and *cosmopolitan* applies to populations.

$$(17) \text{Barcelona is sprawling and cosmopolitan.}$$

If  $T = P = L = e$  (as in Montague), this example has the following simple analysis:

$$(\lambda x^e ((\wedge^{t \rightarrow (t \rightarrow t)} (\text{sprawling } x)) (\text{cosmopolitan } x))) b$$

In our more detailed treatment with coercion, we conjoin the predicates using **AND2**:

$$\text{AND2} = \Lambda \alpha \Lambda \beta \lambda P^{\alpha \rightarrow t} \lambda Q^{\beta \rightarrow t} \Lambda \xi \lambda x^{\xi} \lambda f^{\xi \rightarrow \alpha} \lambda g^{\xi \rightarrow \beta}. (\wedge (P(fx))(Q(gx)))$$

This is flexible coercion, where  $f$  and  $g$  convert  $x$  to *different* types (if we use the same coercion, we end up with a result equivalent to rigid coercion).

**AND2** applied to  $L$  and  $P$  and to *sprawling* $^{L \rightarrow t}$  and *cosmopolitan* $^{P \rightarrow t}$  yields:

$$\Lambda \xi \lambda x^{\xi} \lambda f^{\xi \rightarrow \alpha} \lambda g^{\xi \rightarrow \beta}. (\wedge (\text{sprawling}^{L \rightarrow t}(fx)) (\text{cosmopolitan}^{P \rightarrow t}(gx)))$$

We now wish to apply this to the type  $T$  and to the transformations provided by the lexicon. Because there is a type clash with *sprawling* $^{L \rightarrow t}$ , we use the transformation  $f_l$ . For  $P$ , we resort to the transformation  $f_p$ .

$$(\wedge^{t \rightarrow (t \rightarrow t)} (\text{sprawling}(f_l b^T)^t) (\text{cosmopolitan}(f_p b^T)^t))^t$$

By contrast, we predict the sentence (18) to be ill-formed.

(18) # *Barcelona voted for independence and defeated Real Sociedad.*

When we consider a town at the same time as a political entity and as its football team, the copredication becomes impossible because the transformation  $f_f^{T \rightarrow F}$  of a town into a football club is rigid and therefore incompatible with any other transformation, even with the identity.

## 4.7 Applications

The formal system introduced by Bassac et al. (2010) and described in this section has been applied to several linguistic phenomena, including plurals, mass and count nouns, deverbals (Moot and Retoré 2011; Mery et al. 2013, 2015; Real and Retoré 2014). In what follows, we will show how the formalism introduced can be applied to account for fictive motion.

## 5. Fictive motion: Data, question and outline

### 5.1 A case study and a field for semantic experiments

The Itipy corpus is a French-language corpus of travelogues written between the 17th and the 20th centuries (most text data come from the 19th century). The corpus consists of 576,334 words of stories of travel through the Pyrenees. Parts of the corpus have been annotated with part-of-speech tags, named-entity recognition tags and type-logical formulas (Moot 2012).<sup>10</sup> Our goal is, given some text, to reconstruct the itinerary followed by the traveler.<sup>11</sup> More concretely, we want to transform the text into some semantic representation which allows us to infer the itinerary. Consider, for instance, a sentence such as (19).

(19) *Jusqu'à Langon, nous avons longé la Garonne, traversant un véritable jardin rempli de vignes et d'arbres fruitiers.*

‘Until Langon, we went along the Garonne river, making our way through what seemed like a garden filled with vines and fruit trees’

Intuitively, the semantic representation of this sentence should indicate that the author (and his companions) followed a *path* staying relatively close to a river called la Garonne until they arrive in a city called Langon. The source of the path

10. <https://richardmoot.github.io/Itipy/>

11. See also Gaio and Moncla's chapter in this volume for named entity recognition and itinerary reconstruction.

needs to be determined from the context (we can infer from the preceding text that the depart was from Bordeaux). Additional geographic knowledge would allow us to conclude that Langon is fully on the south bank of the Garonne.

## 5.2 A particular phenomenon: “fictive motion”

*For though it be lawful to say, for example, in common speech, the way goeth, or leadeth hither, or thither; the proverb says this or that (whereas ways cannot go, nor proverbs speak); yet in reckoning, and seeking of truth, such speeches are not to be admitted.* Hobbes, *Leviathan* (1651), Chapter V, Of Reason and Science.

Many of the authors of our corpus don't follow the advice of Hobbes above. In the cognitive linguistic literature, the phenomenon illustrated in (20) to (23) has been described through a variety of terms (see Introduction), “fictive motion” (Talmy 1996) being probably the most widespread.

- (20) *The path descends abruptly.*
- (21) *The road runs along the coast for two hours.*
- (22) *The fence zigzags from the plateau to the valley.*
- (23) *The highway crawls through the city.*

As we can see, fictive motion does not entail that anyone actually followed the path denoted by the sentences. The question which will occupy us for the rest of this chapter is how best to model fictive motion using the formal tools introduced before.

Examples (24) to (29), which are taken from our corpus, show some further particularities of fictive motion.

- (24) *Nous coupons ici un sentier qui vient du port de Barroude (...)*  
'Here, we cross a path that comes from the port of Barroude (...)'
- (25) *La route suit le gave qui vient de Gavarnie.*  
'The road follows the mountain stream coming from Gavarnie'
- (26) *Plus loin, de nobles hêtres montent sur le versant (...)*  
'Further away, noble beeches climb the slope (...)'
- (27) (...) *cette route qui monte sans cesse pendant deux lieues*  
'(...) this road which climbs incessantly for two miles'

- (28) *Le chemin pavé de calcaire et de pierres luisantes (...) serpente à travers fourrés de buis et de noisetiers*  
 ‘The road paved with limestone and shining stones (...) winds through thickets of boxwood and hazelnut trees’
- (29) *Puis, cinq minutes nous conduisent à un petit pont (...) qui nous porte sur la rive droite.*  
 ‘Afterwards, five minutes take us to a small bridge (...) which carries us to the right bank’

In (24), it is clear – from the meaning of *couper* ‘to cut/cross’<sup>12</sup> – that the authors do *not* take the path described. In (25) the path is indicated as following a river, while being unclear (outside of the larger context of the narrative) about whether or not the authors take this path. In (26), there is no real physical path specified and we interpret the sentence as the author’s gaze following a path along the beeches up the slope, whereas in (27) there is adverbial modification: *sans cesse* ‘incessantly’ and *pendant deux lieues* ‘for two miles.’<sup>13</sup> Though the class of licensed adverbs is semantically restricted, it is possible to have temporal adverbs such as *the road goes along the coast for two hours* and some manner adverbs such as *the path descends abruptly/slowly* which do not commit us to inferring that the author actually took the road.<sup>14</sup> All of this suggests that we can interpret a static object as the (abstract) *process* of traveling along it.

Taking the “virtual traveler” approach, (28) can be considered to both refer to the physical aspect of the path (the stones from which it is built) and to the itinerary which corresponds to the traversal of this physical path (exactly like the flexible coercion discussed in Section 4.2).

### 5.3 Types and functions

For our formal analysis, we use a flat ontology with the standard eventuality arguments. To keep the discussion simple, we do not subdivide eventualities into states, events, etc. with different formal properties.

12. The verb *couper* is closest in meaning to ‘cut’. However, when used with a road or a path as its grammatical object, it cannot mean ‘cut a path (with a machete)’ but only ‘cross a path’.

13. Regarding verbs, note that manner of motion verbs such as *serpenter/wind* (28), *ramper/crawl* or *courir/run* are also used in this kind of descriptions in both French and English.

14. This is in part because of the imperfective aspect of the present tense: with the verb in a perfect tense (perfective aspect) e.g. *the path descended slowly* the sentence does have a strong implication that someone followed the path. Although, it might entail that the path no longer exists or no longer descends slowly, similar to a past tense sentence like *Route 66 ran from Chicago to Los Angeles*.

In our type hierarchy, we have two specific types of spatial arguments *regions* and *paths*. We are aware of the limitations imposed by “regional” approaches of space (notion of *region*) and the need to define more clearly the notion of *path* (see Aurnague and Vieu 2013). However, the tools we use here are sufficient for an initial formalization since we focus on the general mechanisms behind the composition of semantic types, while remaining largely agnostic about the precise formal properties of regions and paths.

A function *path\_of* transforms events to paths (some lexical entries such as *road* may specify a transformation to paths as well). Two functions *source* and *destination* convert a path *p* to its source region and its destination or goal region.<sup>15</sup> We also assume a global spatial variable *here*, which denotes the position and orientation of the spatial reference point (which does not necessarily correspond to the position of the narrator; in this sense it is closer to a spatial equivalent of the Reichenbachian “reference time” than it is to the constant “now”). Both position and orientation are necessary to understand the discourse given in sentences (30) to (32).

(30) *My new apartment is awesome.*

(31) *The entrance hall is spacious.*

(32) *To the left, there is the living room.*

In this discourse, we can make sense of the expression *to the left* only because we make a kind of *virtual visit* with the complete orientation of the virtual visitor, including up/down, forward/backward and left/right, all well-defined (see e.g. Tversky 1996).

The distinction between regions and paths is rather standard (Jackendoff 1983). It is motivated by selectional restrictions on verbs: some verbs, such as *stay + PP* are only grammatical when the PP is a prepositional phrase denoting a region argument, whereas other verbs, such as *pass + PP* can only occur with a number of PPs, all of which denote a path. This distinction is muddled slightly by the possibility to coerce a region *r* into a path. As is well known, some prepositions, such as *vers* ‘towards’, can – at least in their spatial uses – only denote paths (“unbounded paths”).

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15. We are aware that there are many ways to refer to places in the *middle* of the paths as well. However, we assume that this is done by a relation *middle(p, x)*, where *p* is a path and *r* a region, rather than by functions. Note that *source*, *middle* and *destination* give us a way of encoding the difference between initial, medial and final verbs in the terminology of Asher and Sablayrolles (1995).



For our semantic analysis, we interpret all motion verbs as being relations between one or more entities and a *path*. This argument can be left implicit (for example when we say *John ran*). The verbs lexically specify which of their arguments follow this path (subject, object or both, see Nam 1995).

All motion verbs are analyzed with a three argument predicate *travel* ( $e, x, p$ ), where  $e$  is a motion event,  $x$  is the moving physical entity (typically a person) and  $p$  is a path.

#### 5.4 Semantics with $\lambda$ -DRT

We use a compositional version of Discourse Representation Theory (DRT), called  $\lambda$ -DRT.<sup>16</sup> Discourse Representation Theory is one of the most widely used theoretical frameworks in formal semantics (Kamp and Reyle 1993). The only change with respect to the standard framework of DRT is that we divide entities/individuals into several sorts, as described in Section 4.2. There are several reasons for resorting to DRT instead of the more classical quantifiers we used in Section 3. Firstly, DRT has been designed to solve a number of semantic puzzles concerning anaphora. Secondly, a wide number of semantic phenomena have been treated using DRT and can therefore be incorporated into the current framework with relatively little work. Finally, we intend to incorporate our results with the output of a wide-coverage French semantic parser (Moot 2012) and this parser produces Discourse Representation Structures as output.

Though reasons of space prohibit us to give a detailed introduction of DRT and its formal properties, we will use a number of examples of lexical entries to illustrate the main properties of this theoretical framework. For a more comprehensive introduction to DRT, we refer the reader to the standard textbook (Kamp and Reyle 1993); van Eijck and Kamp (1997) discuss the formal properties of DRT in detail.

The main intuition of combining DRT with a Montague-style grammar is that expressions of type  $t$  will now correspond to Discourse Representation Structures instead of formulas.<sup>17</sup> A Discourse Representation Structure (DRS) is drawn as a box with a set of variables above the separating line and a set of conditions below the separating line. For instance, the needed entries for the French utterance “*Jean descend*” ‘Jean descends/goes down’ would be *descend* and *Jean*. *Descend*, described below, is syntactically an intransitive verb, which takes a noun phrase  $np$  to its left to produce a sentence  $s$ . Semantically, it takes an argument of type

16. See Cappelli’s chapter in relation with the need for a discourse approach of fictive motion.

17. More precisely, a DRS represents a state update rather than a truth value  $t$  (Muskens 1994; van Eijck and Kamp 1997).

*person* (corresponding to the subject noun phrase) and an *event*, to produce a DRS introducing a variable  $p$  of type *path*. So intuitively, the meaning for *descend* describes a motion action of a person  $x$  along a path  $p$  such that the source of this path is higher than the destination of the path. For the sake of clarity, we observe the French lexical entries but we use English as a meta-language to express the predicates in the associated  $\lambda$ -terms.

word/phrase syntactic type	$\lambda$ -DRS		
<i>descend</i> $np \backslash s$	$\lambda x^{person} \lambda e^{event}$ <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td><math>p^{path}</math></td> </tr> <tr> <td> <math>path\_of(e) = p</math>  <math>travel(e, x, p)</math>  <math>height(source(p))</math>  <math>&gt; height(destination(p))</math> </td> </tr> </table>	$p^{path}$	$path\_of(e) = p$ $travel(e, x, p)$ $height(source(p))$ $> height(destination(p))$
$p^{path}$			
$path\_of(e) = p$ $travel(e, x, p)$ $height(source(p))$ $> height(destination(p))$			
<i>Jean</i> $s / (np \backslash s)$	$\lambda D^{person \rightarrow event \rightarrow t} \lambda e^{event}$ <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td><math>y^{person}</math></td> </tr> <tr> <td><math>Jean(y)</math></td> </tr> </table> $\oplus ((Py)e)$	$y^{person}$	$Jean(y)$
$y^{person}$			
$Jean(y)$			

The upper half of the DRS box contains variables which are existentially quantified, the bottom half a sequence of formulas which are implicitly conjoined by logical *and* ‘ $\wedge$ ’. So the DRS subterm of the lexical entry for *descend* represents the following logical formula:

$$\exists p^{path}. path\_of(e) = p \wedge travel(e, x, p) \wedge height(source(p)) > height(destination(p))$$

The use of the function *path\_of* ensures uniqueness of the path associated with an event (some more complicated solution is needed for motion verbs with a collective subject or figure like *converge upon* which either require multiple paths or very sloppy identify conditions on paths). The choice to handle the existential closure of the path at the verb level keeps the semantic types simple, but it complicates the treatment of adverbs modifying the path (e.g. *for two kilometers*, which uses a distance measure on the path variable), as it requires them to access the path through the function *path\_of*( $e$ ).

The lexical entry for *Jean* uses a Montague-style lifted entry, which identifies the name *Jean* with the set of properties  $P$  (of persons and events) that characterizes the corresponding animate entity. The symbol ‘ $\oplus$ ’ denotes the DRS merge operation, which functions as a logical conjunction between two Discourse Representation Structures but allowing some of the existentially quantified variables of the leftmost DRS to bind free variables in the rightmost one. From the perspective of the translation to first-order logic, the merge operator has the property that  $(\exists x.P(x)) \oplus Q(x)$  is equivalent to  $\exists x.P(x) \wedge Q(x)$ , essentially extending the scope of the existential quantifier. This property of the merge operation is the crucial feature allowing it to handle anaphora (we refer the reader to van Eijck and

Kamp 1997, for the precise formal properties of the merge operation). In standard Montague semantics with events, the term for *Jean* would look as follows:

$$\lambda P \lambda e \exists y. Jean(y) \wedge ((Py)e)$$

As discussed in Section 3.1, in categorial grammar, parsing *Jean descend* corresponds to finding a proof of *Jean descend*  $\vdash$   $s$ . For formulas available in the lexicon for *Jean* and for *descend*, that is to say, for  $s/(np \setminus s)$ ,  $np \setminus s \vdash s$ , this leads to the following simple proof:

$$\frac{s/(np \setminus s) : j \quad np \setminus s : d}{s : (jd)} /E$$

To obtain the meaning of the sentence from the derivational meaning, we substitute the lexical  $\lambda$ -term assigned to *Jean* for  $j$  and the lexical  $\lambda$ -term assigned to *descend* for  $d$ , producing (33).

$$(33) \left( (\lambda P^{person \rightarrow event} \rightarrow \lambda e^{event} \frac{y^{person}}{Jean(y)} \oplus ((Py)e) \right. \\ \left. \lambda x^{person} \lambda f^{event} \frac{p^{path}}{\begin{array}{l} path\_of(f) = p \\ travel(f, x, p) \\ height(source(p)) \\ > height(destination(p)) \end{array}} \right)$$

We can reduce (33) by beta reduction, replacing  $(\lambda P.M)N$  by  $M[P := N]$ , that is substituting  $N$  for  $P$ , where  $N$  is the term appearing in the bottom half of the semantic term (minus the final bracket), and  $M$  is the term shown after  $\lambda P$ . in the top half of the term (minus the bracket at the end of the line). This produces (34).

$$(34) \lambda e^{event} \frac{y^{person}}{Jean(y)} \oplus \left( (\lambda x^{person} \lambda f^{event} \frac{p^{path}}{\begin{array}{l} path\_of(f) = p \\ travel(f, x, p) \\ height(source(p)) \\ > height(destination(p)) \end{array}} y) e \right)$$

Most of the hard work is done now. We only need to reduce the redex  $(\lambda x.M')y$  by  $M'[x := y]$  (where  $M'$  is  $\lambda f$  and the rightmost DRS) as shown in (35):

$$(35) \lambda e^{event} \frac{y^{person}}{Jean(y)} \oplus \left( (\lambda f^{event} \frac{p^{path}}{\begin{array}{l} path\_of(f) = p \\ travel(f, y, p) \\ height(source(p)) \\ > height(destination(p)) \end{array}} ) e \right)$$

A further beta reduction replacing  $f$  by  $e$  is then needed to get the representation in (36).

$$(36) \quad \lambda e^{\text{event}} \left[ \begin{array}{c} y^{\text{person}} \\ \text{Jean}(y) \end{array} \oplus \left[ \begin{array}{c} p^{\text{path}} \\ \text{path\_of}(e) = p \\ \text{travel}(e, y, p) \\ \text{height}(\text{source}(p)) \\ > \text{height}(\text{destination}(p)) \end{array} \right] \right]$$

Now we can merge the two Discourse Representation Structures by combining both the variables in the top half and the conditions in the bottom half. This binds the free occurrence of  $y$  in the rightmost DRS.

$$(37) \quad \lambda e^{\text{event}} \left[ \begin{array}{c} y^{\text{person}} \quad p^{\text{path}} \\ \text{Jean}(y) \\ \text{path\_of}(e) = p \\ \text{travel}(e, y, p) \\ \text{height}(\text{source}(p)) > \text{height}(\text{destination}(p)) \end{array} \right]$$

We complete the computation of the semantics by the existential closure of the abstracted event variable.

$$(38) \quad \left[ \begin{array}{c} e^{\text{event}} \quad y^{\text{person}} \quad p^{\text{path}} \\ \text{Jean}(y) \\ \text{path\_of}(e) = p \\ \text{travel}(e, y, p) \\ \text{height}(\text{source}(p)) \\ > \text{height}(\text{destination}(p)) \end{array} \right]$$

## 5.5 Lexical coercions and fictive motion

The lexicon specifies which transformations can take place, allowing us to account for contrasts in grammaticality such as those in (39) and (40):

(39) *The road leads us to Pau.*

(40) *#The road accompanies us to Pau.*

Concretely, this means that the lexical entry for *road* has an optional transformation  $g$  specified as part of its lexical meaning. We observe the exact same phenomenon in French with the entry *chemin*.

word/phrase syntactic type	$\lambda$ -term				
<i>chemin</i> <i>n</i>	$\lambda x^{\text{immobile\_object}}$ <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td style="width: 50px; height: 15px;"></td></tr> <tr><td style="text-align: center;"><i>road(x)</i></td></tr> </table>		<i>road(x)</i>		
<i>road(x)</i>					
<i>g</i> <i>n/n</i>	$\lambda P^{\text{immobile\_object} \rightarrow t} \lambda p^{\text{path}}$ <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td style="text-align: center;"><math>x^{\text{immobile\_object}}</math> <math>q^{\text{path}}</math></td></tr> <tr><td style="text-align: center;"><i>path_of(x, p)</i></td></tr> <tr><td style="text-align: center;"><i>subpath(q, p)</i></td></tr> <tr><td style="text-align: center;"><i>source(q) = here</i></td></tr> </table> $\oplus (Px)$	$x^{\text{immobile\_object}}$ $q^{\text{path}}$	<i>path_of(x, p)</i>	<i>subpath(q, p)</i>	<i>source(q) = here</i>
$x^{\text{immobile\_object}}$ $q^{\text{path}}$					
<i>path_of(x, p)</i>					
<i>subpath(q, p)</i>					
<i>source(q) = here</i>					

The lexical entry for *chemin* is rather simple and indicates only that  $x$  is an entity of type *immobile object* for which *road(x)* holds (this is a rather standard – but also rather trivial – semantics in the tradition of Montague).

What is more interesting is that the lexical coercion  $g$  allows us to change the type of the argument from an immobile object  $x$  to a path  $p$ , while asserting that this path corresponds to the immobile object as indicated by the predicate *path\_of* and selecting a sub-path  $q$  of  $p$  going forward from *here*, which may or may not go to the end of the path  $p$ . Note that having both  $x$  (the immobile physical object aspect to the path) and  $p$  (its path aspect) as referents in the universe of the DRS is necessary to account for modifiers of both aspects of the path, as in *a brick road to Pau* (see also (28)), as well to allow anaphoric references to both aspects of the path, as in the Examples (41) and (42) (from “Waymarking.com”).

(41) *The street was completed in 1825 (...)*

(42) *It runs from the Regent’s residence at Carlton House (...) to All Souls Church.*

The use of the variable *here*, which has both a place and an “orientation” or “polarity”, has the pleasant consequence of there being no incoherence between saying *le chemin monte* ‘the road goes up’ and *le chemin descend* ‘the road descends’ at exactly the same place but with just the orientation reversed. In sum, the standard assignment of *chemin* is an immobile object with a possible coercion to a path. After reduction, the path coercion  $g$  produces the following derived entry.

word/phrase syntactic type	$\lambda$ -term					
<i>(g chemin)n</i>	$\lambda p^{\text{path}}$ <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td style="text-align: center;"><math>x^{\text{immobile\_object}}</math> <math>q^{\text{path}}</math></td></tr> <tr><td style="text-align: center;"><i>road(x)</i></td></tr> <tr><td style="text-align: center;"><i>path_of(x, p)</i></td></tr> <tr><td style="text-align: center;"><i>subpath(q, p)</i></td></tr> <tr><td style="text-align: center;"><i>source(q) = here</i></td></tr> </table>	$x^{\text{immobile\_object}}$ $q^{\text{path}}$	<i>road(x)</i>	<i>path_of(x, p)</i>	<i>subpath(q, p)</i>	<i>source(q) = here</i>
$x^{\text{immobile\_object}}$ $q^{\text{path}}$						
<i>road(x)</i>						
<i>path_of(x, p)</i>						
<i>subpath(q, p)</i>						
<i>source(q) = here</i>						

The semantic lexicon provides the determiner *le* ‘the’ with a generalized quantifier assignment, but using second-order quantification over the type  $\alpha$  of its noun

argument. Apart from this quantification over the type of the noun and the use of an event argument  $e$ , this is just the standard existential quantifier of Montague (for simplicity, we have not included a uniqueness condition nor a treatment of presupposition).

word/phrase syntactic type	$\lambda$ -term
$le$ $(s/(np\s)/n)$	$\Lambda\alpha\lambda.P^{\alpha \rightarrow t}\lambda.Q^{\alpha \rightarrow event \rightarrow t}\lambda.e^{event} \boxed{x^{\alpha}} \oplus (Px) \oplus ((Qx)e)$

Combining all lexical entries so far together produces the formal representation for *le chemin* ‘the road’ interpreted as a path (using coercion  $g$ ). We leave the interpretation of *le chemin* as an immobile object as an easy exercise for the reader.

$le\{path\}(g\ chemin)$ $s/(np\s)$	$\lambda.Q^{path \rightarrow event \rightarrow t}\lambda.e^{event} \boxed{y^{immobile\_object} p^{path} q^{path}} \oplus ((Qx)e)$ $road(y)$ $path\_of(y, p)$ $subpath(q, p)$ $source(q) = here$
---------------------------------------	---

The main  $\lambda$ -DRT term for the verb *descend* is similar to the one we computed for *Jean descend* ‘Jean descends/goes down’ above, but we now specify a function  $h$  coercing *descend* in order to take a subject of type *path*.

$descend$ $np\s$	$\lambda.x^{person}\lambda.e^{event} \boxed{p^{path}}$ $path\_of(e) = p$ $travel(e, x, p)$ $height(source(p)) > height(destination(p))$
$h$ $(np\s)/(np\s)$	$\lambda.P^{person \rightarrow event \rightarrow t}\lambda.q^{path}\lambda.e^{event} \boxed{p^{path}}$ $path\_of(e) = p$ $p = q$ $\boxed{x^{person}} \Rightarrow ((Px)e)$ $\boxed{travel(e, x, q)}$

The lexically specified coercion  $h$  (for *descend* and other motion verbs which allow a path as their subject) turns a predicate over *person-event* combinations into a predicate over *path-event* combinations by universally quantifying over people traveling over the path (we need to do some extra work to ensure we can access the path variable corresponding to the event at the topmost DRS). The coercion  $h$  applied to *descend* yields the following reduced meaning for  $h\ descend$  (we have simplified a bit, removing the duplicate *travel* predicate from the right hand side of the implication and also removing the new path variable  $r$  introduced by *descend*,

since  $path\_of(e) = p$  and  $path\_of(e) = r$  imply  $p = r$ , making the bound variable  $r$  superfluous):

$h\ descend$	$\lambda q^{path}\lambda e^{event}$	$p^{path}$						
$np\ \backslash s$		$path\_of(e) = p$ $p = q$ <table border="1" style="display: inline-table; margin-right: 10px;"> <tr><td style="padding: 2px;"><math>x^{person}</math></td></tr> <tr><td style="padding: 2px;"><math>travel(e, x, q)</math></td></tr> </table> $\Rightarrow$ <table border="1" style="display: inline-table;"> <tr><td style="padding: 2px;"><math>r^{path}</math></td></tr> <tr><td style="padding: 2px;"><math>path\_of(e) = r</math></td></tr> <tr><td style="padding: 2px;"><math>travel(e, x, r)</math></td></tr> <tr><td style="padding: 2px;"><math>height(source(r)) &gt;</math></td></tr> <tr><td style="padding: 2px;"><math>height(destination(r))</math></td></tr> </table>	$x^{person}$	$travel(e, x, q)$	$r^{path}$	$path\_of(e) = r$	$travel(e, x, r)$	$height(source(r)) >$
$x^{person}$								
$travel(e, x, q)$								
$r^{path}$								
$path\_of(e) = r$								
$travel(e, x, r)$								
$height(source(r)) >$								
$height(destination(r))$								

Since  $path\_of(e) = p$  and  $path\_of(e) = r$  imply  $p = r$ , the bound variable  $r$  is superfluous and we can replace it by  $p$  without changing the meaning. We can also remove the duplicate *travel* predicate from the right hand side of the implication, since  $p = q = r$  implies that  $travel(e, x, q)$  is equal to  $travel(e, x, r)$  and removing the occurrence on the right hand side of the application doesn't change the meaning (in first-order logic,  $A \wedge (B \Rightarrow (A \wedge C))$  is logically equivalent to  $A \wedge (B \Rightarrow C)$ , and  $A \Rightarrow B$  is logically equivalent to  $A \Rightarrow (A \wedge B)$ ). These simplifications give us the following meaning for *h descend*:

$h\ descend$	$\lambda q^{path}\lambda e^{event}$	$p^{path}$			
$np\ \backslash s$		$path\_of(e) = p$ $p = q$ <table border="1" style="display: inline-table; margin-right: 10px;"> <tr><td style="padding: 2px;"><math>x^{person}</math></td></tr> <tr><td style="padding: 2px;"><math>travel(e, x, q)</math></td></tr> </table> $\Rightarrow$ <table border="1" style="display: inline-table;"> <tr><td style="padding: 2px;"><math>height(source(p)) &gt;</math></td></tr> <tr><td style="padding: 2px;"><math>height(destination(p))</math></td></tr> </table>	$x^{person}$	$travel(e, x, q)$	$height(source(p)) >$
$x^{person}$					
$travel(e, x, q)$					
$height(source(p)) >$					
$height(destination(p))$					

Note that *h descend* does not commit us to conclude that anyone actually takes the path. This must be deduced separately. Rather it allows us to conclude that if anyone takes the path, then at the end of the path he will be at a lower height than when he started it.

It may be argued that the  $x^{person}$  variable rather resembles a generic element than a universally quantified variable. That is to say, it specifies something about the *typical* person taking the path, and as in donkey sentences, the proper modeling involves a universal quantifier whose scope is the whole implication.

Taking everything together, both *chemin* 'road' and *descend* 'descends/goes down' permit lexically anchored type coercions, which together solve the type mismatch:

- *chemin* has a lexical  $\lambda$  term  $g$  which coerces it in such a way that *le chemin* is typed as a (lifted) path,

- *descend* has a lexical  $\lambda$ -term  $h$  which coerces its lexical semantics to take a path argument,
- using both coercions together we can analyze *le chemin descend*, with *le chemin* and *descend* combining *path* types.

The prepositional phrase *pendant deux heures* ‘for two hours’ is given a rather simple Davidsonian analysis: it simply states that the duration of the event corresponding to the sentence it modifies is two hours.

$$\begin{array}{c}
 \textit{pendant 2 h.} \\
 s \backslash s
 \end{array}
 \left| \lambda s^{\text{event} \rightarrow t} \lambda e^{\text{event}}(se) \oplus \begin{array}{|c|} \hline \\ \hline \textit{duration}(e, 2h) \\ \hline \end{array} \right.$$

However, it should be noted, that, in spite of the analysis presented assigning them similar meanings, sentences (43) and (44) should have rather different interpretations.

- (43) *Le chemin descend abruptement/doucement.*  
 ‘The path goes down abruptly/slowly’
- (44) *Jean descend abruptement/doucement.*  
 ‘Jean goes down abruptly/slowly’

In (44) Jean is going down the path and he is doing so abruptly or slowly which is neutral with respect to the slope of Jean’s path: e.g. Jean can go down a steep slope slowly.

By contrast, sentence (43) *does* allow us to infer that the slope of the path either suddenly becomes rather steep (*descend abruptement*) or has a rather level downwards slope for the contextually relevant stretch of it (*descend doucement*).

This difference is partly explained by the lack of an agent in (43): if there is no consciousness guiding the motion, then the abruptness can only come from external factors. Another way of interpreting these facts is to see (43) as talking about a “generic” traveler taking this path, who therefore also has a “default” means of transport which can be deduced from the context. This default means of transport is necessary for the correct interpretation of *pendant deux heures* as well. The discussion of adverbs has stayed rather informal and we admit that we only have sketched some possible solutions. However, given the difficulty of the semantics of adverbs, a more detailed and formal treatment would have significantly broadened the scope of the initial project.



## 6. Conclusion

We have proposed a first formal treatment of “fictive motion” in a type-logical grammar based on the “virtual traveler” interpretation of this kind of spatial descriptions. The formalization is mainly aimed at accounting for the semantic processing of fictive motion descriptions in a French corpus of travel narrations though the Pyrenees, bridging static and dynamic spatial language. Our account merges two successful extensions of “standard” Montague-style semantics –  $\lambda$ -DRT and the Generative Lexicon – into a single, coherent type-theoretic framework, the Montagovian Generative Lexicon. This framework allows us to exploit polymorphism and type-coercion to integrate aspects of both lexical and discourse meaning.

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# Geoparsing and geocoding places in a dynamic space context

## The case of hiking descriptions

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The backbone of the proposal in this chapter is an automatic parser and a formal encoder of information describing places, spatial and verbal relations in textual documents in order to reconstruct and map the textually described itinerary. These tools allow us to show how to combine the information expressed in French texts, referring to places, spatial actions associated with them, and data found in external geographical resources to build a geocoded representation of an itinerary. Our approach focuses on the automatic reconstruction of routes and transcribes them in their geographical setting, identifying locations and routes by interpreting spatial information in a dynamic space context.

**Keywords:** spatial actions, spatial relations, itinerary, automatic parser, formal encoder, geocoded representation, ambiguity resolution

### 1. Introduction

A considerable number of documents describing journeys or walks in different tourist sites are now available in digital form. Concerning the Pyrenees area for instance, these kinds of documents are very abundant thanks to different storage sites such as multimedia libraries. Additionally, many people describe and share their journeys (with daily descriptions, photos, etc.) on travel blogs, participative websites or social media. In the last few years, analysis of data coming from social media has become a challenge for researchers and data scientists (Sui and Goodchild 2011), particularly with the evolution of technologies and the increasing availability of geocoded data. In the early nineties, Frank and Mark (1991) wrote “It is conceivable that systems of the future might be able to assimilate and

to analyze an explorer's journals such as Columbus' logs or the journals of Lewis and Clark, check them for consistency, and perhaps reach new inferences about the itineraries of their travels". Since then, scientific and technical progress, but also the explosion of open digital geographical resources, have made developing such systems now more realistic.

The purpose of this chapter is to describe a set of methods to achieve systems with such capabilities. This set of implemented methods combines information expressed in French texts such as spatial places and associated actions, with data found in external geographical resources, to build a geocoded representation of an itinerary. Motion expressions involve the main spatial actions but certain expressions of visual perception are also of interest (see Cappelli's and Lefevre, Moot and Retoré's contributions in this volume). In fact, an itinerary not only refers to the route travelled but also to the context of the trip (description of landmarks and landscapes, purpose of the displacement, etc.). Our approach focuses on the automatic reconstruction of routes and transcribes them in their geographical setting, identifying locations (i.e. waypoints or landmarks) and routes by interpreting spatial information in a dynamic space context.

We propose to divide the problem into three sub-problems: the annotation of places and their related spatial relations in texts, i.e. geoparsing; the geolocation of places according to their context of evocation, i.e. geocoding; and the reconstruction of the itinerary on a map. In order to solve the problem of itinerary reconstruction from text, we first define and analyze all the components of an itinerary and how they are expressed in natural language, especially in French. Our main contribution addresses the problem of automatically annotating passages in the text that describe the various stages making up the itinerary. Based on the analysis of elements used in the description of itineraries, this problem involves the annotation, the resolution and the disambiguation of place names but also the annotation and the resolution of their discursive context such as verbal relations (primarily those expressing motion and to a lesser extent visual perception). Our second contribution will be to reconstruct itineraries using information extracted from textual descriptions of itineraries and additional data coming from external geographical resources. It addresses the problem of distinguishing waypoints from other types of locations, identifying the sequence in which waypoints are visited during the displacement and building an approximate representation of the itinerary. These two contributions can be seen as independent tasks. Additionally, annotations provided by the approach can be used for other purposes than reconstructing an itinerary. However, we have developed a fully automatic processing chain to show the feasibility of our proposal and to evaluate our approach on real data.

The chapter is structured as follows. In Section 2, we present several methods and tools that can be used to implement geoparsing and geocoding. Then

(Section 3), we describe our approach, based on the methods and tools previously described. This approach aims to solve two main problems. The first is identifying the extended spatial named entity, in which the role of spatial relations and of motion verbs is crucial, as described in Section 3.1. The second problem is resolving possible specific ambiguities involved in toponym recognition, for which there is no single solution yet. We propose solutions depending on the type of ambiguity, as described in Section 3.2. Both problems tackle the overall goal of automatically reconstructing and mapping a textually described itinerary. In Section 4, we present and discuss a series of experiments and evaluations, and Section 5 concludes this chapter.

## 2. Background and related work

As stated in the general introduction of this volume, over the last decades linguists have conducted extensive studies on space in language and cognition (e.g. Herskovits, Talmy, Vandeloise) and, among other things, on motion in French (e.g. Boons, Guillet and Leclère, Kopecka, Laur). These studies have highlighted the importance of verbs in dynamic *localization* processes (see Section 3.1.2), at least for “verb-framed languages” (Talmy 1985, 2000).

As regards our needs and as shown in these studies, the expression of spatial location involves three main elements: a located entity, a locating or reference entity and a spatial relation between them. Other studies (Levinson 1996; Frank 1998; Levinson 2003) resort to the concept of “frame of reference” to describe the geometrical/referential and linguistic principles that govern the description of space in natural language.

### 2.1 Parsing in computational linguistics

Parsing (from the Latin *pars orationis* ‘part of speech’) in the traditional sense involves taking words one by one in a sentence, assigning each to a part of speech, specifying their grammatical categories, and listing the grammatical relations between words. Here we must stress the fact that, in the traditional sense, parsing is in no way an extraction of properties and relations that are of semantic relevance. In the last century, the notion of parsing came to be extended due to new conceptualizations arising from theoretical and computational linguistics, computer science, psycholinguistics and cognitive science.

In computational linguistics parsing is the process of analyzing natural language data in accordance with the rules of a formal grammar. In order to automatically parse such data, it is initially necessary to agree on the grammar

to be used. Syntactic parsing, then, is the task of recognizing a sentence and assigning a syntactic structure to it. Parsers can be viewed as searching through the space of possible parse trees to find the correct representation for a given input, using two basic search strategies: top-down search and bottom-up search. The top-down strategy tries to build the correct tree from the root node to the leaves, whereas in the bottom-up strategy the parser starts with the words of the input, and tries to build trees from the leaves to the root node, by applying, one by one the rules of the grammar. Local and global ambiguities are perhaps the trickiest problem that parsers have to tackle. This problem is particularly important when the parser is based on a complex grammar. In the literature, many strategies have been proposed to remove as many ambiguous cases as possible, but currently in some contexts there is still no solution.

## 2.2 Named entity recognition and classification

Many tasks do not require a complete parse for all the input; a shallow parse of input sentences may be sufficient. This is usually the case in information extraction systems that focus on the segments in a text that are likely to contain valuable information. Typically, the task known as Named Entity Recognition and Classification (NERC) can be seen as a shallow parsing. The notion of “Named Entity” was formally established at the Sixth Message Understanding Conference (MUC-6, 1995). From the beginning the notion included names of persons, locations and organizations, but also numerical expressions of time, date, money, etc. Since then, the annotation of named entities (NE) has become an essential task in NLP. Approaches for named entity parsing cover a huge variety of strategies, methods and representations. These approaches are generally classified in two main categories, data-driven approaches and knowledge-based approaches. Currently proposals are based on some methods of deep learning and more generally on machine learning methods in a context of re-discovery of these methods due to the very high computing capacity available. These proposals are part of the category of data-driven approaches. One of the earliest research papers in the field of NERC was written by Rau (1991). Her approach was based on heuristics and handcrafted rules, in other words was knowledge-based. Many different methods can be used: some make use of cascades of finite-state transducers to produce tree-like representations. Because regular languages and relations can be encoded as finite automata they can be more easily manipulated than more complex languages; cascades of transducers have therefore turned out to be very useful for linguistic applications, in particular for shallow parsing.

A considerable amount of work in NERC research takes the language factor as a parameter and in this body of work a significant proportion is devoted to

the study of English, but French is also considered (Poibeau 2003; Friburger and Maurel 2004), as well as other languages. The impact of literary genre (narrative, memoir, journalism, etc.) and domain (supply of raw materials, market or economic intelligence, politics, etc.) is a problem that has been more recently addressed in the NERC literature.

### 2.3 Construction grammars

Alongside the development of these parsers the notion of construction grammar emerged. This kind of grammar evolved out of work initiated by Fillmore (1985), Lakoff (1987), and Langacker (1987) and assigns a major role to the concept of construction as a theoretical entity. As specified by Yannick-Mathieu (2003) the elements of the grammar are constructions: a construction is a pattern used to generate the elements of a language, or to extract these elements from an instance produced from a language. Construction grammars may specify a semantics that differs from the sum of the lexical meanings of its components. Construction grammars can reuse concepts already employed in other theoretical frameworks, such as NP (Noun Phrase) or VP (Verb Phrase), or PP (Prepositional Phrase). In this kind of construction, a feature structure is usually used to represent the elements of the language. A feature structure is a set of attribute-value pairs; the value can be atomic or another feature structure. A feature structure can be represented as a directed acyclic graph (DAG), with the nodes corresponding to the variable values and the paths to the variable names. Often however, feature structures are written as follows:

$$\left[ \begin{array}{l} \text{use for} \\ \text{named entity} \end{array} \left[ \begin{array}{l} \text{landmark} \\ \left[ \begin{array}{l} \text{component} \\ \text{category} \\ \text{type} \end{array} \right] \left[ \begin{array}{l} \text{noun phrase} \\ \text{descriptive} \\ \text{location} \end{array} \right] \end{array} \right. \right]$$

Finally it should be mentioned that a finite-state automaton is probably the most widely used mathematical device to implement shallow parsers based on construction grammars, while very few studies are specifically devoted to a specific genre in a specific domain.

### 2.4 Geoparsing, toponym ambiguities and geocoding

Parsing that is solely concerned with geographical data is known as geoparsing and aims at extracting keywords and keyphrases describing geographical references from unstructured text. There are currently several types of specific ambiguity



involved in geoparsing and more specifically with the problem of toponym recognition (Leidner 2007). Smith and Mann (2003) defined three main types of ambiguity: “referent class ambiguity”, “reference ambiguity” and “referent ambiguity”. Referent class ambiguity refers to place names that may be used in a non-geographical context (i.e. organizations or persons); this ambiguity is also known as “geo/non-geo ambiguity” defined by Amitay et al. (2004). Reference ambiguity refers to places that have several names. For example, this happens when the name has changed over time, or when the name commonly used by people is different from the official name. Apart from these clear cases of reference ambiguity, we will focus here on the problem of the inclusion or exclusion of subtypes within the official name of a toponym. This is known as structural ambiguity and was defined by Wacholder et al. (1997). Referent ambiguity refers to place names that represent several geographical places. Referent ambiguity is also known as referential ambiguity, which Leidner (2007) considers as a subset of linguistic ambiguity. Some well-known examples of toponyms are usually used to illustrate this class of ambiguity. For instance, the toponym *Paris* refers to hundreds of different geographic places around the world such as the capital of France and cities in different countries such as the United States (Texas), Canada, Togo, Panama, etc. In addition, a large number of spatial entity types exist: geopolitical entities (countries, administrative divisions), populated places (towns, addresses and postal codes), and natural geographical entities (parks, valleys, mountains, rivers, etc.), all of which can also create ambiguities about the type of geographic entities.

Toponym resolution (Leidner 2007) involves associating a non-ambiguous location with a place name and solving the problems of some forms of ambiguity that toponyms may contain. Toponym disambiguation is defined as a subtask of toponym resolution and is complementary to the subtask of toponym recognition. According to Buscaldi and Rosso (2008a) the approaches for disambiguating toponyms can be classified in three categories: supervised or data-driven approaches, map-based approaches and knowledge-based approaches. Data-driven approaches are based on machine learning algorithms and exploit non-geographical content and events to build probabilistic models using spatial relationships between entities (i.e. dates, persons, or organizations) and places. As pointed out by Smith and Crane (2001), a place is more likely to be located near other places mentioned around it. Knowledge-based approaches aim at considering semantic relations between named entities, concepts or key terms such as social, associative or lexical relatedness and not only co-occurrence statistics of terms. These methods use knowledge sources (gazetteers, ontologies, etc.) to determine whether other related toponyms in the knowledge source are also referred in the document, or exploit additional information from the toponyms, such as importance, size or population counts. Finally, map-based disambiguation approaches use other

unambiguous and georeferenced toponyms found in the same document as context for disambiguation.

### 3. Recognizing and locating places in a dynamic space context

#### 3.1 Geoparsing extended spatial entities

As previously mentioned, NERC approaches are classified in two main categories, data-driven approaches and knowledge-based approaches, each with its specific advantages and drawbacks. The main drawback of data-driven approaches is the lack of classified collections and the need for large corpora of annotated ground truths. Although knowledge-based methods can be time-consuming to develop, they require only a small amount of training data. Furthermore, knowledge-based methods are more suitable for approaches based on domain-specific corpus analysis and rules are described in a readable way and are easy to modify and maintain. This is the case here, where the goal is to design and implement a parser for recognizing and classifying places in a dynamic space context mentioned in French texts.

##### 3.1.1 *Extended named entity (ENE) structure*

According to Jonasson (1994) there are two categories of proper names: pure and descriptive. Pure proper names can be simple (i.e., composed of a single lexeme) or complex (i.e., composed of several lexemes) and are composed of proper names only. Descriptive proper names refer to a composition of proper names and common names (i.e. expansion). In other words, descriptive proper names overlap pure proper names. Descriptive proper names refer to a named entity (NE) built with a pure proper name and a descriptive expansion. This expansion can change the implicit type (e.g. location, person, organization, etc.) of the initial pure proper name.

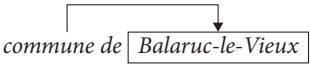
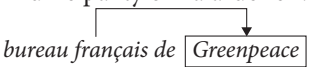
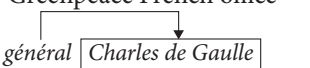
An ENE may contain an entity built with both categories of proper names (i.e. pure and descriptive), and that can be composed of one or more concepts. Whereas most NERC investigations usually only consider pure proper names, we define several levels of overlapping (0, 1, 2, etc.) for the representation of ENE. Each level is encapsulated in the previous level.

*Level 0* refers to pure proper names. It can be seen as the core component of an ENE. Thus, we consider NE as a special kind of ENE. Examples (1a–1c) illustrate level 0 entities:

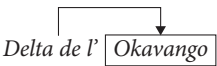


- (1) a. Balaruc-le-Vieux → one entity (location)

- b. Greenpeace → one entity (organization)  
 c. Charles de Gaulle → one entity (person)

*Level 1* refers to descriptive proper names composed of a pure proper name (i.e. an entity of level 0) and a common noun (i.e. expansion). The following Examples (2a–2c) show the representation of ENE. In these cases, descriptive expansions do not change the implicit or default nature of the entity described by the proper name; they just specify the nature or the feature type.

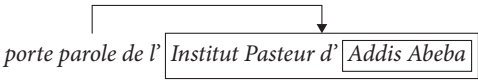
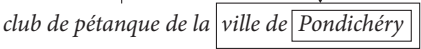

- (2) a.   
       *commune de* Balaruc-le-Vieux  
       ‘municipality of Balaruc-le-Vieux’  
 b.   
       *bureau français de* Greenpeace  
       ‘Greenpeace French office’  
 c.   
       *général* Charles de Gaulle  
       ‘general Charles de Gaulle’

However, when the associated term has not the same type of the intrinsic or default type of the pure proper name, it defines a new entity that overlaps the pure proper name one. The following Examples (3a–3c) show that an entity may contain the name of another entity, and that the new entity may have a different type, Examples (3b–3c).

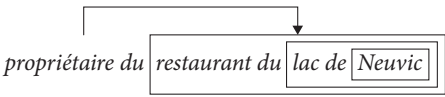
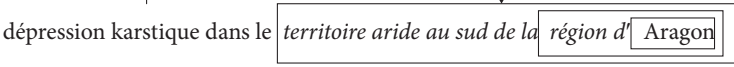
- (3) a.   
       *Delta de l'* Okavango  
       ‘Okavango Delta’  
       → two entities, *Okavango* (location) and *Delta de l'Okavango* (location)  
 b.   
       *siège social de l'* Unicef  
       ‘Unicef headquarters’  
       → two entities, *Unicef* (organization) and *siège social de l'Unicef*  
       (location)  
 c.   
       *maire de* Pau  
       ‘mayor of Pau’  
       → two entities, *Pau* (location) and *maire de Pau* (person)

*Level 2* refers to a descriptive proper name composed of another descriptive proper name. ENE of level 2 are built with ENE of level 1 and with a descriptive expansion, as shown in the Examples (4a–4c). The behavior is the same as for the

previous level i.e., the expansion can change the type of the entity described by the ENE of level 1.

- (4) a.   
 ‘spokesperson of the Pasteur Institute in Addis Ababa’
- b.   
 ‘pétanque club of Pondichéry city’
- c.   
 ‘Marechal Leclerc avenue’

Level 3 ENE at this level are built with ENE of level 2 plus a descriptive expansion. In fact, there is not really a limit to the overlapping. However, it is extremely rare to find an ENE of level 3 or more. The following Examples (5a–5b) show some ENE of Level 3.

- (5) a.   
 ‘owner of the restaurant of Neuvic Lake’
- b.   
 ‘karstic depression in the arid land south of the Aragon region’

The annotation of ENE can be considered as a shallow parsing and the grammar to be used as a specific construction. The core of the grammar is:

$S \rightarrow ENE$

$ENE \rightarrow ENEA \mid (Term) ENER$

$ENER \rightarrow Offset ENEA \mid Offset ENER$

$ENEA \rightarrow (Term) ProperNoun \mid Term ENEA$

$Term \rightarrow Nominal Det$

*Offset* can be seen as an adverbial clause.

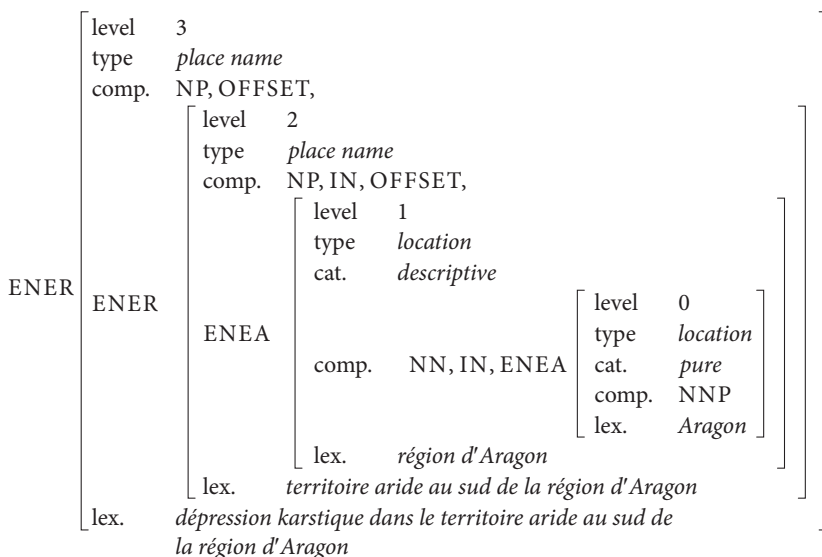
With this kind of grammar each level of the ENE can be marked, from the pure proper name to the whole ENE and it can distinguish between two types of ENE, “absolute” (i.e. a landmark in Vandeloise’s (1991) terms) referring to standard spatial ENE and “relative” (i.e. a target in Vandeloise’s (1991) terms) referring to spatial ENE associated with spatial relations (i.e. “offset” and “measure”). For instance, taking Example (5b), using the NERC method detailed in (Moncla et al. 2014) it produces the results represented in feature structure form in Figure 1.

We argue that for a fine-grained task, such as marking and classifying named entities, it is essential to consider ENE (5a and 5b) as whole entities. Standard NER tools consider only the entity “Neuvic Lake”, and therefore lead to inaccuracies in classification. Of course this must be consistent with the discourse context.

With respect to the specific problem of the NERC category of place names, this makes it possible, in particular, to move beyond reducing a place to a name and a set of coordinates, a model that is still predominant in Geographic Information Science as specified by Purves and Derungs (2015).

### 3.1.2 Motion verbs and extended spatial named entity structures

In view of our aim of using the dynamic space context to achieve a better disambiguation of places, the core of the “vT” grammar proposed hereafter can be seen both as a specialization and as an extension of the ENE construction grammar. The symbol  $V$  represents a set of motion verbs and the symbol  $T$  a set of n-tuples i.e., a composition of elements belonging respectively to three sets:  $SO$  a set of spatial offsets,  $TG$  a set of geographical noun phrases and  $E$  a set of ENE.



NP = Noun phrase, NN = Noun, IN = Preposition, NNP = Proper noun, singular

**Figure 1.** The annotation of an ENE

Consider the following sentence:

- (6) *descendre sur le territoire aride au sud de la région d'Aragon*  
 ‘go down onto the arid land south of the Aragon region’

Example (6) has the following VT structure=  $(v,t)$ , with:  $v = \textit{descendre}$ ,  $t = \textit{sur le territoire aride au sud de la région d'Aragon}$ .

With  $t$  respectively composed of:  $tg_3 = \emptyset$ ,  $so_3 = \textit{sur}$ ,  $ENE_2 = \textit{territoire aride au sud de la région d'Aragon}$ ,  $tg_2 = \textit{territoire aride}$ ,  $so_2 = \textit{au sud de}$ ,  $ENE_1 = \textit{la région d'Aragon}$ ,  $tg_1 = \textit{région}$ ,  $so_1 = \emptyset$ ,  $ENE_0 = \textit{Aragon}$ .

The set SO of spatial offsets is composed of locative phrases in which the role of prepositions is central. A large number of studies on French have shown that prepositions are involved in the operation of spatial tracking, or location. As regards location, following the conclusions of work on French conducted according to Vandeloise's (1991) proposals (cf. general introduction of this volume), prepositions contribute significantly to bringing together two entities: a locator and a localized entity (i.e., a landmark and a target in Vandeloise's (1991) terms). The phrase used as locator must have spatial properties that facilitate its identification and the explanation of the spatial relationship in which it is involved. Linguistically, there are three kinds of phrases that can serve as locators: noun phrases including a name involving spatial properties (6), noun phrases indicating distance (e.g., *le refuge se trouve à trois kilomètres ou à une heure de marche* 'the refuge is three kilometers or an hour's walk away') or orientation (e.g., *prendre la bretelle de droite* 'take the exit on the right') and noun phrases evoking an activity that may be associated with a place (e.g., *je me rendais au cours de natation* 'I was on my way to my swimming lesson').

The first category of phrases used as locator is the most common one and it can be associated with the greatest number of prepositions. The VT construction grammar relies only on this category. In this category, the included name can be of two types: place names and names of concrete entities (entities that can be located in the same place at the same time), in other words the  $ENE_2$  elements contained in the set  $E$ . Frequently, a particular sub-group consisting of noun phrases referring to specific parts of a locator (the peak, the bottom, the slope, the interior) is considered separately. They are unique in that they are considered suggestive of spatial properties only if they are in relation with  $ENE$  via prepositions such as *à* and *de*. In the VT structure the set  $TG$  represents this sub-group of noun phrases.

As pointed out by various studies, location is often a static principle unless a dynamic component related to the verb also operates. What can be retained from the literature on French and other languages is that, in many cases, the same prepositional phrase can be used to describe a variety of spatial situations and that the discriminating factors are at the level of modalities of action. It is also well-known that these modalities of action are likely to vary in the domain of dynamic space, specifically according to the now famous typological opposition between verb-framed and satellite-framed languages (Talmy 1985, 2000). To make matters even more complex, languages are not systematically part of one category or the

other (Pourcel and Kopecka 2005) – see also Soroli, Hickmann and Hendriks, and Fibigerova and Guidetti’s contributions in this volume.

Focusing on the polarity of motion events, it should be noted that, without changing the intrinsic polarity of the verb, the preposition can change what could be called the focus of the displacement. More specifically, the association of a motion verb with a spatial preposition can change the focus of the displacement and take on the polarity of the preposition instead of that of the verb. Undeniably, *leaving from Paris* and *leaving for Paris* are two expressions with a radically opposite focus of the displacement. If we consider the role played by the name, in one case the place name is the origin of the displacement, and in the other case it identifies the destination. *Paris* operates as the landmark of both descriptions and, in the latter case, the whole expression may be considered as predominantly final.

The VT construction grammar aims to be a computational synthesis of research on the expression of motion in French, in particular studies on the functioning of motion verbs in a sentence, and studies on the combinatorial principles of these verbs with different prepositions (see, for instance, Aurnague’s and Sarda’s contributions in this volume). The core of the grammar is:

$$S \rightarrow V T$$

$$V \rightarrow \textit{Verb} \mid \textit{Verb SO}$$

$$C \rightarrow \textit{Conjunction} \mid$$

$$LT \rightarrow \textit{ENE C T}$$

$$T \rightarrow (\textit{SO}) (\textit{det}) \textit{ENE} \mid (\textit{SO} \mid \textit{ENE}) T \mid (\textit{SO}) LT$$

*SO* can be seen as a spatial adverbial clause.

Of course, in order to take into account the combinations which by their structure are inconsistent with French, the real grammar is more complex. The VT construction grammar reuses a sub-set of the concepts employed in a traditional parts-of-speech (POS) grammar.

The bottom-up parser, based on the real grammar and implemented with a cascade of transducers, can be viewed as searching through the space of possible parse trees to find the correct parse tree for a given “VT” phrase. Then if a correct parse tree is found the *ENE* becomes a candidate to be an Extended Spatial Named Entity (*ESNE*).

Finally, consider the following sentences:

- (7) *Emprunter successivement rue des Capucins et rue de Compostelle*  
‘Walk down **Capucins Street** and then **Compostelle Street**’
- (8) *Prendre à gauche après l’entrée de l’usine de Fontanille*  
‘Turn left after the entry to the **Fontanille factory**’

- (9) *Suivre la route depuis le hameau Lic jusqu'à la Chapelle Saint-Roche*  
 'Follow the road from the hamlet Lic to the Chapelle Saint-Roche'

These sentences are extracted from a French hiking description. For each of them the cascade of transducers found a correct parse tree. So each marked ENE becomes a potential ESNE but first all the specific ambiguities described in Section 2.1.3 must be removed. In fact, most of the descriptive proper names used to build the ENE in these sentences are very common proper nouns and moreover refer to small localized entities. These are specific aspects that may cause ambiguity.

As already mentioned, there is no single solution to the problem of ambiguities. In the next section we will see how, thanks to the dynamic space context, some elegant solutions can be found depending on the type of ambiguity.

### 3.2 Geocoding

Our cascade of transducers produces a generic annotation of ENE i.e., ENE boundaries are identified but not classified except for those associated with internal or external evidence such as persons or road names. Then, our objective is to categorize ENE and more specifically to identify spatial ones (i.e. ESNE). This purpose is closely related to the problem of toponym resolution. The concept of ENE will help us to identify spatial entities thanks to information contained within the ENE such as terms that can be found in geographical ontologies and offsets that may refer to spatial relations.

In this study we propose a hybrid solution based mainly on a gazetteer lookup method in order to identify spatial entities among all the entities extracted from textual descriptions and to find their geocoded representation. Once spatial named entities have been extracted and spatial named entity boundaries have been identified, the main issue to be solved in order to achieve resolution is the ambiguity contained in place names.

As we propose to use a classic gazetteer lookup method, we can make several hypotheses. First of all, each toponym is stored in the geographical resources with its geo-coordinates which means that there is no ambiguity and that all toponyms can be easily associated with their geo-coordinates. Then, a second hypothesis is that toponyms can have several referents stored in the resources describing different places with the same name (referent ambiguity). In this case we need to disambiguate toponyms in order to discard incorrect referents. Finally, a third hypothesis is that among all the referents found in gazetteers none of them actually refers to the one we are looking for. This hypothesis is equivalent to the fact of not finding any referent for a given toponym in the gazetteers and is due to the incompleteness of the resources.



### 3.2.1 Subtyping of place named entities

As mentioned above, we propose a hybrid solution combining the “classic gazetteer lookup” method with the subtyping of place names. We query geographical resources to find a geocoded representation for each place name. Then, we analyze the information contained within the *ENE* in order to disambiguate the referents found in gazetteers. We lookup in geographical ontologies or lexicons to determine if the subtype contained within the *ESNE* matches a geographical concept. This method is based on the approach described by Nguyen et al. (2013). It relies on *ESNE* recognition expressed in terms of semantic features and combines the use of specific intra-sentential lexico-syntactic relations and external resources such as gazetteers, thesauri, or ontologies.

Furthermore, the large number of spatial entity types is a potential source of ambiguity about the type of geographic entity in question. Thus, the use of contextual elements such as words that have a geographical denotation (e.g. *downtown*, *valley*, *ridge*, etc.) is very important in toponym disambiguation (Hollenstein and Purves 2010) and allows the ambiguity to be removed from the type of the spatial entity under consideration. Concerning the subtyping of place named entities, we distinguish two concepts: “type” and “subtype”. The type refers to the geographical nature of the spatial entity under consideration, whereas the subtype refers to the expression of the type within the textual description if it exists.

As described by Rauch et al. (2003), we propose to use the local linguistic context, when available, to identify subtypes associated with toponyms (e.g. *city*, *lake*, *river*, etc.) and then to filter out irrelevant references. The annotation of *ESNE* contained within *VT* structures is then used to extract the local context associated with toponyms (subtype). Thanks to the concepts of *VT* and *ESNE* our automatic annotation system is able to distinguish the proper name and the subtype that are part of the toponym. Figure 2 shows the annotation of the *VT* obtained with our processing chain following the Text Encoding Initiative (TEI) guidelines.<sup>1</sup>

The `<phr>` element refers to the *VT* structure, the `<offset>` elements refer to spatial relations, the `<geogName>` element refers to the *ESNE*, the `<geogFeat>` element refers to the subtype of the toponym and the `<name>` element annotates the proper name (Moncla and Gaio 2015).

The proposed gazetteer lookup method queries geographical resources with the full name of the toponym (including subtype and name) and if there is no record for the full name a second query is made using only the name. Then the method compares the subtype extracted from the text with the metadata associated with each record to match corresponding references and filter out irrelevant ones. One problem is that the local context is not always available in the textual description:

1. <http://www.tei-c.org/Guidelines/P5/>

due to the ambiguous nature of natural language and more particularly to the phenomenon of under-specification (which holds that values are predictable), a spatial named entity may be expressed in texts without any subtype. In that case, the subtype is implied and refers to the intrinsic or default type of the spatial entity. For instance, *France* is a country, and *Paris* is a city.

```

<phr type="verb_phrase" subtype="motion">
  <w lemma="descendre" type="verb"
    subtype="motion_final">descendre</w>
  <offset>sur</offset> le
  <placeName type="relative" role="destination">
    <geogName type="vegetation" n="2">
      <geogFeat>territoirearide</geogFeat>
      <offset type="orientation" subtype="south">
        au sud de
      </offset>
    <placeName type="absolute">
      <geogName type="administrative_boundaries" n="1">
        la <geogFeat/<noige'r>geogFeat> d'
        <name n="0">Aragon</name>
      </geogName>
    </placeName>
  </geogName>
</placeName>
</phr>

```

**Figure 2.** Annotation of the VT: *descendre sur le territoire aride au sud de la région d'Aragon*

The method queries geographical resources to classify NE as spatial named entities and also to find their geocoded representation, since our goal is not only to know that the name refers to a place but to be able to locate this place in order to reconstruct the plausible footprint of the itinerary. Several geographical resources are queried in order to obtain a better coverage and increase the number of distinct toponyms found. However, querying several geographical resources also increases the problem of toponym ambiguity, since some toponyms may be stored in several gazetteers and sometimes their coordinates are not exactly the same. To solve this problem we apply a radius (buffer) in order to remove near duplicate toponyms. This method is applied on toponyms having the same name and coming from different geographical resources.

To summarize, the objective of our method is to find the subtype of toponyms using contextual information provided by the textual descriptions. Thanks to the annotation of ESNE we are able to compare the subtype associated with the proper name with the value of the metadata available with each record of the toponym in

the geographical resources. Additionally, the fact of querying different gazetteers also expands the probability that the method will find a match with one of the possible names of a place.

### 3.2.2 *Density-based spatial clustering*

In many cases the disambiguation approach based on subtyping place names is not enough because external geographical resources may contain several toponyms with both the same name and type. In this case of “referent ambiguity” we need a mechanism to distinguish the relevant group of toponyms associated with the real trajectory of the displacement.

The effect of referent ambiguity may be very significant for geocoding toponyms and in particular with hiking descriptions. Our experiments showed, for instance, that most toponyms are fine-grained toponyms and are very common in France, since many small villages (settlements), churches, hotels or streets have the same name.

The fact that our main objective is to reconstruct itineraries helps in the disambiguation process. The main difficulty in several studies dealing with the problem of toponym disambiguation is that the method needs to find some kind of relationship between toponyms in order to discard irrelevant references using other toponyms or unambiguous toponyms. For instance, relationships between toponyms may refer to geographic distance defining an area of interest or arborescent proximity using conceptual matching.

As we are working with specific texts describing displacements, we cannot use the standard methods of toponym disambiguation that are usually applied to a corpus of news articles. Each corpus of documents has pros and cons, and disambiguation methods have to be chosen according to the specific context of evocation of toponyms. For example, in news articles the notion of event is very important and can help to disambiguate toponyms, and methods commonly use semantic relationships between different types of entities (company, person and places). The situation is different, however, in the case of a travel description where each place is related to another one by a motion event or is related to the route by perception expressions that describe landmarks and more generally the spatial context of the displacement. Standard knowledge-based approaches (Buscaldi and Rosso 2008b; Lieberman and Samet 2012) are not suitable because it is common to find toponyms referring to geographical entities of varying size, and occurrences of toponyms have nothing to do with their importance in terms of population heuristics. We can easily imagine a hiking trail starting from a big city, and then leaving the urban area and continuing in forests or mountains. To illustrate these constraints we can cite the well-known *Camino de Santiago* (Way of St. James) which refers to several pilgrimage routes in Europe crossing different countries

and various kinds of geographical areas (urban areas, countryside). These routes include typical landmarks such as cathedrals, churches or chapels but also many different landmarks located all along the route. Furthermore, techniques based on hierarchical relations are also difficult to apply in the specific case of a displacement described by documents that usually contain fine-grained toponyms or natural features (mountains, lakes, refuges) because the coverage provided by knowledge resources is very limited.

Similar to the work of Intagorn and Lerman (2011) or Feuerhake and Sester (2013), we propose to use clustering algorithms to find collections that share a spatial property. In our case, these collections enable us to find clusters of the most likely geospatial points belonging to a hiking trail. Our proposal to disambiguate referent ambiguities can be classified as a map-based approach (Moncla et al. 2014). In particular, we use the DBSCAN clustering algorithm introduced by Ester et al. (1996). It uses the concept of density to determine the neighborhood of a point, that is, what constitutes a cluster. This map-based approach can deal with toponyms that are disparate in terms of importance without considering population or social statistics and can also deal with toponyms located in different countries. DBSCAN uses two parameters to define the density concept: *Eps* and *MinPts*. *Eps* (epsilon radius) determines the area of a neighborhood and *MinPts* determines the minimum number of points that have to be contained in that neighborhood to deem it a cluster. In our current methodology, the values of DBSCAN parameters were empirically adjusted according to the features of the linking dataset used in the experiments.

DBSCAN can deal with the problems of noisy data i.e., DBSCAN has the ability to detect outliers. In our context, an outlier is a point that does not belong to the hiking trail cluster. Additionally, since hiking trails may have many points describing different trajectory shapes, DBSCAN can find arbitrarily shaped clusters. The output of the DBSCAN is a set of clusters of toponyms whose footprints are very similar. Each cluster represents a possible set of points describing the hiking trail. Then we need a way to identify the cluster that best matches the set of points in the hiking trail. The heuristic is defined as follows: given a set of clusters  $C_1, C_2, \dots, C_n$  generated by the clustering algorithm, the best cluster  $C_b$  is the one containing the largest number of distinct toponyms. In other words, the best cluster identifies the area with the largest co-occurrence of toponyms.

### 3.2.3 Geocoding for unreferenced toponyms

Whatever the resource selected for geocoding, another problem that usually arises is its completeness. It was found during the experiments that toponyms that occur frequently (especially fine-grained toponyms) are not stored in geographic resources and the incompleteness of these resources is an important factor in

toponym ambiguity. For instance, in a corpus of narrative descriptions of places in a small area, it is common to find toponyms referring to geographical entities of varying size. We therefore introduced the notion of “unreferenced toponym ambiguity” and proposed a method to approximate the spatial footprint of these unreferenced toponyms (Moncla et al. 2014).

Our approach is a hybrid solution that combines map-based disambiguation with information about spatial relations extracted from the textual description for the assignment of georeferences for new toponyms. Thus, the proximity of locations associated with ambiguous toponyms is one of the main criteria to discard alternatives. The annotation obtained after the toponym extraction process can be used to inform about a more precise geolocation, or the topics associated with this toponym. Our proposal is to infer locations from the locations of previously disambiguated toponyms using spatial relations contained in the textual description such as “south of”, “north of” and “between”. However, these spatial inferences cannot be as precise as points with geographical coordinates (latitude/longitude). They are represented by a geographical area which can be refined depending on the spatial information contained in the textual descriptions.

There are three main cases. In the first case there is no explicit spatial information in the text linked with the unreferenced toponyms. In this case, we define a geographical area that contains all the well-located toponyms thanks to the clustering method previously described, on the principle that in the specific context of the description of a displacement, toponyms are related to each other and the geographical entities they refer to are located in the same area. The second case is when explicit spatial relations are associated with the unreferenced toponym. For example, if we know that the unreferenced toponym refers to a geographical entity somewhere south of another one, then we can define a new area that is smaller than the previous one. A third case arises when we have even more information available in the textual description. In this case we can define a much smaller area. For example, if we know that the unreferenced toponym refers to a geographical entity somewhere between two other entities that have already been localized, we can define a small area between these two entities. Spatial relations are very important to determine the geographical context of unreferenced toponyms in order to approximate their location.

#### 3.2.4 *Automatic reconstruction of itineraries*

The objective of our work is to turn a text describing a displacement into a map. As already highlighted, itineraries and displacements are described in natural language using spatial named entities (i.e. toponyms), spatial relations (Bloom et al. 1996; O’Keefe 1996), perception expressions with description of landmarks, motion expressions and trajectories (Talmy 1985, 2000). An itinerary can be defined

as a sequence of displacements between places called waypoints. Waypoints and route are the two main elements involved in the description of an itinerary.

The last part of our processing chain implements the mapping of information extracted from texts. The purpose of the reconstruction of the itinerary is to interpret and link spatial information in order to reconstruct the route which refers to the displacement described. Our proposal is to combine the use of all the information, when available, as criteria in order to find the most likely route linking each step of the displacement. Since the goal is to provide a generic method that can deal with all types of narrative structure describing itineraries, we make the assumption that we do not know the starting and ending points of the itinerary nor the sequence of waypoints. Therefore, the challenge is to find the itinerary that is as close as possible to the real route intended by the authors who wrote the text. In Moncla et al. (2016), we proposed a graph-based representation using geo-coordinates as vertex coordinates. Furthermore, in order to build this representation, we proposed to use a multi-criteria analysis approach and an informed spanning tree algorithm.

We define an itinerary as a Directed Acyclic Graph (DAG),  $G = (V, E)$  comprising a set  $V$  of vertices and a set  $E$  of edges. The edges of the graph represent route segments and the vertices represent locations. Each vertex  $v$  of  $G$  is associated with its real-world location and each two consecutive vertices are connected by an edge. The leaves of  $G$  represent the starting point and ending point and also the points that are not considered as waypoints. The graph contains a main edge representing the displacement and secondary edges representing the relations between waypoints and places not reached during the displacement, such as places seen or described by the narrator. In a more formal way a displacement can be represented as a sequence of waypoints (locations). Each sequence has the form  $(w_1, \dots, w_n)$  where for each  $i < j$ , the  $w_i$  waypoint is reached before  $w_j$ .

Our approach combines local information extracted from the text with physical features extracted from external sources such as gazetteers or datasets providing digital elevation models. This combined spatial and textual analysis aims at resolving some ambiguities and reconstructing the geocoded representation of the route. The aim is to identify waypoints and find the most probable itinerary linking them with a minimal “length”. The term length does not refer only to geographical distance, but also to an aggregated value that takes into account different criteria whose weight will be minimized. This length is a combination of contextual information extracted from the description and geographic information. Finding this optimal itinerary helps to remove ambiguities or places appearing in the text but not actually crossed. The criteria defined in the proposed approach are the following: sequence of the displacement (sequence in which the places appear), geographical distance, effort (steepness of the displacement), orientation and

elevation (comparison of spatial relations extracted from the text with the location of other places), temporality (based on temporal relations extracted from the text), perception and negation.

The proposed approach for automatically identifying the sequence of waypoints and solving ambiguities from a geoparsed text and building an approximation of a plausible sequence of the described displacement has been fully implemented and tested (Moncla et al. 2016). The results of the evaluation are described in the following section.

**Table 1.** Document sets

	French	Spanish	Italian
# of documents	30	30	30
# of words	11297	5549	15724
# of ESNE	638	416	475
Avg. # of ESNE	21	14	16

#### 4. Evaluation

For our experiments we used the multilingual Perdido corpus (Moncla et al. 2016) which is a TEI compliant gold-standard corpus containing 90 hiking descriptions (French, Spanish and Italian) manually annotated. Each document in the corpus describes one trail and is associated with the real trajectory (GPS) of the route. In the present study, real GPS trajectories are only used for the evaluation of the results of the automatic process of itinerary reconstruction. Hiking descriptions are a specific type of document describing displacements using geographical information, such as toponyms, spatial and motion relations, and natural features or landscapes.

Table 1 shows some features of the Perdido corpus. Furthermore, 53% of the occurrences of ESNE are contained within a VT structure and 47% are associated with feature types. Table 2 lists the ten most frequent terms contained by ESNE with their number of occurrences.

Table 3 shows the distribution of verbs in the Perdido corpus and Table 4 lists the ten most frequent motion verbs. About 59% of verbs are motion verbs. Final and medial/internal verbs (in term of polarity) are the most frequent ones and only 3% of verbs refer to verbs of perception. The ten most frequent motion verbs represent about 64% of the occurrences of motion verbs.

**Table 2.** The ten most frequent terms associated with ESNE

French		Spanish		Italian	
col	20	puente	17	rifugio	20
village	20	rio	17	monte	19
hameau	20	pueblo	12	villagio	17
route	17	iglesia	10	masi	15
sentier	15	camino	9	castello	9
chalet	13	barranco	8	lago	8
refuge	11	parque	5	passo	7
pont	11	castillo	3	foce	7
lac	8	barrio	3	chiesa	6
chapelle	8	casa	2	via	5

**Table 3.** Distribution of verbs

<b>Total # of verbs</b>	<b>3366</b>	
# of motion verbs (% of total # of verbs)	1985	(59%)
- initial (% of motion verbs)	174	(9%)
- medial/internal (% of motion verbs)	1181	(59%)
- final (% of motion verbs)	630	(32%)
# of perception verbs (% of total # of verbs)	113	(3%)
# of topographic verbs (% of total # of verbs)	154	(5%)

**Table 4.** The ten most frequent motion verbs

French		Spanish		Italian	
prendre <sup>a</sup>	188	llegar	64	proseguire	44
suivre	100	recorrer	34	seguire	41
traverser	78	seguir	34	raggiungere	29
arriver	71	pasar	31	arrivare	24
continuer <sup>a</sup>	64	tomar	28	attraversare	22
descendre	61	continuar <sup>a</sup>	27	salire	22
passer	60	visitar	21	continuare <sup>a</sup>	20
monter	51	salir	20	scendere	18
rejoindre	44	dirigir	19	portare <sup>a</sup>	18
partir	35	ir	17	percorrere	15

a. Verbs expressing motion when associated with geographical feature such as *prendre le chemin* 'to take the path'



#### 4.1 Named entity recognition and classification

As we saw above, we consider only two types of named entities: spatial and non-spatial, and *ENE* and *ESNE* are considered as described in the previous sections. With respect to the NERC task, we implemented the construction grammars previously described using a hybrid solution combining a POS analysis and a cascade of transducers. The NERC task was evaluated using both manual POS processed texts (POS 100% corrected) and a fully automatic process (automatic POS processed texts). More details about the results of the POS analysis and the comparison of several POS analyzers can be found in Moncla (2015). The configuration for experiments done with manually corrected POS is called *Perdido I* hereafter and the configuration for experiments done with POS automatically processed *Perdido II*. This will enable us to show the percentage of errors introduced during the pre-processing step of our method. In the remainder of this section we will only describe results for the French documents of the corpus; further results about Spanish and Italian documents can be found in Moncla (2015).

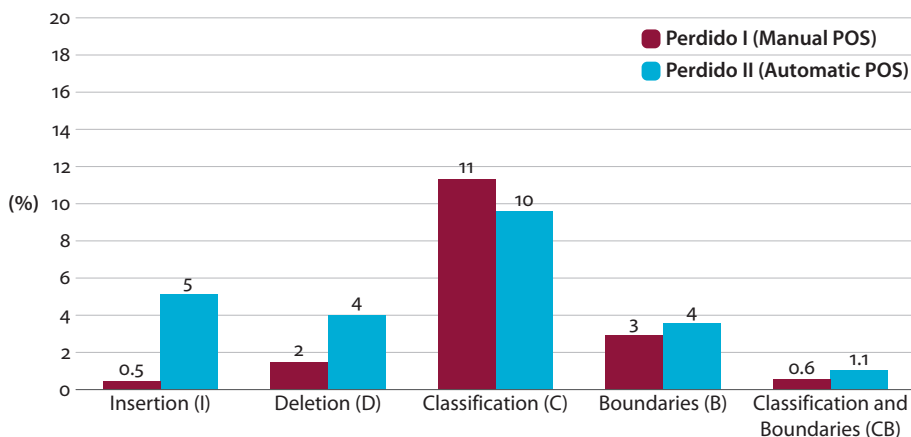
Table 5 shows the number of *ENE* in the annotated French reference corpus that were correctly detected by *Perdido I* and *Perdido II* without any errors, i.e., insertion (I), deletion (D), classification (C), boundaries (B) or classification and boundaries (CB). The column “N” shows the reference number of *ENE* in the French *Perdido* gold-standard corpus. As expected, the *Perdido I* configuration, which is based on a manual POS tagging, obtains better results than the *Perdido II* configuration.

**Table 5.** Number of correctly detected *ENE* with *Perdido I* and *Perdido II* (French)

	N	Perdido I		Perdido II	
level 0	304	235	77%	244	80%
level 1	332	302	91%	280	84%
level 2	20	16	80%	17	85%
level 3	4	0	0%	1	25%
total	660	553	84%	542	82%

Figure 3 shows the comparison of the percentage of slot errors of the *Perdido* NER tools. Each bar on this chart refers to the percentage of errors, thus, the lower the percentages are, the better the results are. Concerning errors of insertion (i.e., false positives), it can be seen that *Perdido II* makes more errors than *Perdido I*. This can be explained by the fact that as *Perdido I* is based on a manually corrected POS pre-processing, there is no ambiguity or mistake concerning which words are proper names or not. The percentage of classification errors refers to the number

of errors over the number of detected entities (i.e., deletion errors are not taken into account in the calculation).



**Figure 3.** Comparison of the percentage of slot errors of Perdido I and Perdido II (French)

Table 6 shows the overall results of the evaluation of the NERC task with Perdido I (Table 6a) and Perdido II (Table 6b). We used the SER metric (Makhoul et al. 1999) which represents the total slot error rate taking into account the different types of errors (i.e., insertion, deletion, classification, boundary detection and

**Table 6.** Evaluation of the NERC task (French)

(a) Perdido I					
	level 0	level 1	level 2	level 3	total
SER	13.6%	5.4%	10%	50%	9.6%
Recall	97.4%	99.4%	100%	100%	98.5%
Precision	99.3%	99.7%	100%	100%	99.5%
Precision classification	81.9%	94%	85%	0.0%	87.6%
Precision boundaries	95.6%	96.4%	95%	100%	96%
(b) Perdido II					
	level 0	level 1	level 2	level 3	total
SER	31.1%	13%	7.5%	37.5%	16.7%
Recall	98%	93.7%	100%	100%	95.9%
Precision	90.9%	98.7%	100%	100%	94.9%
Precision classification	77.7%	92.1%	90%	50%	84.7%
Precision boundaries	86.9%	94%	95%	75%	90.4%

both classification and boundary detection) shown separately in previous tables. Approximately seven percent of the errors are introduced by the POS preprocessing step of our method. However, considering the three levels and all the different types of errors, 83% of correct recognition of ENE is a good score.

We also compared the results of the Perdido method with those obtained with the CasEN system (Maurel et al. 2011). CasEN is a NERC tool for French also based on a cascade of transducers which obtains good results on French newspapers. The Quaero version of CasEN obtained an SER score of 51% over the Perdido French gold-standard corpus. However, results depend on the type of documents, since CasEN obtained an SER score of 29% using newspapers. The comparison with CasEN is described in more detail in Moncla (2015).

## 4.2 Toponym disambiguation

We have proposed a hybrid approach for toponym disambiguation based on a gazetteer lookup method and on the subtyping of toponyms combined with an unsupervised algorithm that applies clustering techniques. For the geocoding experiments we used gazetteers provided by national mapping agencies: BDNyme<sup>2</sup> (France), Nomenclátor Geográfico Básico de España<sup>3</sup> (Spain), and Toponimi d'Italia IGM<sup>4</sup> (Italy). We also used two well-known gazetteers: Geonames and OpenStreetMap. As we have seen, the use of contextual elements such as words that have a geographical denotation (e.g. *downtown*, *valley*, or *ridge*) is very important in toponym disambiguation. We proposed to use the local context of toponyms, when available, to solve structural and referent ambiguities.

As we developed an automatic processing chain, the errors introduced during the NER step are not corrected and are given as input of the next module in the chain. Hence, errors introduced at each level of the workflow are propagated along the process. Thus, the term ESNE “candidates” means that some of the ESNE might not refer to spatial entities.

Table 7 shows the number of ESNE candidates (level 0 or level >0) found in gazetteers with the Perdido I and the Perdido II configurations.

Column (x) shows the number of ESNE candidates annotated from the text documents. Column (y) shows the number of ESNE candidates having one or more results in the gazetteers. Column (z) shows the percentage of ESNE candidates having one or more results according to column (x). The first line (level 0) refers to

2. <http://professionnels.ign.fr/bdnyme>

3. <http://www.ign.es>

4. <http://www.pcn.minambiente.it/GN/>

**Table 7.** Number of ESNE candidates found in gazetteers

		Perdido I			Perdido II		
		(x)	(y)	(z)	(x)	(y)	(z)
level 0	Full name query	218	160	73%	326	244	75%
	National Gazetteer		121	55%		136	42%
	Geonames		94	43%		112	34%
	OpenStreetMap		128	59%		211	65%
level >0	Full name query	368	95	26%	358	77	22%
	National Gazetteer		31	8%		27	5%
	Geonames		11	3%		11	3%
	OpenStreetMap		86	23%		68	19%
	Sub-toponym query		179	49%		197	55%
	National Gazetteer		135	37%		135	38%
	Geonames		104	28%		112	31%
	OpenStreetMap		157	43%		172	48%
	Sub-total		274	74%		274	77%
	Total		586	434	74%	684	518

the queries for ESNE candidates of level 0 (pure proper names), and the second line (Level >0) distinguishes the number of ESNE candidates having results with full name queries and those with sub-toponym queries. It can be seen that about 25% of ESNE candidates of level >0 are found in gazetteers with their full names. Although this number seems low, it shows the importance of considering the hierarchical classification of ENE.

This problem is related to the errors introduced by the classification process and can be explained by the incompleteness of gazetteers and by the fine-grained ESNE expressed in French documents. Furthermore, it can be seen that the gazetteers complement each other. For instance with the Perdido I configuration, whereas 73% of ESNE candidates of level 0 are found with the three gazetteers, only 55% are found with BDNyme, only 43% found with Geonames and only 59% found with OpenStreetMap.

### 4.3 Density-based spatial clustering

As we have seen before, even if referent toponyms are found in gazetteers, there are still some remaining ambiguities. With our cascade of transducers, 1290 toponyms were retrieved over a total of 1380 and the gazetteer lookup method

returned 13057 results. Additionally, in the case of French hiking descriptions in the Perdido corpus and depending on the gazetteer used, between 45 to 70% of the toponyms found are ambiguous. This means that for these toponyms the gazetteers provide more than one result. Figure 4 shows the distribution of the percentage of referent toponyms found in gazetteers for our corpus of experiments (three languages combined). For many toponyms (between 30% and 40%) between 1 and 20 results were found in gazetteers.

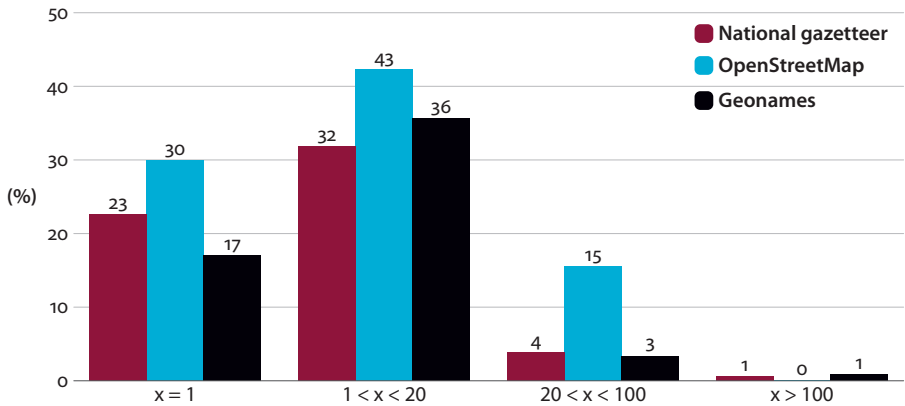


Figure 4. Distribution of the percentage of referents found in gazetteers

In order to avoid this ambiguity we applied the DBSCAN clustering algorithm, which uses the concept of density to determine the neighborhood of a point. At the end of the process, each cluster represents a possible set of points describing the displacement. Once the clustering is complete, our method chooses the “best cluster” based on the heuristic that the best cluster is the one containing the largest number of distinct toponyms.

Figure 5 shows an example of the result of the toponym disambiguation on a French hiking description. The map on the left shows all the referent locations found in gazetteers (each grey level refers to an ESNE), and the map in the middle

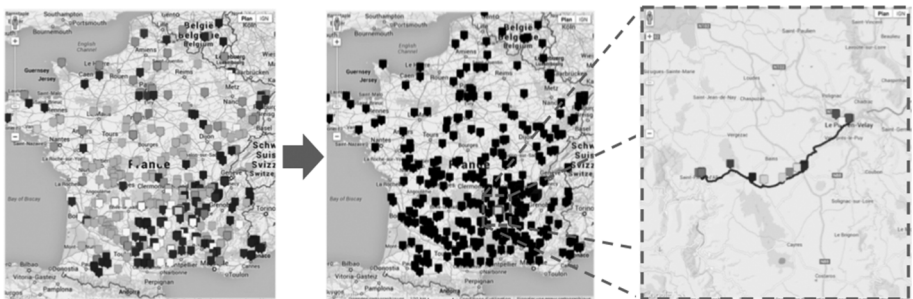


Figure 5. Illustration of referent ambiguity

shows the result after disambiguation (black dots refer to referent ambiguities). Finally, the focus on the right shows that the remaining color dots match the itinerary (the black line represents the real GPS trajectory of the route). Furthermore, the validity of the best cluster for every document proposed by our algorithm was evaluated by comparing the similarity between the point set of each cluster generated and the original point set of the trajectory described in a GPX file. To measure the similarity we computed the convex polygon of the original point set of the trajectory and each cluster with the `ST_ConvexHull` PostGIS function, and then calculated the distance between these point sets using the `ST_Distance` PostGIS function.

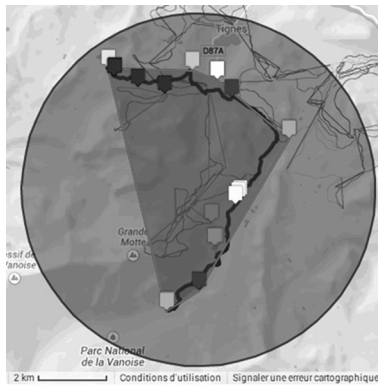
In 88 out of the 90 cases the best cluster suggested by our method was the correct one, that is, the cluster with the best match with respect to the real points in the trajectory. According to the experiments 1290 ESNE were found in geographical resources with 13057 referents. After disambiguation only 719 referents remained. As the numbers after disambiguation are less than the number of retrieved ESNE, this means that some of the retrieved ESNE are not located inside the best clusters.

However, thanks to the comparison with respect to the real trajectory, our experiment has shown that ESNE that are not included in the best clusters (missing points) were in fact not retrieved from gazetteers. Some of these missing points may have one or more referents found in gazetteers but not the actual referent we are looking for. This means that only the points included in the best clusters are well located and that all the points located outside the best clusters refer to referent ambiguities. This points out the problems derived from the lack of coverage in gazetteers and the need to assign a geographic reference to those toponyms not found. For each case analyzed, the missing points were associated with fine-grained toponyms.

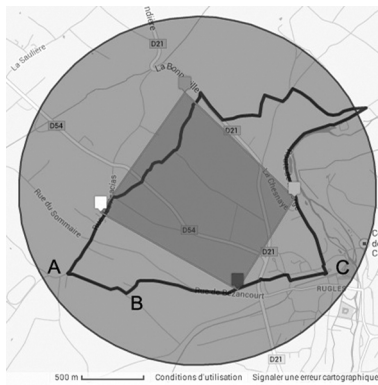
#### 4.4 Geocoding for unreferenced toponyms

As described in Section 3.2.3, in addition to the problem of the automatic reconstruction of itineraries we proposed an approach to infer locations for unreferenced toponyms. The proposed solution combines map-based disambiguation with information about spatial relations extracted from the textual description of the itinerary. This solution provides an approximate and fuzzy spatial footprint for unreferenced toponyms which are not used for the automatic reconstruction of the itinerary but can be used to create or improve gazetteers. We implemented two approaches to define a geographic area where the unreferenced toponyms are supposed to be. The first approach takes into account the geometric outline of the displacement by implementing the convex hull computed with all the toponyms included in the best cluster. The second approach implements the circumscribed

circle around the rectangle of the bounding box and does not take into account the geometric outline of the displacement.



(a)



(b)

**Figure 6.** Refining spatial inferences according to the context

We manually reviewed all the unreferenced toponyms of each document in the corpus. We searched various resources such as web pages or detailed geographical maps to find the real locations of the unreferenced toponyms. When the toponyms were impossible to find, we also used the GPS track available with each document in the Perdido corpus. Furthermore, we removed from the total number of automatically annotated toponyms the ones which were not toponyms (referent class ambiguity) and also the ones which were associated with an expression of perception. These toponyms can be situated far from the real trajectory described and our proposed method is not adapted to locate them. The experiments showed that 485 toponyms were not associated with their geo-coordinates.

After running the experiments, we identified different cases of spatial inference. The first one was the perfect case, that is, when all the toponyms cited in the

textual description were found and were all well located (Figure 6a). The second case was when there were some unreferenced toponyms, and their real locations were located inside the convex hull. The third case was when there were several unreferenced toponyms and when the real locations of these toponyms were not included in the convex hull but were included in the circumscribed circle (see points A, B, and C in Figure 6b). Lastly there were also some cases in which the real locations of unreferenced toponyms were located neither in the convex hull nor in the circumscribed circle. Whereas 267 new toponyms were well located thanks to the convex hulls, 402 were located thanks to the circumscribed circles. Using the circumscribed circle, results are therefore better (in terms of number of toponyms found) than with convex hull. Although the number of new toponyms found increases with the use of the circumscribed circle, the precision of the approximated locations is better with the convex hull (because the spatial area covered is smaller).

To summarize the experiments of disambiguation of the full processing chain, Table 8 shows some global results: the initial numbers of toponyms manually and automatically annotated (excluding toponyms associated with expressions of perception or errors); the number of toponyms located by gazetteers after the cluster based disambiguation; the number of toponyms located by our spatial inference method; and the number of toponyms still unlocated at the end of the process. The experiment shows that the description of the itinerary is very important and helps in finding an approximate location for missing toponyms. Furthermore, we also noticed from our experiments that we need at least 4 or 5 well located toponyms in order to find the best cluster and to propose a good geographic area for unreferenced toponyms.

**Table 8.** Global results of our processing chain

Toponyms	Number
manually annotated	1254
automatically annotated	1249
located by gazetteers	719 (58%)
located by inferences	402 (32%)
unlocated	128 (10%)

## 5. Conclusion

This chapter has proposed an automatic geoparsing and geocoding process that combines information referring to places or spatial relations (such as expressions



of displacement) in French texts and data found in external geographical resources. Our proposal aims at turning textual information written in natural language into GIS data by applying an automatic process. This automatic process builds a geocoded representation of an itinerary from a textual description.

With respect to the annotation of spatial information used to describe displacements, we have devised a shallow parser. The proposal can be seen as a hybrid method where construction grammars are implemented with a cascade of transducers which make use of pre-annotated texts by POS taggers. Such approaches, also known as knowledge-based approaches, were very popular at the end of the 1990s. Later, they were neglected in favor of quantitative or data-driven approaches based, in particular, on machine learning techniques. The rapid growth of computing capacity combined with a considerable number of annotated datasets made available enabled quantitative approaches to achieve tangible results. But so far, for many tasks, knowledge-based approaches have not yet been superseded, at the very most the two approaches are progressively combined. This is particularly true when the task needs to establish the explanation of how it works (see Figure 1 in Section 3.1) and when the context may be complex (Béchet et al. 2011; Nouvel et al. 2012). As a computational synthesis of research on the expression of motion in French, we introduced the construction grammar *VT* which aims at marking and formalizing the relations between *ENE*, geographical terms, spatial relations and motion verbs. With respect to the geocoding part of our method (Section 3.2), we then placed particular emphasis on the problem of toponym ambiguity. That brought us to propose an approach combining a classical named entity classification based on a gazetteer lookup method, and a method for subtyping place names thanks to the use of geographical ontologies or lexicons (in order to determine if all or part of the multi-word expression contained within the *ESNE* matches a geographical concept). Because in several cases the ambiguity remains unsolved, we also found a complementary solution to address the disambiguation problem using the dynamic space context. Our proposal combines a map-based disambiguation method with information about spatial relations extracted from the textual description.

Furthermore, we also proposed an approach (Section 3.2.4) for automatically distinguishing waypoints from other types of locations and identifying waypoints from a geoparsed text. Then, using the list of identified waypoints, our method builds a first approximation of a plausible footprint of the described itinerary. This method for reconstructing an itinerary is based on a multi-criteria approach combining quantitative and qualitative criteria. The combination of criteria (i.e. text distance, geographical distance, effort, orientation, elevation, temporality, perception, or negation) is used to decide among a number of alternatives for the successive displacements.

The benefit of our proposal has been tested (Section 4) for the geoparsing and geocoding of toponyms in a corpus of hiking descriptions and obtained good results in terms of accuracy, precision and recall. The data analyzed in this work seem to indicate that, in French, for a fine-grained task of marking and recognizing toponyms, ambiguity resolution is mandatory. Therefore, to resolve the different categories of ambiguities it is essential to consider as broadly as possible the evocation context, and in particular, the dynamic space context. We have shown that the hierarchical overlapping introduced by the concept of ENE is very helpful to detect a local context associated with a named entity. The local context contained within ESNE, such as feature type, significantly improves the classification process and the disambiguation results, even when proper names are not found in gazetteers. Although it is a simplifying synthesis of the theoretical framework outlined in other contributions to this volume, the VT construction grammar highlights some important aspects of this research.

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Research on the semantics of spatial markers in French is known mainly through Vandeloise's (1986, 1991) work on static prepositions. However, interest in the expression of space in French goes back to the mid-1970s and focused first on verbs denoting changes in space, whose syntactic properties were related to specific semantic distinctions, such as the opposition between "movement" and "displacement". This volume provides an overview of recent studies on the semantics of dynamic space in French and addresses important questions about motion expression, among which "goal bias" and asymmetry of motion, the status of locative PPs, the expression of manner, fictive or non-actual motion. Descriptive, experimental and formal or computational analyses are presented, providing complementary perspectives on the main issue. The volume is intended for researchers and advanced students wishing to learn about both spatial semantics in French and recent debates on the representation of motion events in language and cognition.

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