Spatial semantics: Recent advances

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Abstract: In this paper, we discuss the most recent trends in the study of space and time. We consider four volumes — *Space and Time in Languages and Cultures: Language, Culture, and Cognition* (2012), *Motion encoding in language and space* (2013), *The Spatial Language of Time. Metaphor, Metonymy and Frames of Reference* (2014), and *Space in diachrony* (2017) — that cover a relatively broad set of topics and approaches. The main topics the authors focus on are: language-specific systems of space and time conceptualization, cultural differences in understanding time, space and time (dis)analogy, granularity, frame of reference, verbs of motion, and Source vs. Goal asymmetry. The methods that the contributors apply are versatile ranging from formal and experimental to anthropological participant observation, and lexical typology. Many of the papers collected in these volumes deal with similar problems applying different frameworks to them, which makes it possible to compare how different approaches handle similar problems and thus reveal how they may be combined. This reflects one of the strongest trends in modern linguistics, namely the tendency to conduct interdisciplinary studies that allow to simultaneously view the same data from different angles.

Keywords: frames of reference, Source vs. Goal asymmetry, granularity, spatial relations, TIME-IS-SPACE metaphor, verbs of motion

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Пространственная семантика: новые достижения

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Аннотация: В данной работе рассматриваются тенденции в исследованиях пространственных и временных отношений в языке на основе четырех книг — «Space and time in languages and cultures: Language, culture, and cognition» (2012), «Motion encoding in language and space» (2013), «The spatial language of time. Metaphor, metonymy and frames of reference» (2014) и «Space in diachrony» (2017), — охватывающих широкий круг тем и подходов. Основные темы таковы: концептуализация времени и пространства в разных языках, влияние культуры на представления о времени и пространстве, гранулярность, системы координат в языке, глаголы движения, асимметричное

выражение источника и цели. Используемые в исследованиях методы также очень разнообразны (формальные, экспериментальные, лексическая типология и т. д.) Многие работы демонстрируют тенденцию к междисциплинарным исследованиям: одна и та же проблема изучается с помощью разных подходов и рассматривается с разных ракурсов.

Ключевые слова: асимметрия источника и цели, глаголы движения, гранулярность, метафора «время — пространство», системы координат в языке, пространственные отношения

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Introduction

Over the past decade, the study of space and time has become a highly developed area of linguistics. Space and time as objects of investigation have proved to be fruitful and the methods used to study them are versatile, ranging from formal and experimental to anthropological participant observation, and lexical typology. Most recent studies (e.g. [Janda 2013; Molsing, Ibaños 2014]) combine these approaches and attempt, for example, to find cognitive parallels and explanations for the observed typological data or to conduct a formal semantic analysis of particular space and time expressions.

In this paper, we review studies of space and time that have been conducted over the last 10 years. The most prominent recent studies include, among others, [Evans 2004; 2013] on the definition of what time is and how it functions in language, [Ibarretxe-Antuñano (ed.) 2017] and [Hickmann, Robert (eds.) 2006] on motion and space, [Levinson 2006] on the grammars of space across languages. Since we are limited to the boundaries of a single overview paper, we have chosen four edited volumes for the detailed review: [Filipović, Jaszczolt 2012; Moore 2014; Luraghi et al. 2017], and [Vulchanova, van der Zee 2013], while also providing some additional information about some of the most significant journal papers. The reason for choosing the first three volumes is their interdisciplinarity and the wide range of approaches presented in them; many of the studies presented in these volumes deal with very similar issues but explore them within different frameworks, which allows to explore those topics from various angles and either provide additional support for the results, or point out their controversial nature. The fourth volume has been chosen because it is the first collection of papers devoted solely to granularity in language, which makes it a fundamental work for this line of research.

The authors of these volumes include both worldwide-known linguists and their younger colleagues, and the papers represent well-established frameworks as well as new and highly promising approaches to old issues. The main topics of interest in these volumes are as follows: language-specific systems of space and time conceptualization, cultural differences in understanding time, space and time (dis)analogy, granularity, frame of reference, verbs of motion, and Source vs. Goal asymmetry.

Our review begins with a brief description of notions that are relevant to the study of space and time in the recent 20–30 years. In the rest of this article, each section corresponds to one of the volumes listed above. We start by discussing the most general volumes that cover relatively wide sets of problems and contain papers that use different approaches and frameworks. Then, we proceed to more specific issues that receive special attention in those volumes, such as granularity, frame of reference and diachronic development of spatial expressions across languages.

1. Important notions

TIME-IS-SPACE metaphor. According to the theory proposed by Lakoff and Johnson [1980a; 1980b; 1999], our ability to conceptualize time and encode it in linguistic terms is mediated by a metaphorical mapping of the basic terms used for describing our spatial experience from the domain of space onto the more abstract domain of time. This mapping is argued to be typologically universal and influence the way spatial terms acquire time-related semantics. The TIME-IS-SPACE metaphor and, more widely, the relations between time and space in general have become crucial in the discussion of the cognitive aspects of language functioning and development (see [Clark 1973; Traugott 1978; Langacker 1987; Lehrer 1990; Haspelmath 1997; Heine, Kuteva 2002]).

Verb-framed vs. satellite-framed languages. According to [Talmy 1985; 1991], languages differ in how they encode the information about path and manner of motion. In verb-framed languages, e.g. in Spanish, verbal roots encode the information about the path of motion, cf. Talmy's prototypical example: *la botella salió flotando*, lit. 'the bottle exited floating', where the verb *salió* expresses the path, and the manner is expressed by the gerund *flotando*. In satellite-framed languages, like English, the manner is encoded within the verb and the path is expressed by a satellite, cf. the following example: *the bottle floated out*. Here the verb *floated* only expresses the manner of motion, while the path is expressed by *out*. This typology has been widely discussed in the literature, cf. [Slobin 1996a; 2004; Pedersen, Nimb 2000; Acedo-Matellán, Mateu 2013].

Fictive motion is usually defined as the metaphorical motion of an object through space, when an inherently static situation is conceptualized in terms of motion and encoded by dynamic means. According to Talmy, this phenomenon involves a discrepancy between two cognitive representations (static and dynamic) of the same situation within the cognition of an individual [Talmy 2000a: 100].

Figure and Ground in language. One of the most known definitions of Figure and Ground belongs to Leonard Talmy. He defines the **Figure** as "a moving or conceptually movable entity whose site, path, or orientation is conceived as a variable the particular value of which is the relevant issue". The **Ground** is conceptualized as "a reference entity, one that has a stationary setting relative to a reference frame, with respect to which the Figure's site, path, or orientation is characterized" [Talmy 2000a: 184].

Frames of reference (FoR) are coordinate systems, used by speakers for identifying the location of an object and representing spatial relationships. [Levinson 2003] proposed a threefold FoR system, recognizing intrinsic, relative and absolute FoRs. In the intrinsic FoR, the coordinate system is projected from the Ground, i.e. this relation is binary and view-independent (*This man is in front of the house* means that the location of the Figure (*man*) is determined as a projection from the inherent front part of the Ground (*house*)). The relative frame of reference is ternary, based on the Observer (the location of the Figure in *The ball is in front of the tree* is determined in terms of the Observer's, rather than Ground's front, as the Ground (*tree*) is symmetrical and has no intrinsic front). The absolute frame of reference expresses a relation between the Figure and the Ground using a system of fixed absolute points (e.g. cardinal directions). Spatial FoRs have become a critical issue in discussing linguistic relativity, since languages tend to conceptualize and describe space differently (see [Pederson et al. 1998; Levinson et al. 2002; Li, Gleitman 2002; Majid et al. 2004; O'Meara, Pérez Báez 2011]).

Granularity. Establishing common spatial scale or grain allows speakers and hearers to share understanding of the sizes of objects and distances of places under discussion. As [Talmy 1983] pointed out, spatial scale in language depends primarily on the objects being talked about rather than on structural linguistic properties. This has been demonstrated in studies, where participants had to estimate the distances described in sentences like *A secretary is just approaching* ***the flower stand*** and *A secretary is just approaching* ***the department store*** [Morrow, Clark 1988].

The estimated distance between the secretary and the building increased in the second case. Until recently, there has been few discussion of granularity in linguistics. This lacune is filled by the the second part of the volume edited by Vulchanova and van der Zee [2013].

Goal vs. source asymmetry. A vast number of studies address the observation that some semantic roles seem to be more "basic" than others and especially highlight the prevalence of goal over source (see [Ikegami 1987; Lakusta 2005; Papafragou 2010; Kabata 2013]). For instance, goals of motion are in general more frequent than sources and are expressed with more details, goal and location are more often encoded by the same marker than source and location.

2. Space and Time in Languages and Cultures: Language, Culture, and Cognition

The *Space and Time in Languages and Cultures* [Filipović, Jaszczolt 2012] volume is a diverse collection that combines papers in three main frameworks: linguistic, cultural, and cognitive. The first part of the volume deals with linguistic and conceptual representation of motion events.

2.1. "Linguistic and conceptual representation of events"

The part begins with "Event-based time intervals in an Amazonian culture" by Vera da Silva Sinha, Chris Sinha, Wany Sampaio and Jörg Zinken. In this paper, the authors discuss cross-linguistic universals in humans' perception of time as well as the cross-linguistic variability of this phenomenon. The authors employ ethnographic and experimental methods to investigate the conceptualization of time in Amondawa, a Tupi language of Amazonia. The experiment conducted by the authors has shown that there are no time-based interval systems, no lexicalized concept of "time as such", and no practices of "time reckoning". These results allow to raise a question about the universality of the "time as such" concept as well as the universality of time perception in different cultures.

In the second paper of the volume "Vagueness in event times: An epistemic solution", Minyao Huang investigates vagueness in the temporal boundaries of events. The aim of the article is to select a proper theory for studying vagueness. After a careful examination of three different frameworks: **Supervaluationism**, **Fuzzy Logics** and **Epistemicism**, the author concludes that Epistemicism remains the only framework applicable to temporal vagueness.

In "Aspectual coercions in content composition", Nicholas Asher and Julie Hunter investigate the encoding of temporal information in lexical aspect and the contextual changes that may happen to this information. In particular, they address the interaction between temporal information in aspect and other types of information such as lexical input, modality, and adverbial modification. These three types of interaction comprise a problem for standard compositional semantics, because the standard homomorphic mapping from syntax to semantics and the simple use of function application does not suffice for an adequate analysis. Using the **type composition logic** introduced in [Asher 2011], the authors sketch a formal theory of lexical meaning and show that it can be successfully applied to the problem of aspect coercion. The approach used by the authors allows to put the problem of coercion (not only aspectual) into the context of modern dynamic semantics and provide a simple answer to previously unanswerable questions.

Though the analysis that the authors propose is clear from the formal point of view, there remains a question whether such a heavy transformation does indeed happen every time in such a huge number of cases. The question is whether in the examples like *James enjoyed the book* the shift between types does actually happen. Since examples like this are numerous and likely

to occur with extremely high frequency in humans' speech, applying such a process would be extremely costly and uneconomical for the human brain and thus needs additional evidence.

A possible test for this analysis could be a neurolinguistic experimental study of coercion, e.g. an eye-tracking or a self-paced reading experiment. Since coercion is an additional change of the semantics of the utterance, it would result in a higher memory expenditure and longer processing as compared to the ones without coercion. A positive result of such study would allow this analysis to escape the purely formal domain and to support the reality of cognitive processes.

In the last paper of Part 1 called "Back to the future: Just where are forthcoming events located?", Alan Wallington considers the use of location metaphors in referring to the future tense. The article argues that mental interaction can be metaphorically viewed as physical interaction and thus the location of an event allows one to determine the degree of epistemic detachment from the event. Further, the author argues that the degree of epistemic detachment serves as the conceptual basis for temporality.

The article poses several interesting questions, such as: if the TIME-IS-SPACE metaphor is valid, then what are the properties of space that are also characteristic of time? Is time-related lexicon a reduced version of space-related lexicon or are they two intersecting sets? If time is space, then how is this space organized, e.g. how many dimensions does it have and how can the distances be measured? Interestingly, the authors show that time is indeed space, but it is not similar to the one we actually live in and are used to: the number of suggested dimensions is different as well as specific types of movement are restricted. Raising such questions may be fruitful for the study of metaphor, since the sets of properties shared by the source and target domains may uncover peculiar principles of how human cognition works and how metaphors actually function. This in turn may lead to the classification of metaphors and a better understanding of what semantic components may underlie metaphor and how those components can be combined.

2.2. "Cultural perspectives on space and time"

The second part of the volume called "Cultural perspectives on space and time" begins with "The 'Russian' attitude to time" by Valentina Apresjan. In this paper, the author discusses two temporal constructs in Russian: 1) events do not usually happen when they had been planned to and 2) if two unrelated events happen at the same time, there is some fateful connection between such events. By looking at the pragmatic properties of the construction "X to X" (e.g. *minuta v minutu* lit. 'minute to minute' meaning 'to the minute') and its English equivalent, Valentina Apresjan shows that the interpretations of the construction in Russian and in English are different, which she attributes to cross-cultural differences in attitudes to events.

Culture-specificity in understanding temporality is also the subject of Bernard Charlier's paper titled "Two temporalities of the Mongolian wolf hunter". Using an ethnological approach, he describes what he calls "temporalities" of Mongolian wolf hunters and points out that this domain is not uniform for them as they have both cyclical and single-event-based temporalities. Then, the author discusses wolf hunting as a culturally significant temporal anchor and describes the extremely diverse set of concepts Mongols have for describing different types of "fortune" with respect to the wolf hunting.

The third article titled "Koromu temporal expressions: Semantic and cultural perspectives" by Carol Priestley considers time expressions in Koromu, a Papuan language. Using a *(neo-) Wierzbickian* ethnolinguistic tool known as the Natural Semantic Metalanguage, or NSM (see [Goddard, Wierzbicka 2002]), the author shows that several Koromu temporal expressions represent exponents of the proposed universal semantic primes of the NSM, which allows comparing the meanings of culture-specific temporal expressions in Koromu. The implications that

the author proposes are that this method could serve as "an agreed common unit of comparison (tertium comparationis)" and thus be applied for typologically diverse languages.

The second implication of the article is that some semantic molecules may be found in many languages, while others are shown to be key parts of the semantic domain in a particular language and may be absent in other languages. The authors conclude that this is a "rich area for further rigorous study".

In "Universals and specifics of 'time' in Russian", Anna Gladkova also employs NSM to demonstrate that Russian words *vremja* and *sejčas* are the exponents of the primes TIME and NOW, while the close-in-meaning terms *pora*, *teper'*, and *nynče* are semantically complex. The paper also articulates the culturally salient attitudes to time in Russian, such as "change", "persistence", "things being outside people's control". Interestingly, these findings overlap with the ideas of Valentina Apresjan's article from the same volume. Thus, using completely different research techniques, both authors arrive at the same idea of "external forces", "destiny" and lack of control as important characteristics of time in the Russian culture. This case illustrates how seemingly unrelated problems seen/treated from completely different angles may lead to similar conclusions thereby supporting and amplifying the implications made by the authors.

The applications of NSM described in the articles by Priestley and Gladkova demonstrate that it is indeed a useful tool for language comparison and lexical typology. The notion of semantic molecules, however, is quite vague as they appear to be a mere shortcut that can be defined (and thus substituted) by a longer prime-based definition. First, according to the definition of semantic molecules, any concept that is not a prime can be proved to be a molecule as there always is a more specific notion (e.g. 'eagle' is a molecule of 'bald eagle', 'bald eagle' is a molecule of 'American bald eagle', etc.). Second, unlike molecules in chemistry, semantic molecules do not obtain any new properties compared to the set of primes they consist of. Semantic molecules indeed allow a linguist to write *'eagle'* instead of an extensively long definition, which makes definitions more human-readable. However, they do not really make this unit different in nature. Thus, semantic molecules are a useful annotation tool, but they hardly are a real conceptual innovation.

2.3. "Conceptualizing spatio-temporal relations"

Part 3 of the volume focuses on the cognitive aspects of space and time perception. The part opens with Ronald Langacker's "Linguistic manifestations of the space-time (dis)analogy". Logically, the part continues the line of research of the previous part but uses a different methodology; the author aims at comparing the properties of space and time and points out that though space and time can plausibly be treated similarly, time appears to have a special status and be different in nature. This, however, raises another question: if time and space are closely connected, what is more basic? This problem is solved by distinguishing two different roles of time: time as an object of conception and time as a medium of conception. Langacker argues that time is more basic as a medium of conception, but space is more basic as an object of conception. Thus, the dynamic conception of space proposed by Langacker, "...through time, makes possible the metaphorical conception of time itself, in terms of space. Activity through processing time, by the subject of conception, allows the apprehension of space, which in turn allows the apprehension of time as an object of conception" [Langacker 2012: 214].

Thus, rather than answering the questions outlined by Alan Wallington, Langacker's paper questions their validity. Instead of taking the basicity of space for granted, the author makes it into a subject of analysis and arrives at some highly non-trivial conclusions making the discussion of space and time (dis-)analogy more precise and promising.

Langacker's paper is followed by "Vectors and frames of reference. Evidence from Seri and Yucatec" by Jürgen Bohnemeyer and Carolyn O'Meara. Using the data from English and two

indigenous languages of Mexico, Yucatec Mayan and Seri, the authors show that frames of reference play an equally important role in representations of the orientation of entities as they do in representations of their location and direction of motion. They propose that orientation is conceptually encoded in terms of vectors, which are a separate type of primitive conceptual function. The authors introduce two classes of FoRs: the first class corresponds to the classical "angular-anchored" FoRs, while the second includes previously unrecognized "head-anchored" FoRs. The authors show that languages differ with respect to which type of FoR is dominant.

The paper titled "Verbal and gestural expression of motion in French and Czech" by Kateřina Fibigerová, Michèle Guidetti and Lenka Šulová investigates the relations between "framedness" of a language and the co-speech gestures. The analysis conducted by the authors reveals that, though the two languages are differently framed in Talmy's sense, French and Czech gestures are far more similar than expected.

The procedure described in the article does not take into account any cultural parameters of gesturing in each language, such as e.g. acceptability of intensive gesturing, which may have an impact on the results of the experiment. A simplistic example could be the following: for a speaker of Russian, intensive gesturing may seem awkward and not polite, while for an Italian speaker intensive gesturing is a fully appropriate type of behavior. The difference between Czech and French thus may arise from similar cultural differences and not from how their languages are framed. This factor can be tested by conducting a similar experiment with two languages that are same-framed, but whose gesturing cultures are different.

The article by Fibigerová, Guidetti and Šulová follows a very interesting and relatively recent line of research that concerns co-speech gesture. A range of journal papers investigate similar issues and underline the importance of both linguistic and extralinguistic factors in the discussion of spatial and temporal co-speech gesture. Below we briefly outline two papers published in *Frontiers in Psychology* that support the idea that it is important to include a discussion of cultural issues into the research of FoR and co-speech gesture.

[Le Guen et al. 2012] explore the connections between FoR and temporal and spatial gestures in Yucatec Maya. They show that though the spatial frame of reference in Yucatec Maya is geocentric, which is especially visible in their use of spatial gesture, time is not mapped onto a geocentric axis. The authors argue that, rather than being a basis for time mapping, the use of a spatial geocentric FoR in Yucatec Maya seems to inhibit it. The Yucatec Maya expression of time in language and gesture fits the more general cultural conception of time as cyclic. The authors' findings thus support the idea that gesture in a particular language may be determined by a rather wide set of cultural and linguistic features, which proves that treating FoR as a single source of influence may be inappropriate.

Levinson and Majid [2013] discuss a similar issue in Yélî Dnye, an isolate language spoken offshore from Papua New Guinea. In Yélî Dnye, time is anchored to the time of speaking, with days being defined with special words for *n* days from the utterance time. Consequently, the metaphor from space to time is not commonly used. The co-speech gesture system, on the other hand, uses pointing to sun position to indicate time of day and may make use of systematic timelines thus creating a mismatch between what speakers say and what they gesture. The experiment conducted by the authors showed that there is no single axis used for mapping time to space. The authors thus conclude that the universality of the metaphor from space to time may be questioned. Another important finding of this paper is the mismatch between speech and gesture, which, once again, underlines the importance of including cultural research into the discussion of FoR and gesture.

The next article of the volume titled "Language-specific effects on lexicalisation and memory of motion events" by Luna Filipović and Sharon Geva continues the discussion of verb- vs. satellite-framed languages and deals with language as a factor in the construal of dynamic spatial relations. In their experiment, the authors compared color and motion recognition in English and Spanish speakers and demonstrated that English speakers recognize motion events better than color conditions, while Spanish speakers perform equally on both conditions. The results

of this study reveal the cognitive parallel of Talmian verb- vs. satellite-framed typology. The difference between the performance of Spanish and English points out that path and manner may be stored differently in their memory, which results in better recognition of motion events in the speakers of satellite-framed languages.

Memory has also received attention in "Space and time in episodic memory" by James Russell and Jonathan Davies. The article focuses on episodic memory, i.e. the conscious recollection of an autobiographical episode. The authors conduct an experiment, in which children aged between 14 and 48 months had to repeat the actions of an experimenter. The experimental task involved a "Tim and Tom box", a toy with two levers and two sailors drawn on it. The task was to "help" the two sailors and repeat the actions of the experimenter. The authors show that children begin to be able to bind the spatiotemporal elements of a recollected event to the semantic elements ("What?", "Where?", and "When?") and fully recall the event at about the age of two-and-a-half, with this ability becoming well-established at the age of 3.

Next, Grzegorz Drożdż in "Conceptualising the present through construal aspects: the case of the English temporal constructions" applies the tools of Langacker's Cognitive Grammar and illustrates how structured temporal concepts and temporal constructions interact with each other in English. Drożdż investigates the temporal distinctions that are relevant for the understanding of temporal boundaries of the present in English and points out that though both past and future boundaries of the present exist, they are essentially different in nature. While the past is accessible for the speakers, there are no constructions denoting processes beyond the future boundary, i.e. when talking about the future, English speakers do not use any construction that would specifically refer to the future.

The results obtained by the author are valuable in the sense that they apply a new framework to a well-known range of problems. However, the author arrives at the same conclusions as the previous scholars, namely that English only distinguishes past and non-past in the sense that it does not have any grammatical means of referring to the future irrespectively of past or present. The problem is that this is a relatively well-known fact and its mere existence is hardly in need of any additional proof, which in turn makes the contribution made by this article much more limited than it could possibly be.

The volume concludes with an article by Marlene Johansson Falck, "From perception of spatial artefacts to metaphorical meaning", in which she combines a psycholinguistic investigation of mental imagery for paths and roads with a corpus linguistic analysis of the terms *path* and *road* in English. This paper continues the line of research established in Part 2 of the volume and is methodologically connected with the papers by V. Apresjan, A. Gladkova and C. Priestley. Using a psycholinguistic survey of people's mental imagery for paths and roads, the author investigates whether the constructs in mental imagery focus on similar aspects as those in metaphorical language. The study shows that mental imagery and metaphorical language are more restricted than non-metaphorical language. The focus in metaphors is mostly on function, which influences both direction and manner of motion.

3. The Spatial Language of Time. Metaphor, Metonymy and Frames of Reference

In his book *The Spatial Language of Time. Metaphor, Metonymy and Frames of Reference* [Moore 2014] , Kevin E. Moore investigates space-time interactions in language and cognition. Since a detailed review is already available (see [Jódar-Sánchez 2015]), in this short section we will just outline Moore's approach to some problems, examined in the volume *Space and Time in Languages and Cultures*, which has been reviewed in the previous section. The author relies on the Conceptual Metaphor Theory and postulates a number of spatial metaphors construing time in spatial terms. At the same time, he avoids direct mapping of spatial and

temporal concepts and highlights the distinct nature of time illustrating it by his theory of temporal frames of reference (FoR). The FoRs adopted for the time domain are grouped into clusters, called ego-perspective, field-based, Mover-based and scenario-based. In contrast to Evans [2013: 127–141], Moore does not include extrinsic FoRs (fixing an event with respect to the system being used, such as clocks or calendars). He concentrates on the FoRs that are related to location and motion in space.

The main feature of an ego-perspective FoR in time is the ego's deictic origo ('now') and translational motion of a Figure relative to a Ground through a path. It can be illustrated by the metaphors of Moving Ego (*We are approaching the end of the week*) and Ego-centered Moving Time (*The end of the week is approaching*). The Moving Ego metaphor is claimed to correspond to the factive (real) motion in terms of Talmy's theory [Talmy 2000a: 99–175] and the Ego-centered Moving Time — to the fictive motion.

Ego-perspective FoRs also allow for indirect participation of ego, when the orientation of the Ground depends on ego's perspective. Such strategies are called ego-aligned and ego-opposed and are claimed to function as a temporal counterpart of a spatial relative FoR. The ego-opposed (mirror image) strategy is illustrated by the Wolof word *gannaaw* (lit. 'back'), which can mean both 'past' and 'later than'. For example, *gannaaw ëllëg* ('back tomorrow') means 'the day after (literally 'behind') tomorrow'. Moore argues that this construction can be interpreted in terms of the ego-opposed locational strategy, where ego projects not her own, but the hearer's orientation onto a Ground. In contrast, in the case of ego-aligned strategy ego projects her orientation onto the Ground, so the Future is interpreted as being in front.

In a field-based FoR, Figure and Ground do not move relative to each other, hence, here we deal with unchanging temporal relations that do not depend on ego's perspective and have no tendency to be deictic. Two metaphors are claimed to presuppose this kind of FoR. The first one — SEQUENCE IS RELATIVE POSITION ON A PATH — implies single-direction motion of all entities within the FoR (e.g. *Spring follows winter*). Another metaphor — SEQUENCE IS RELATIVE POSITION IN A STACK — is structured by vertical put-on relations and illustrated by Wolof examples (in this Niger-Congo language the idea that Tuesday follows Monday is expressed as "Tuesday is put on Monday"). Such contexts were previously classified as ego-perspective, in terms of Ego-centered moving time metaphor (see [Clark 1973; Lakoff, Johnson 1980a; 1980b]). Moore challenges this analysis and puts forward a perspective-neutral, field-based conceptualization, adducing a detailed evidence for distinction between ego-centered and field-based metaphors. There exists an empirical corroboration of Moore's hypothesis: a fundamentally allocentric time construal strategy is attested among the Yupno of Papua New Guinea (whose language makes extensive use of allocentric topographic terms also for describing spatial relations). According to the study of gestures, the past in this community is associated with the downhill of the valley and the future — with the uphill (see [Núñez et al. 2012]).

Another frame of reference mentioned in the study is called "Mover-based"; it is presupposed by the metaphor SITUATION IS A MOVER (e.g. *The candle burned from dusk to dawn*) or by TIME IS A MOVER (e.g. *Time marches on*). This FoR is consistent to coextension path type of fictive motion in spatial relations (e.g. *The road runs along the river*; see [Talmy 2000a: 138; Matlock et al. 2005]).

The aforementioned FoRs are classified as path-configured and are contrasted to a scenario-based frame of reference presupposed by Other-centered Moving Time metaphor (e.g. *Summer found Vincent in Paris*). Such examples do not involve path semantics, and the author classifies them as a change of state. The Wolof data provide a number of productive examples of this strategy: the word *fekk* 'become collocated with' is used in everyday speech both in spatial and temporal contexts.

Thus, although spatial concepts are not simply transferred to the time domain, the author resorts to direct analogies (e.g. with fictive motion or with the relative FoR). Nevertheless, the research is a significant contribution to understanding what spatial conceptualizations are relevant for the temporal relations and how people in different cultures construe and express temporal

concepts. One of the most important Moore's contributions is the clear distinction of temporal relations 'future-past' and 'earlier-later' in terms of the reference points: the former is based on the ego's perspective, whose location corresponds to 'now', whereas in the latter another event functions as a reference point.

4. Motion Encoding in Language and Space

The volume *Motion Encoding in Language and Space* edited by Mila Vulchanova and Emile van der Zee [2013] investigates how motion is encoded in spatial language, i.e. those parts of natural language that describe aspects of perceived space (see also [Carlson, van der Zee 2005]). Part 1 titled "Motion Encoding across Languages: Multiple Methods and Applications" discusses the parameters that influence the expression of motion as well as the representation of direction in language. Part 2 titled "Granularity" addresses granularity of motion representation, which is a relatively new and therefore not very developed area of study.

4.1. "Motion Encoding across Languages: Multiple Methods and Applications"

The article "Distinctions in the linguistic encoding of motion: evidence from a free naming task", by Mila Vulchanova, Liliana Martinez and Valentin Vulchanov concerns the verbs of biological motion in five languages: Bulgarian, Russian, English, Norwegian, and Italian in order to show that the linguistic encoding of motion may be based on a system of conceptual features which reflect physical parameters acknowledged to influence motion categorization both in visual perception and in linguistic semantics. Using a free naming experimental task, the authors point out that these features are **medium**, **phase**, **velocity**, **posture**, **method of propulsion**, **species**, **path orientation**, and **figure orientation**.

In "The encoding of motion events in Estonian" Renate Pajusalu, Neeme Kahusk, Heili Orav, Ann Veismann, Kadri Vider and Haldur Õim aims at finding out which regularities prevail in the structuring and categorization of the spatial characteristics of motion events in Estonian. The methodology of the paper is based on Slobin's "Thinking for speaking" hypothesis [Slobin 1996b]. Using corpus methods, the authors examine various ways of expressing Goal, Source and Location. The main findings of the article are the following:

a) goal is most frequently encoded;
b) three-dimensional local cases are more frequent;
c) adverbs denoting goal are extremely frequent.

The article "Verbs of aquamotion: semantic domains and lexical systems", by Yury Lander, Timur Maisak and Ekaterina Rakhilina examines the expression of motion/being in a liquid medium. Using a convenience sample of 50 languages, the authors attempt to build a typology of aquamotion systems. They propose a scale of "poor", "medium", and "rich" with respect to the degree of the lexical elaboration of the aquamotion semantic field. The typology is based on the distinction between SWIMMING, SAILING, DRIFTING, and FLOATING. The authors argue that this distinction mirrors universal tendencies in conceptualization of aquamotion, since it is based on similarities between unrelated languages and its manifestations occur frequently across languages.

The articles by Pajusalu et al. and by Lander et al. are exemplary studies conducted within the lexical typological approach. The authors show how combining lexical semantics and typology allows to identify the parameters that are relevant for the use of verbs of motion across languages and thus to investigate the conceptualization of this semantic domain in the human

mind. Another advantage of this approach is that it allows to study the limitations on the combinability of particular meanings within a single lexeme, which may be important for the study of cognitive processes. However, this kind of investigation is hardly possible at the moment as it requires a significant amount of preliminary research that is still to be done.

The following two articles consider the language people use when giving directions. In "Spatial directionals for robot navigation", Andi Winterboer, Thora Tenbrink and Reinhard Moratz focus on directed motion and how it is encoded in spatial language. The authors discuss a series of experiments where participants give instructions to a robot so that it reaches a goal. The experiments point out that people spontaneously use more direction instructions (e.g. go left) compared to goal-based descriptions (e.g. go to the black cardboard box), and that the efficiency of their direction-based instructions improved when some basic changes were made to the robot's lexicon and its possibilities for moving around, thus allowing the robot to recognize more expressions and allowing the instructions to be briefer.

The results obtained by the authors may have been determined by Grice's maxims. Since the speakers are not aware of the robot's lexicon, they tend to avoid concepts that may be unintelligible for a robot in order to make the communication successful. Since the same object can often be described differently, e.g. *a box*, *a black box*, *a big black box*, *a black cardboard box*, etc. and directions can only be described in terms of, roughly, *left*, *right*, *straight on* and *back*, the speakers may decide to sacrifice precision and use the directionals that seem to be more basic than object names. Therefore, the results of the article may indeed reveal the particularities of how English speakers talk to those whose lexicon they consider to be limited (e.g. robots or foreigners) but do not shed any light on the way they give such instructions to each other.

The article titled "The role of structure and function in the conceptualization of direction", by Alexander Klippel, Thora Tenbrink, and Daniel R. Montello continues the same line of research and analyze how native English speakers describe the route of an imagined cyclist on a map. The authors mainly focus on the verbs and prepositions that are used for describing points where the direction of the cyclist's movement changes. One of their interesting findings is that at complex junctions participants use ordering concepts (e.g. *take your* ***second*** *left*) instead of using prepositions with modifiers (e.g. *go* ***slightly*** *left*). These results are in contrast with their previous findings related to object location, where participants use modifiers in order to locate a Figure in relation to a Ground object (e.g. *It is left behind Y*).

This article is another illustration of Grice's maxims. The only difference from the previous article is that the speakers in this experiment are sure that they will be properly understood. Since instructions have to be as sharp and clear as possible and there is no reason to sacrifice precision, the speakers choose the most informative way of instruction. Considering the examples of *slightly left* and *second left*, in the case of a complex junction or a roundabout it is much less clear what *slightly left* is than what *second left* is.

4.2. "Granularity"

Until recently, there have been few discussions about granularity of motion representation across languages. Part 2 of the volume under review aims at filling this lacuna and collects a unique series of papers that deal with this phenomenon. Starting with a review paper by Jeffrey M. Zacks and Barbara Tversky on the role of granularity in humans' cognition, the part proceeds to other papers that link granularity with motion encoding.

The part begins with the paper "Granularity in taxonomy, time, and space" by Jeffrey M. Zacks and Barbara Tversky, where the authors provide an overview of the notion of granularity in several areas of cognition and relate this notion to language.

Then, Miriam van Staden and Bhuvana Narasimhan use Zacks and Tversky's work to distinguish three different notions of granularity: i) the encoding of event boundaries at the clausal

level, ii) the expression of elements within an event, and iii) the level of specificity at which the elements in (ii) are expressed. They show that in the events of caused motion into containment, the event boundaries at the clause level and the degree of the event characterization in terms of its constituent elements may vary considerably.

"Granularity, space, and motion-framed location" by Mark Tutton binds the two parts of the volume and discusses "motion-framed location", i.e. the use of motion to encode a sequential locative relationship. The author considers spatial relations between stationary objects and shows that the ways motion-framed locative prepositions set the spatial scene are significantly different from how this is done by static locative prepositions. The factors that Tutton argues to be critical for the felicitous use of sequential *before* and *after* are size of space, manipulability of objects, and extended path of motion.

In "Path and place: the lexical specification of granular compatibility" Hedda R. Schmidtke introduces formal tools for representing granularity-dependent notions such as 'point-like' or 'proximity'. The author proposes formal notions of **focus regions** and **grains** to link the descriptive, spatially static lexical specification to the procedural, spatially dynamic interpretation for the tasks of localization and route following. Using the data on German spatial adverbs *entlang* 'along' and *vorbei* 'past', Schmidtke demonstrates how her formalism can be applied to the compatibility restrictions of spatial granularity.

In "The lexical representation of path curvature in motion", Urpo Nikanne and Emile van der Zee consider verbs of motion that encode curvature (such as *to zigzag*) in Finnish and Dutch. The authors introduce a set of path-curvature features in (Finnish and Dutch) verbs that express these distinctions. They further use these data to create a typology of expressing curvature and point out that it can be expressed neutrally, globally, or locally. After that, they prove that Dutch and Finnish grammars are sensitive to these distinctions.

Taking together the articles by Pajusalu et al., Lander et al. and H. Schmidtke, we arrive at an extensive description of features that are relevant for verbs of motion. Importantly, those features are not mutually exclusive, which makes a set of possible options very diverse. The reality, however, is different and not all the features appear to be combinable, e.g. there seems to be no aquamotion verb that would mean 'to zigzag in water' as well as there is no separate verb of 'moving under the ground' (e.g. for the types of movement worms and moles use). It thus appears that adding the 'aquamotion' component somehow excludes the possibility to add the 'curvature', while moving in a medium other than water does not allow to specify whether the movement happens through the medium, on the surface of the medium or somehow else. Therefore, further study of these parameters can examine combinability of the features presented in this volume and make implications concerning what meanings can be expressed simultaneously within one verbal root.

5. Space in Diachrony

Another issue that has received much attention in the last years is the possible asymmetrical nature of spatial relations and the Goal bias (see Section 2 of this paper). However, this issue is mostly examined from a synchronic perspective, whereas a lot of underlying diachronic processes remain understudied. A number of studies applying diachronic approach to this issue have recently been collected and published in the volume *Space in Diachrony* [Luraghi et al. 2017]. The studies are based on the corpus data of Ancient and Modern Indo-European languages, as well as some minority languages and dialects from other families in a diachronic perspective.

The paper by Thanasis Georgakopoulos and Petros Karatsareas deals with the problem of zero marking based on the Modern Greek varieties of Asia Minor. Cross-linguistically, Goals are zero-marked more frequently than Sources [Stolz et al. 2014]. Modern Greek data enable us to observe the emergence of zero marking in a historical perspective. The authors divide the varieties

into three groups: conservative (Source and Goal are encoded by prepositions), intermediate (Source is encoded by prepositions, Goal allows both overt and zero marking) and innovative (Source is encoded by prepositions, Goal is zero-marked). The analysis shows that Goal, a more frequent semantic role with a higher rank on the markedness hierarchy (i.e. less marked), gradually becomes less complex than Source; then, based on these data, they hypothesize that the Goal zero marker is more likely to emerge than that of Source. Thus the Modern Greek data corroborate the predominance of Goals over Sources. In the remainder of the article, the authors introduce one peculiar exception from this rule. In the Silliot variety of Modern Greek, the Source marker expresses both the Source and the Goal functions and the Goal-Source asymmetry works in the opposite direction, which drastically contradicts the Goal bias hypothesis.

The factor of frequency of Goal constructions may also affect the entrenchment of Goal-associated expressions and lexical items. Diana Lewis investigates the diachronic development of the Modern English directional particle *away*, which is claimed to be in decline and gradually replaced by the particle *off*. She assumes that the Goal bias could have influenced this shift and predicts that "Verb + *off*" combinations are more frequent with Goals, whereas "Verb + *away*" constructions are mostly followed by Source expressions. The corpus-based analysis of "Verb + *away*" and "Verb + *off*" distribution supports this hypothesis; however, the author puts forward alternative explanations, such as inflation — prevalence of a "stronger" (less frequent and newer) expression over the regular one (see [Dahl 2001]), or the fact that *away* became widely associated with Location. Cross-linguistically, the identical encoding of Source and Location is relatively infrequent, but not impossible (see more in [Nikitina 2009]).

Chiara Zanchi approaches the problem of Goal vs. Source asymmetry from a different angle. By analyzing the synchronic behavior and diachronic development of Ancient Greek Source and Goal preverbs, which partially contradict the typological data, she shows that the Source preverbs are more grammaticalized than Goal preverbs. The Goal-Source asymmetry is also examined in Silvia Luraghi's paper. She discusses the differential marking of Goal and Source in Ancient Greek, exploring their development in the Homeric poems (8th century BC) and Herodotus' Histories (5th century BC). According to Luraghi's data, animacy-based differential marking of Source emerged earlier than that of Goal. Nevertheless, both authors do not reject the Goal bias hypothesis, but rather suggest language-specific explanations of these phenomena.

A number of papers in the volume investigate the connections between the Source-Goal asymmetry and the aforementioned patterns of describing motion events (verb-framed or satellite-framed; see [Talmy 2000a; 2000b]). Elizabeth Gilbert Sotelo examines the Goal over Source problem based on Spanish Source and Goal prefixes; here the asymmetry is observed in the productivity of morphemes. The Source prefix *des-* is highly productive in forming new verbs from verbal bases, whereas the Goal prefixes *a-* and *en-* are not. This asymmetry emerged only in the late Latin period (3rd century AD — 6th century AD). Sotelo claims that the difference in productivity of Goal prefixes in Latin and Spanish is related to a change from a satellite-framed to a verb-framed system. She also proposes a formal analysis of the asymmetrical behavior of the prefixes, suggesting that Goal and Source phrases have different internal structure (the Goal phrase is embedded in the Source phrase).

Anetta Kopecka also focuses on the change from a satellite-framed to a verb-framed system and its effect on the Source-Goal asymmetry. She approaches this problem using Old and Modern French parallel texts to identify the ways the two languages encode Source and Goal. Goal descriptions turned out to be more frequent than those of Source in both languages. However, Old French texts contained a higher rate of complex motion events (involving both Source and Goal). Thus, Old French describes motion events in a more fine-grained way, whereas in Modern French explicit path information has to be inferred from context. This change is claimed to be attributed to the development from a satellite-framed system, which has a large inventory of verb satellites easily combined with the verb, to a verb-framed one, where path is usually a part of the inherent meaning of the verb.

Claudio Iacobini, Luisa Corona, Noemi de Pasquale, and Alfonsina Buoniconto use parallel corpora of ancient classical languages and their descendants to investigate the encoding of motion events in Ancient and Modern Greek, Latin and Italian. The ancient languages are usually classified as satellite-framed, while the modern ones are considered verb-framed. The authors argue that the shift from a satellite-framed to a verb-framed type could have been partially caused by a low degree of path specification: both Ancient Greek and Latin demonstrate a strong preference for simple Goal-oriented paths and for the encoding of only one segment of a path (usually Goal, as the most salient one) in the prepositional phrase. For example, in Ancient Greek in a complex path with Goal and Source, the Goal is mostly encoded in the prepositional phrase, while the Source is expressed simply by a prefix, cf.: ***apo-****pléein* ***eis Kórinth-on*** 'sail **away to Corinth**'.

In other words, only one Ground element is explicitly expressed per clause. Then the verb lexicalizes and incorporates the meaning of the satellite, whereby the language shifts to the verb-framed system. Hence, the data of classical languages indicate that the avoidance of complex paths represents a significant factor, enhancing the probability of the shift to the verb-framed type.

Annemarie Verkerk explores the Source-Goal asymmetry based on parallel translations from English into 17 Indo-European languages. She formulates an assumption that satellite-framed languages are likely to display a stronger Goal bias than verb-framed ones, since they have more means available for marking Goal. All languages of the sample demonstrate a Goal bias, but to different extents. However, neither Talmian typology, nor language affinity and geographical factors can explain the cross-linguistic differences, since the translations into two varieties of the same language turn out to be significantly different with respect to Source vs. Goal marking. Verkerk provides several explanations for this phenomenon (such as small dataset, different styles and schools of translations, lexical resources of each language). Notably, some other corpus-based studies on omission of Source and Goal phrases also demonstrate controversial and ambiguous results [Narasimhan, Kopecka 2012: 12–13]. It can therefore be concluded that the parallel corpus method has considerable limitations in studying the asymmetry in spatial relations.

Thus, the research on the relations between the satellite/verb-framed type and the asymmetry in spatial relations appears to be a rather promising and prolific topic. However, the results must be interpreted carefully, since the diachronic data are rather limited and sometimes may allow for several explanations.

Interactions between different semantic roles and overlaps in encoding are also considered in the volume. Some spatial roles are encoded identically in many languages (e.g. Goal and Location), while others are rarely conflated. The diachronic dimension of this problem also involves the lexical sources of spatial markers (e.g. Location markers often originate from Source markers; see [Mackenzie 1978]).

Olga Thomason and Hanne Eckhoff investigate this problem based on the corpus of parallel translations of the New Testament, which allows not only analyzing language-internal syncretism, but also approaching this problem at a cross-linguistic level (e.g. in one language the context is marked by a typical Source marker, but another language uses a Location marker). The authors explain the spatial overlaps by the so-called "bridging contexts" that allow for several interpretations, so the situation can be viewed from different perspectives. This factor is claimed to stimulate semantic extension of a marker within a language. The study demonstrates the advantages of using parallel corpora for investigating interactions between semantic roles, since it reveals potential bridging contexts which may be overlooked in language-internal analysis.

In order to approach the problem of syncretism of semantic roles, Thomas Stolz, Nataliya Levkovych, and Aina Urdze consider the diachronic development of spatial interrogatives (such as 'where', 'whence') in 45 Romance varieties. Though the Latin system consisted of three interrogatives derived from a separate root each, most Romance languages developed a ternary system of interrogatives, where all the markers are derived from a single root. Half of the varieties have undergone semantic extension of locative interrogative (*ubi* 'where') and 44 % of the sample

have generalized the Source marker (*unde* 'whence'). Importantly, this semantic extension does not correspond to synchronic paradigms: if Source interrogative acquires a locative meaning, it cannot function as interrogative of Source anymore resulting in the emergence of a new more complex construction (usually ablative preposition + former Source interrogative). Hence, at the synchronic level we often observe only Location-Goal syncretism, whereas the interrogative locative term can be traced back to the Source marker. These findings corroborate the idea of ablative-locative transfer by [Mackenzie 1978] and the predictions made in [Nikitina 2009] and [Pantcheva 2010] that the pattern "Source = Location ≠ Goal" is rather unlikely to emerge.

However, in the same volume Tatiana Nikitina provides a number of counterexamples to these assumptions, showing that ablative and locative meanings can coexist for quite long periods of time. She claims that in the case of ablative-locative transfer we do not deal with a reanalysis and abrupt change, but rather with a productive strategy of encoding location by directional expressions (both ablative and allative), which can be described in terms of fictive motion (type "access paths", see [Talmy 2000a: 136]). The location of the Figure can be defined not only by static means, but also by a mental path from the Ground toward the Figure (e.g. *to the left (from here)*). Nikitina puts forward a hypothesis that in several Ancient Indo-European languages the access path strategy of marking location was ousted by rich prepositional systems that developed later and replaced the previous systems of directional adverbs. However, in some modern Indo-European languages this strategy is still used for marking relatively infrequent spatial relations that do not have corresponding prepositions (such as "right/left"). This way, the ablative etymology of spatial adverbs is explained as traces of the access path system.

The two last papers of the volume deal with the semantic role of Path (trajectory of motion). Luisa Brucale and Egle Mocciaro describe the encoding of spatial roles in Sicilian in a diachronic perspective. Source, Goal and Location are expressed consistently with the cross-linguistic tendencies, whereas Path is encoded differently. According to the available typological data, this semantic role is less autonomous than Source, Goal and Location. Path meaning is usually conveyed by locative markers. However, in Sicilian this widespread means of encoding coexists with two other strategies that demonstrate a tendency for differential Path encoding (unidirectional vs multidirectional Path).

In Russian, the trajectory of motion is also expressed by special markers, different from those of Goal, Source and Location: prepositional phrases with *po* 'along, through' or by bare noun phrases in the instrumental case, e.g. *xodili pol-em* (field-INSTR) 'walked through the field'. Natalia Philippova explores factors that may influence the choice of the encoding strategy based on a diachronic corpus study. She concludes that the bare instrumental construction is in decline because of the general trend towards analyticity in Slavic languages. Combining the synchronic and diachronic analysis, the author demonstrates that path instrumentals are in the process of lexicalization as adverbs.

Hence, the papers collected in the volume demonstrate the great potential of the historical approach to this topic. The studies provide diachronic explanations for cross-linguistically observed phenomena and contribute to clarification of patterns of historical change in the spatial domain.

6. Summary and future research

In this review, we outlined the main trends in the study of space in the recent decade. The main changes that have been introduced in the recent years are the shift from a synchronic to a diachronic perspective in the study of spatial markers and increased attention to granularity and verbs of motion. The range of approaches applied to the spatial domain has become highly diverse and interdisciplinary: the hypotheses that originated as purely typological are now tested by formal and experimental linguists, while the descriptive and functional domains have become a mixture of linguistics, ethnology and anthropology.

Since none of the contributions to the four volumes reviewed in this article consider the influence of language contact on the spatial and temporal domains, this field remains a significant lacuna. Considering areality and contacts as well as other extralinguistic factors, such as migrations, political systems, population genetics and climate change may be useful for research on space and time (as well as for research in any other linguistic domain) as they may shed new light on how spatial and temporal categories are borrowed and how they spread across languages.

Another important issue that has to be studied is which level of linguistic units is being borrowed, e.g. a particular morpheme, a category or both, and whether this is determined by linguistic or by extralinguistic features.

The space-to-time metaphors and the temporal FoR theory show that the typological approach is vital for these issues. For example, the examination of the Wolof data has shown that Wolof speakers employ metaphors and strategies of time conceptualization atypical for well-documented European languages. This way, the space-to-time metaphors and the temporal frames of reference seem to be a fruitful topic for future typological studies; they also have promising implications for linguistic anthropology.

The *Space in Diachrony* volume demonstrates that the historical linguistics can contribute a lot to the understanding of how language structures space. The authors put forward a number of interesting hypotheses explaining the development of the asymmetry of spatial semantic roles, their differential marking and overlaps in the encoding of spatial relations. However, some of them highlight the lack of data and suggest directions for further corpus-based diachronic research, that can test the assumptions formulated in this volume. Moreover, diachronic approach can complement significantly the quantitative typological studies on synchronic material and cover their methodological limitations.

Further research of time and space appears to be an interdisciplinary area of study. Bringing together linguistic, cultural, philosophical, anthropological and ethnological aspects of cultural diversity appears to be a fruitful idea for the study of spatial and temporal concepts as well as of their historical development.

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