Semantic Structure of English Prepositions: An Analysis from a Grammaticalization Perspective*

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This paper aims to investigate the holistic semantic structure of 20 high frequency English prepositions from a grammaticalization perspective. Based on the lexicographic sense designations in Oxford English Dictionary and frequency literature, this paper analyzes them both at macro- and micro-structure levels to determine the semantic network pattern. A large number of these high frequency prepositions do not show recognizable lexical sources, but among those with lexical sources, spatial nouns constitute the major lexical source category. The notion LOCATION is the most central source meaning, followed by its closely related MOTION. From these central senses, meanings extend across psychological and temporal domains, then further across diverse subdomains, by way of semantic change mechanisms such as metaphor, frame-of-focus variation, and subjectification. Contrary to expectation, these three mechanisms account for majority of the attested semantic changes both at the macro-level and the micro-level; and while metonymy is normally expected to operate at the micro-level semantic change, the result shows otherwise. It is hypothesized, therefore, that metonymy is operative even below the level of lexicographic designations of word meanings. Of particular importance is that frame-of-focus variation accounts for a high percentage of semantic changes associated with these high frequency prepositions.

Key words: semantic structure, prepositions, grammaticalization, semantic change, semantic change mechanisms, semantic change models

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1. Introduction

This paper investigates English prepositions from a broad perspective to determine the nature of their lexical sources, their diachronic semantic change, and their synchronic semantic structure. The earliest extant meanings were sought and compared with the current primary meanings to determine the nature of historical change and, in a quantitative approach, the grammaticalization mechanisms that enabled such changes. On the synchronic level, the semantic network is reconstructed as a result of diachronic grammaticalization processes.

1.1. Prepositions as Grammatical Category

Prepositions as a grammatical category constitute an important element of grammar in English because they are one of the most exploited grammatical formants ever since the more extensively used case inflectional systems in Old and Middle English were largely replaced by them. It is for this reason that prepositions encode an array of grammatical notions specifying the semantic and grammatical functions played by the noun phrases they are affixed to. With the advent of cognitive linguistics, and the grammaticalization theory in particular, prepositions, or rather, adpositions crosslinguistically, have been among the most frequently studied areas in recent years because research turned up interesting universalities across languages in recruitment patterns of the adpositional sources, and the paths of the development with similar motivating forces (e.g. Heine et al., 1991; Svorou, 1994; Kuteva & Sinha, 1994).

On the lexicality-grammaticality continuum, they are largely located close to the end of the grammaticality pole, even though they do not exhibit intra-categorial homogeneity (Heine et al., 1991; Hopper & Traugott, 2003, 1993; Lehmann, 1995, 1982; Matsumoto, 1998; Rhee, 2002a).[1] Located toward the

1) Note, however, the controversy in the generative paradigm over the theoretical status of prepositions ranging from the position that prepositions are lexical (Jackendoff, 1973), one that they are intermediate (Abney, 1987), one that they are functional (Grimshaw, 1991), and one that they are heterogeneous (Riemsdijk, 1990; Zwarts, 1995). In a discussion on German postpositions, Di Meola (2003) notes that German postpositions constitute a fuzzy category between lexical and function words, and Grünthal (2003) shows that there are no clear boundaries between Finnic adpositions on the one hand and nouns and adverbs on the other. The proximity to lexical category seems to be generally applicable to most secondary adpositions. Most English prepositions have cross-categorial uses, notably with adverbs and conjunctions (Rhee, 2002c; see Svorou, 1986, 1994; Heine, 1989; Bowden, 1992

extreme grammaticality pole, suggesting that they have undergone a long grammaticalization process, they tend to be highly polysemous. This high level polysemy again suggests their high level semantic generality, which makes them increasingly susceptible to erosive grammaticalization processes even to a point of loss and renewal. Indeed, in English an extremely small number of prepositions are actively used as compared to the number of historically attested prepositions.

Since prepositions as a grammatical category comprise numerous members with diverse nature, individual studies set typology of prepositions based on their semantics. For example, Bennett (1975) divides the usage into spatial uses and temporal uses; Nam (1995) classifies locative prepositions into topological invariants, symmetric locatives, orientational locatives, and directional locatives based on their semantic characterization; and Tyler and Evans (2003) divide them into those making use of the vertical axis, spatial particles of orientation, and those of bounded landmarks. However, the present study does not classify the sample prepositions in order to see the general picture of the prepositional category as a whole, instead of one of individual prepositions or of their subsets.

1.2. Data Selection

The high frequency of the prepositions is well illustrated in the fact that about 8 of the top 20 high frequency items in English are prepositions. Furthermore, about 20 prepositions, accounting for the majority of the prepositions actively used in Modern English, belong to the top 100 high frequency items, exhibiting a high level of semantic polysemy.

This study explores the polysemy structure of English prepositions focusing on these 20 top frequency prepositions in Modern English. There are various sources that indicate the frequency ranking of English words. Due to the fact that lexicographers have differing views and criteria in determining the grammatical categories, there are variations among sources. This study is largely based on the part-of-speech categorizations and semantic designations of *Oxford English Dictionary* (1991, 2nd Edition; henceforth OED), and part-of-speech frequency in Johansson and Hofland (1989).

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for adverb-adposition connection). The notion of 'adprep' with three way distinction of particle, preposition, and adprep in Bolinger (1971), Sroka (1972), O'Dowd (1998) also shows the intercategorial fluctuations.

Some modifications have been made to reconcile the discrepancies among these major sources.[2] The items analyzed in the present study are as listed in (1) in the order of their respective frequency in prepositional uses.[3]

(1)	1. of	2. in	3. to	4. for	5. with
	6. on	7. by	8. at	9. from	10. into
	11. about	12. than	13. after	14. like	15. between
	16. over	17. through	18. without	19. under	20. against

Selecting research items based on frequency is well justified by the truism that the linguistic system is affected and formed by uses, as is well articulated in the usage-based model (cf. Barlow & Kemmer, 2000). Frequency yields entrenchment (Langacker, 1987, 1991, 2000; Haiman, 1994), and the humans have the capacity to abstract more schematic structural patterns from recurring specific but similar instances (Rohde, 2001). Therefore, highly frequent prepositions should carry grammatical importance in English, and in fact, based on the calculations of the Johansson and Hofland (1989), the categorial frequency of prepositions ranks four (about 11.4%), following nouns and verbs and, with a narrow margin, determiners, and followed by adjectives with a wide margin.[4] The use of these 20 prepositions accounts for 94.0 percent of the total prepositional uses. The grammatical importance of the prepositional category and the representative sampling lend support to the rationale of the present study.

1.3. Organization

The general scheme of this study is to discuss various notions that bear theoretical importance and have relation to the semantic analysis of prepositions, such as semantic domains (§2.1), polysemy (§2.2), and prototypes (§2.3), and various semantic change mechanisms (§3), and analyze the

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2) Among the notable discrepancies is that OED lists no prepositional use for *as* in its 404 prepositional entries, which ranks the 10th in Johansson and Hofland's (1989) classification. Following OED, *as* is not included in this study. British National Corpus, on the other hand, does not list *than*, and includes secondary prepositions such as *out of, because of, as well as*, etc. in its 122 prepositional inventory. The present study includes *than* and excludes secondary prepositions in accordance with the other two sources.

3) The ranking may differ if their respective token frequency is taken category-blindly.

4) The relative categorial frequency in the LOB corpus in Johansson and Hofland (1989) is: Noun (23.5%), Verb (19.2%), Determiner (11.8%), Preposition (11.4%), and Adjective (6.8%).

prepositional semantics endeavoring to investigate the source characteristics, characterizing the historical change, and identify semantic change mechanisms at macro- and micro-levels (§4).

2. Modeling Semantic Structure

Modeling semantic structure is an intriguing yet difficult task because various complex and controversial notions are involved and resolving such controversy requires theorizing insurmountable number of issues across disciplines. Detailed discussions of these notions should go beyond the scope of this paper, and therefore, as a preliminary to an investigation to semantic structure we briefly touch on some of such major issues with criticisms wherever applicable.

2.1. Semantic Domains

The notion of semantic domains (Fillmore, 1975; Langacker, 1987; Lakoff, 1987) is a useful one in both theory and practice for dealing with the meanings of words, as it enables categorization and comparisons with respect to similarities and differences. Such an act of categorizing things, both linguistic and non-linguistic, is believed to be deeply embedded in human perception and cognition. Cognitive linguists largely agree on the fundamental tenets that the basic semantic unit is a mental concept, and that concepts cannot be understood independent of the domain in which they are embedded (Clausner & Croft, 1999). Thus the domain refers to the background knowledge structure of concepts. However, since domains are thought to be dependent on and formed by human experience, which is largely represented as image schematic, they cannot be either exhaustively listed or unambiguously delineated.

Likewise, in a discussion of cognitive domains, Barcelona (2003, p. 230) notes that Langacker (1987, pp. 154-158), Taylor (1995, pp. 83-87), and most other cognitive linguists understand them as encyclopedic domains and, thus, that they will vary in breadth from person to person and may have no precise boundaries.

However, many of the names of image schemas are also used by lexicographers (Clausner & Croft, 1999) in their semantic designation and classification, thus showing certain level of convergence in cognitive linguistics and lexicography. For example, many concepts such as "Existence",

"Relation", "Quantity", "Order", "Time", "Causation", etc. are used both in image schematic nomenclature and lexicographic classification. For ease of exposition, we adopt most of the lexicographic terminology and other frequently invoked terms in grammaticalization scholarship in this paper.

2.2. Polysemy

Some of the notorious problems in modeling semantic networks largely originate from the different approaches taken by the theorists (cf. Sandra & Rice, 1995; Tyler & Evans, 2003), and the subjective nature of classifying polysemous senses makes it hard to reconcile different stances. Tyler and Evans (2003) establish two criteria, i.e. 'additional meaning' and 'context independence'. However, these two criteria may not be clear-cut in all instances, largely because these two concepts are gradient and thus unavoidably involves subjective decisions. Such fuzziness is largely due to the fact that linguistic meanings constantly change and pragmatic forces are exerting pressure on them, and consequently, all linguistic forms have varying degrees of conventionalized conversational implicature (Traugott, 1988; Sweetser, 1990, inter alia; see also Geeraerts, 1993 for discussions of the vagueness and polysemy issue).

The difficulties involved in determining what cognitive, and for the same token, semantic, domains there are, inevitably lead to arbitrariness. There have been numerous attempts to establish the criteria to neatly organize polysemous structures (e.g. Taylor, 1995; Croft, 1998; Sandra, 1998; Tuggy, 1999; Langacker, 1993, inter alia) but admittedly there are no hard-and-fast criteria to that end.

It is for this reason that Rhee (2003b), acknowledging potential risks, adopts the classifications used by lexicographers giving the maximum credit to their expertise, since their decisions and application of rules should have considerable amount of internal consistency throughout their work. The present study adopts most sense designations in OED as the individual word meanings.[5]

2.3. Prototypes

In his pioneering research, Bennett (1975) uses stratificational grammar

5) Certain modifications have been made with this respect in that certain domains and meanings are omitted, e.g. domains with idiomatic phrases; and certain domains are added, e.g. in the case of *from*. However, these modifications are kept to a minimum.

for English prepositions selecting the 'general meaning' of each locative preposition, which inspired most prototypicality-based analyses, built on the notion 'prototype' that began in Rosch (1973, 1978) and taken up and developed in Lakoff (1987), Fillmore (1985), Langacker (1987), Fillmore and Atkins (1992), and numerous others. Resembling the prototype approach, Herskovits' (1985, 1986) approach states that spatial terms encode representations of space based on idealizations and approximations of objects, their shapes and their environments.

Selecting a primary or prototypical sense is an empirically thorny problem because, despite the usefulness of the notion prototype or prototypicality in object classification, lexical categorization involves complex relations and processes (cf. Evans, 2000; Wierzbicka, 1990; Herskovits, 1986). Langacker (1987) suggests 'sanctioning sense' from which other senses may be extended. Drawing upon Langacker (1987), Tyler and Evans (2003, p. 47) establish five criteria in identifying the primary sense, i.e. earliest attested meaning, predominance in the semantic network, use in composite forms, relations to other spatial particles, and grammatical predictions.

However, despite their evident merits, not all of these criteria advanced by Tyler and Evans (2003) seem to be straightforwardly applicable in the case of prepositions. For example, some prepositions are old grams and many of their uses are attested from the early extant data, and their cognates in other languages also are often those that have been already grammaticalized. Predominance also can pose problems if applied to grammaticalization research. Inherently dynamic in nature, the grammaticalization research pursues the diachronic changes exhibited by a linguistic form. In the course of semantic changes, previously primary senses may become obsolete and new senses may prevail in their stead. For example, English *after* was primarily making reference to a space, while it designates temporality in Modern English, yielding the spatiality to *behind*. Likewise, Korean *-ketun* was the primary marker of conditionality, which, however, became a marker of speaker-confirmation or sentential end, yielding conditionality to the relatively recently emerged *-umyen* (Koo & Rhee, 2002). Furthermore, as Casad (2001) illustrates with the case of Cora locative prefix, two distinct historical sources may converge into a single form semantically and phonologically, obscuring the sources and confounding linguists in their effort to establish a single prototype. This type of situation can be extensively listed across languages. For these reasons, in part, such criteria may be more appropriate for constructing synchronic semantic networks.

Furthermore, there are variations across languages in conceptualization of space (Cienki, 1989; theses in Pütz & Dirven, 1996; Davy, 2000), which complicate identifying unambiguously central meanings.

For reasons stated above, identifying a central meaning involves difficulties. In the present study, we turn to a simplistic, yet intuitively appealing and empirically facile, method, i.e the historical source meaning for the central meaning, assuming that semantic extension occurs in the direction of core to periphery, rather than the reverse. If the historical meaning coincides with the primary meaning in Modern English, this very meaning is considered the central meaning. As will be made clear in subsequent discussions, English prepositions in general are largely developed from the locative meaning and its closely related motional meaning.

3. Semantic Extension Mechanisms

Semantic extension is by no means arbitrary. The extension pattern is constrained by the source lexeme (Heine, 1997; Heine et al., 1991). A strongest position in this regard is the Source Determination Hypothesis (Bybee et al., 1994).[6]

There is a large body of literature that testifies recognizable semantic extension patterns under such notions as metaphor, metonymy, subjectification, etc. Apparent lack of motivation, and thus suspected arbitrariness, in certain cases of emergence of abstract notions has been shown otherwise through experiments. For example, Beitel et al. (2001) show with the case of English preposition *on* that even the figurative uses are not arbitrary but are related via the embodied image schemas through metonymic extensions and metaphoric instantiations of these image schemas in various conceptual domains.

Since different scholars have different views on semantic change in the course of grammaticalization, and use identical terms with different meanings, the terminology on semantic change mechanisms should merit a brief exposition, to which now we turn.

6) The Source Determination Hypothesis states that the source meaning of a grammaticalizing from uniquely determines the path and resulting meaning.

3.1. Metaphor

Metaphor is typically defined as a conceptual mechanism of understanding and experiencing one kind of thing in terms of another (Lakoff & Johnson 1980:5). Heine et al. (1991) argue that there is unidirectionality in metaphorical mappings of tenor and vehicle as the following:

(2) PERSON > OBJECT > PROCESS > SPACE > TIME > QUALITY

It has been observed in numerous works that in the use and the structure of language in general, metaphor is a ubiquitous phenomenon (notably in research by Heine and his colleagues, and Lakoff & Johnson, 1980). An extreme position is found in Matisoff (1991, p. 384), who suggested that grammaticalization may be viewed as a subtype of metaphor.

In grammaticalization of prepositions the domains most frequently involved are SPACE, TIME, and QUALITY, as we shall see in subsequent discussions.

3.2. Metonymy

Metonymy, in contrast with metaphor, is a figure of speech whereby the name of an entity is used to refer to another entity that is contiguous in some way to the former entity (Heine et al., 1991, p. 61). Traugott and König (1991, pp. 210-211) differentiate three kinds of metonymy as the following:

(3) a. Contiguity in socio-physical or socio-cultural experience
b. Contiguity in the utterance
c. Synecdoche

However, more importantly, metonymy may occur at the conceptual level along the conceptual contiguity. For example, the focus change from on-going motion to future event at destination, as is shown in grammaticalization of English *be going to* futurity marker, is a good example of metonymy enabling the grammaticalization change.

The most frequent metonymic change attested in semantic change of English prepositions involves the conceptual contiguity representable as POSITION-DIRECTION-MOTION, whereby any of these concepts is viewed as a part of this series of the related concepts.

3.3. Subjectification

Since the now-classic Traugott's (1982) exposition on semantic-pragmatic tendencies, which dealt with speaker involvement in semantic change, the notion of subjectification has been widely resorted to for explaining grammaticalization phenomena. Traugott (1982, 1988) and Traugott & König (1991) further claimed that the subjectification process is unidirectional. Rhee (2002b), in a discussion of semantic change of *against,* uses the concept more broadly and shows that there are human tendencies such as anthropocentricity and egocentricity involved in subjectification.

In grammaticalization of English prepositions, subjectification as a mechanism occurs most frequently in projecting the speaker's attitude, evaluative judgment, and epistemic causality relation to linguistic forms, e.g., *for* originally referred to a place or location in front of something, but it later became a marker of benefit. It means that an entity in front of someone is viewed as if it is there for the benefit of the person, a clear instance of subjective judgment on a state.

3.4. Frame-of-Focus Variation

Semantic changes are largely schematic. For this reason semantic changes usually involve image or event schemas. When schemas are extended or transferred, details of source images or events are generally ignored and only the schematic structures are preserved.

As has been noted by Navarro i Ferrando (2002), most widely accepted ways of accounting for the meanings of English prepositions are based on geometric, or topological, descriptions (Lindkvist, 1950; Leech, 1969; Bennett, 1975; Quirk et al., 1985; Herskovits, 1986, inter alia). However, as Talmy (1983) suggests, there are other aspects that language takes into account, such as trajector's geometry, site, path or orientation, the conceptualizer's perspective and point of view, the scope and reference frame of the scene, and force-dynamic patterns (Navarro i Ferrando, 2002). Deane (1993) summarizes the three aspects of space that language users perceive and conceptualize as: (i) visual space images, (ii) manoeuvre space images, and (iii) kinetic space images (as cited in Navarro i Ferrando, 2002, p. 211).

Lakoff (1987) persuasively presented an analysis of *through, around, across, down, past, by,* etc. in English which reflect the different focus on part(s) of image schema, such as 'path' and 'end of path', and named this

phenomenon as image schema transformation.

Rhee (2000) shows cases of antonymic semantic change which seems to have resulted from variations of frame of focus (FFV) on source schemas. For example, English *out of* means association in certain cases as in (4a) and (4b), whereas in other cases it means separation as in (4c), (4d), and (4e).

(4) a. It was out of my intention. : with intention; intentionally
b. I asked out of curiosity. : with curiosity
c. His behavior was out of decorum. : without decorum; rudely
d. Fish cannot live out of water. : without water; outside the water
e. We are out of milk. : without milk

This kind of antonymic contrast is produced by changing the frame of focus on the source schema. If the focus frame is telescopic, i.e. if the schema is viewed from afar, the two participating objects, i.e. trajector (TR) and landmark (LM), are viewed as being together, thus bringing forth 'association' sense, as in (4a) and (4b); whereas, if the focus frame is microscopic, i.e. if the schema is viewed closely, the gap between the two participating objects becomes prominent, thus bringing forth 'separation' sense, as in (4c), (4d) and (4e).

The use of FFV as grammaticalization mechanism resembles in many aspects the spatial scene approach proposed by Langacker (1987) where an idealized mental representation is composed of landmark and trajector in the schema. According to the spatial scene approach, ways of viewing spatial scenes are: (a) every spatial scene is conceptualized from a particular vantage point; (b) certain parts of the spatial scene can be profiled; (c) the same scene can be construed in different ways; and (d) the exact properties of the entities that are conceptualized as TR and LM can vary (Tyler & Evans, 2003, pp. 53-54).

The major resemblance between the spatial scene approach and FFV is that both utilize the schematic representation of an event. However, FFV is more dynamic because it allows for variable focus frame, thus enabling the distance adjustment. According to the spatial scene approach, profiling and active zone are devices to make variable representations, but if the schema itself remains static, it is not clear how seemingly antonymic meanings can be derived from the identical spatial scene.

3.5. Generalization

The last mechanism to discuss is generalization. It has been noted by many grammaticalization scholars that the semantic change in grammaticalization often involves generalization (Bybee et al., 1994), whereby words lose their semantic specificity and become more general, and in turn, become compatible in larger contexts of use. This increases use frequency, which contributes to, or qualifies for, development into grammatical markers.

However, generalization can be a general description rather than an enabling mechanism. For example, semantic generalization can be brought about by other mechanisms, such as metaphor and metonymy. For this reason, generalization in this paper will solely refer to a subset of conventionally regarded generalization, i.e. the cases where source conceptualization generalizes without domain change (i.e. effectively, without metaphor). For example, *across* was originally used for a dissecting direction with right-angularity as is suggested by the source lexeme 'cross', but later it could be used regardless of the angularity unless it is in parallel with the reference object. Likewise, *above* was used only to refer to an area 'directly over', which was later extended to the general diffused area vertically up above the referenced object. These semantic changes involve not domain change but merely schematically extend 'acrossness' and 'aboveness'. These are considered genuine generalization instances here.

4. Semantic Networks of Prepositions

We now turn to a discussion of source typology, characteristics of semantic changes, and mechanisms of change at macro-structure, i.e. semantic domains, and micro-structure, i.e. individual prepositional meanings.

4.1. Sources

From the grammaticalization perspectives, researchers investigate historical sources of grammaticalized markers, since the synchronic polysemous lexical semantic structures reflect the diachronic evolution of word meanings (notably, Sweetser, 1990; Heine et al., 1991; Traugott & König, 1991; Hopper & Traugott, 2003[1993]; Jurafsky, 1996). Grammaticalized meanings of prepositions were often found to be traceable back to their initial spatial

meanings (Genetti, 1991; Kilroe, 1994; Cuyckens, 1999).

What becomes readily obvious in an investigation of English prepositions is that LOCATION surfaces as the major source.[7] Living in the three-dimensional space, humans have perceptually well-grounded, and yet complicated, system of spatiality, including such components as points, planes, paths, and portions (Tversky, 2003). Focusing on one or more of these components and interactions among them can produce rich and complicated semantic networks. Furthermore, the LOCATION concept is directly connected with topology, direction, distance, and movement (Gambarotto & Muller, 2003, and many others).

As is also evident from a cursory look at the inventory of English prepositions, MOTION is also one of the most prominent source concepts. As a matter of fact, almost all spatial prepositions do have motional uses. The close space-time connection is strongly grounded in human experience, as is well pointed out by Lakoff (1987, p. 275), who states, "Every time we move anywhere there is a place we start from, a place we wind up at, a sequence of contiguous locations connecting the starting and ending points, and a direction." Radden (1988) even suspects that human ability to perceive movement may be vital for survival.

The position of the cognitivists about the prepositions is largely that space is a semantic primitive on which preposition studies must be based (see, however, Cadiot 2002, and Visetti & Cadiot 2002 for a different position), thus conferring distinguished status to space encompassing PLACE and TIME. Drawing upon historical texts, Nagucka (1999, pp. 80-82) states that, in English prepositional uses, there is sufficient textual evidence that the concept of time is an inherent component of spatial reality, adding that in historical data, as the same lexical preposition can be used for both spatial and temporal relations, it is the meaning of the prepositional object that makes the phrase semantically clear. This observation seems intuitively reasonable from the fact that all states and events are firmly anchored in time in human experience. Between these two experientially close concepts, LOCATION and TIME, however, there is ample research that shows that LOCATION is the more basic notion from which the temporal notion was derived (Heine et al., 1991; Verspoor, 1996; Cook, 1996; Dabrowka, 1996; Kochańska, 1996; Dorgeloh, 1996; Zelinsky-Wibbelt, 1996, inter alia).

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7) We use the terms LOCATION, PLACE and POSITION largely interchangeably, because essentially all of them refer to spatial occupancy of an object.

Identifying the lexical sources of each of the 20 prepositions under investigation is not as straightforwardly successful as it would seem, because many of them are old grams and already appear with prepositional semantics from the earliest extant data. From what is available, their lexical sources are as follows:

(5) a. No identifiable lexical sources (13)
of, in, to, with, on, by, at, from, into, than, over, through, under
b. Spatial nouns (4)
for: 'front' *about*:'exterior'
after: 'posterior' *without*:'exterior'
c. Others (3)
like: 'body' *between*: 'two'
against: 'direct/straight'

The above shows an interesting aspect with reference to source transparency. All but one (i.e. *for*) from ranks 1 through 10 belong to the first group that has no identifiable lexical source. This strongly suggests that these higher frequency items, as compared to the other relatively lower frequency items, have undergone more erosive grammaticalization processes, and may be historically older. Considering that the higher frequency prepositions are phonologically shorter also (see Rhee, 2003b for a discussion with a larger sample), the Parallel Reduction Hypothesis seems to be borne out here.[8]

With absence of lexical sources of majority of the items, it should be worthwhile to inquire about the source meaning associated with the earliest data. A look into the historical source meaning shows the following:

(6) a. LOCATION (8) *in, for, by, about, after, between, over, under*
b. MOTION (6) *of, to, from, into, through, against*
c. RELATION (4) *with, on, at, without*
d. TIME (1) *than*
e. OTHERS (1) *like*[9]

8) The Parallel Reduction Hypothesis states that phonological reduction and semantic reduction occur in parallel in the course of grammaticalization (Bybee et al., 1994).

9) The lexical source of *like* is OE *li:c* which meant 'body', the identicalness sense of which was then generalized to similarity.

In the above, however, certain forms seem to be ambiguous in its placement into one of the categories, and also the categories seem to be not entirely mutually exclusive. For example, SPACE, MOTION, and RELATION may converge at a certain conceptual level. As a guiding principle, SPACE is for designating a place as a location of an entity, such as 'interior area' for *in*, 'adjacent area from two entities' for *between*, etc. An item belongs to MOTION if it involves movement such as 'moving away from' for *of*, 'moving toward' for *to*, 'moving straight to' for *against*, etc. RELATION refers to the existence of dynamic relationship between two entities (rather than simple spatial relationship) as 'opposition' for *with*, 'contact' for *on*, etc. If we can reasonably assume that these earliest meanings were reflecting their ultimate lexical sources, we can say that SPACE was the semantic domain that provided the most sources for English prepositions.[10]

For dynamic characterization of Modern English prepositions it is also worthwhile to compare the historical source meanings, i.e. the primary meaning in the oldest attested data, with the current, primary, meanings, which may shed light on the nature of diachronic change with long temporal distance. Taking into account the oldest meanings, including the grammaticalized prepositional meanings, the changes of the individual preposition are as in <Table 1> and the characterization of historical semantic change by type is as in (7).

Table 1. Comparisons of Semantic Change

	Prep.	Original/Early Meaning	Current Primary Meaning		Prep.	Original/Early Meaning	Current Primary Meaning
1	of	separation	association	11	about	vicinity of outer surface	vicinity
2	in	interior location	NO CHANGE	12	than	posterior sequence	suppression
3	to	reaching	direction	13	after	posterior location	later time
4	for	front	benefit	14	like	body	similarity
5	with	opposition	collaboration	15	between	next to two	at intervening space of two
6	on	contact	superior point in contact	16	over	superior location	NO CHANGE
7	by	side	agency	17	through	moving within and passing	NO CHANGE
8	at	contact	NO CHANGE	18	without	opposition at exterior	absence
9	from	forward	departure point	19	under	inferior location	NO CHANGE
10	into	to interior location	NO CHANGE	20	against	straight/direct	opposition

10) This shows a contrast with the Oceanic prepositions that came from the body parts the most (38%), more than the locatives (27%); and with African languages predominantly with the body parts (52%) and relational concepts (16%) (cf. Bowden, 1992).

(7) a. ANTONYMIC CONTRAST
of: separation > connection/association
with: opposition > collaboration/association
b. METONYMY
to: arrival/reaching > direction
from: forwardness > point of departure
about: vicinity of outer surface > vicinity
c. SUBJECTIFICATION
for: front > benefaction
by: side > agency
than: sequential posterity > suppression
without: opposition at outside > absence
against: straight direction > opposition
d. NARROWING
between: area next to two > intervening space of two
on: any point in contact > superior point in contact
e. GENERALIZATION
like: body (identicalness) > similarity
f. METAPHOR
after: posterior location > later time
g. NO SUBSTANTIAL CHANGE
in: interior location
at: contact
into: to interior location
over: superior location
through: moving within and passing
under: inferior location

The above characterization reveals two interesting aspects. The first is that the two high frequency prepositions, *of* and *with*, were developed into highly contrastive meanings, even to a point of antonymy, i.e. from separation (as is evident from its related word *off*) to connection in case of *of*, and from opposition to collaboration or association in case of *with*. Another one is that contrary to the common expectation that metaphor would be one of the most commonly found semantic change pattern, there is very few, in fact, only one, instance that may clearly qualify for such characterization. One that comes close may be *than*, which was once closely related both in form and meaning to *then*, signifying temporal posteriority.

Since its most common meaning in Modern English is to mark the standard in comparison or to suppress the compared item in properties at issue, it thus may possibly qualify for [TIME > QUALITY] domain change, if the change is characterized as one from temporal posteriority to inferiority in quality.[11]

4.2. Macro-structure

The semantic domains covered by most prepositions include LOCATION, DIRECTION, and MOTION. The dynamicity associated with the notion of the movement has significant import. It is interesting to note that most prepositions that started out as spatial grams tend to semanticize movement senses in the course of development. Some suggest that English prepositions are generally neutral with respect to dynamicity (cf. Bennett, 1975; Ruhl, 1989), and the dynamicity sense is a product of the context. However, the dynamicity seems to be fully semanticized and robust in many prepositions, and indeed according to Rohde (2001) they have differing levels of dynamicity, with *through* with the highest dynamicity index.

A survey of macro-structure of the semantics of individual prepositions shows that the items that can be used for static spatial sense and dynamic sense have instances of both uses at similar point in time. However, LOCATION and MOTION may well be treated as separate domains for two main reasons. One reason is that the developmental direction between these two concepts is conceptually better motivated when it is hypothesized as one from LOCATION to MOTION. This direction of development can be motivated by the human's teleological conceptualization, whereby a simple location is viewed with a potential of direction and movement, an instance of conceptual metonymy and of subjectification. The other is that in cases where the uses in LOCATION and MOTION domains occur at different time points, if we compare the historical attestations in OED, the uses in the LOCATION domain predate the ones in the MOTION domain, which clearly indicates that the latter is developed from the former. For example, the positional meaning of *about* is attested in the 9th century data, whereas its motional meaning is attested in the 11th century data. Likewise, the positional meaning of *in* is attested in the 8th

11) At the level of the macro-structure, however, metaphor surfaces as the most frequently used mechanism (see following discussion in §4.2).

century data, in contrast with the motional uses in the 9th century data.

For reasons stated above, when the LOCATION and MOTION are separated, as in OED, and DIRECTION is taken as a subjectified meaning from positional meaning en route to MOTION, the macro-structure of prepositional semantics reconstructed from the designations in OED can be diagrammed as in <Figure 1> and <Figure 2>.[12]

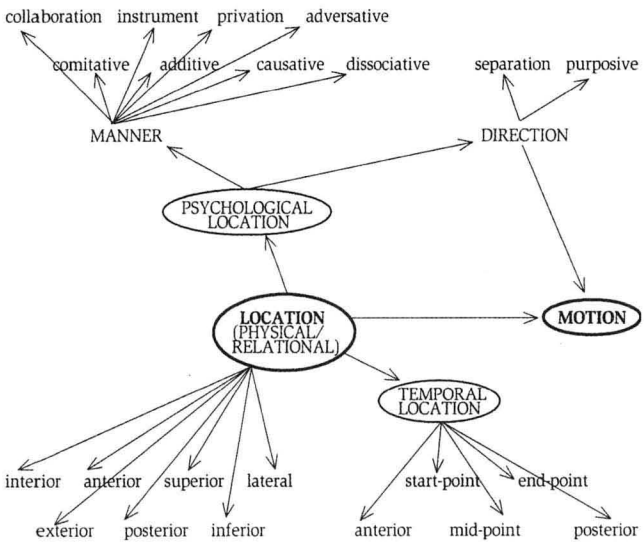

Figure 1. Macro-Structure of English Prepositional Semantics I

It is to be borne in mind that <Figure 1> and <Figure 2> are schematic representations of semantic domains and the components therein are not intended to be well-defined and well-delineated semantic categories. The levels of fine-grainedness of representing interrelations and of abstraction in setting up intermediate concepts are by no means unequivocal. However, these structures capture relatively comprehensively the general structure of macro-domains.

The formative forces of the general structures of the macro-level semantic domains seem to be some of the mechanisms previously discussed (see

12) Note, however, that certain domain names may occur under different higher domains, as many domain labels in Physical Location and Temporal Location in <Figure 1>. This is largely due to the notational limitations of planar mapping of the higher-dimensional cognitive representations.

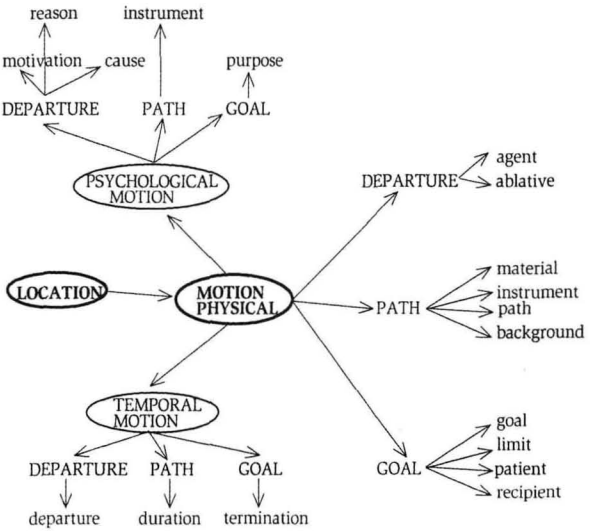

Figure 2. Macro-Structure of English Prepositional Semantics II

§3). Both the domains LOCATION and MOTION are central in the structure, but LOCATION is primary. This LOCATION is primarily physical and relational, as would be supported by the human experiential embodiment. The major directions of domain extension from this physical LOCATION, as shown in <Figure 1>, are to PSYCHOLOGICAL LOCATION, TEMPORAL LOCATION, and MOTION. The direction from physical LOCATION to TEMPORAL LOCATION is a paradigm case of metaphorization, one of the most widely attested [SPACE > TIME] ontological domain change (cf. directions in metaphorization in Heine et al., 1991). The extension from physical LOCATION to PSYCHOLOGICAL LOCATION seems to be best interpreted as an instance of subjectification. At the first glance, this domain change seems to be of metaphorization as well, but more importantly, a state-of-affairs in the physical world is viewed by the language user with specific focus on the mode of an entity's existence in the epistemological context. For example, a mere collocation of two entities in the physical world is viewed as one entity using the other as an instrument in performing certain purposeful action. Therefore, while on the surface, the change from PHYSICAL WORLD to MENTAL WORLD may qualify metaphorization, a closer look reveals that it is more of subjectification (i.e. the projection of the speaker's subjective attitude and evaluation onto the state-of-affairs) than

of metaphor.

The direction from LOCATION to MOTION also suggests subjectification, whereby an entity's mere existence in a physical space is viewed with a potential of MOTION, or rather, as a segment of motion, based on the fact that human's placement of self or others at a particular location is largely purposeful and leads to a subsequent motion.

The extension patterns shown in <Figure 2>, where MOTION is the central component, show that the typical motional components like departure, path, and goal are intermediate categories both in PSYCHOLOGICAL MOTION and PHYSICAL MOTION. The mechanisms are parallel to those with the previously discussed changes from LOCATION domain, i.e. metaphor to TEMPORAL MOTION and subjectification to PSYCHOLOGICAL MOTION.

In quantitative terms, the mechanisms utilized in the development of semantic domains are as in <Table 2>.[13]

The statistical result brings forth certain observations that may bear theoretical implications. The first is that the frame-of-focus variation (FFV) is very productively used, accounting for nearly 30% of the total instances. This suggests that, in manipulation of prepositional semantics, language users conceptualize the semantics largely represented schematically, and by way of manipulating the frame size and changing focus, they extend the semantics gradually.

The second observation is that metaphorization is also frequently used as a mechanism, which is well expected from the generalization made in many studies that metaphors, as they involve domain change by definition, tend to operate at macro-levels, a fact well-captured in the metonymic-metaphoric model of semantic change (Heine et al., 1991). Considering this fact, the ratio of metaphor seems rather inadequately low in this cross-domain investigation of semantic change.

The third observation is that subjectification is one of the common mechanisms as well. This is also in accord with the observation that meanings become increasingly subjective as they change over time. Most instances of subjectification in prepositional semantic change are those where language users view the position or location of an entity in the context of more subjective judgment, especially with reference to future relevance. This may have to do with human tendency to enrich the

13) Certain domains in OED, such as one for listing of idioms, or one set up purely for grammatical exposition, are not taken into account.

Table 2. Semantic Extension Mechanisms at Macro-Level

	Preposition	Metaphor	Meton.	FFV	Subj.	Gen.	Total
1	of	3	0	12	1	0	16
2	in	2	0	2	0	0	4
3	to	4	0	1	0	0	5
4	for	1	0	1	5	0	7
5	with	0	0	2	2	0	4
6	on	2	1	0	0	0	3
7	by	2	1	1	3	0	7
8	at	1	1	0	3	0	5
9	from	2	1	0	2	0	5
10	into	1	0	1	0	0	2
11	about	2	1	1	9	3	16
12	than	1	0	0	0	0	1
13	after	2	0	1	1	0	4
14	like	1	0	0	0	1	2
15	between	0	0	1	0	0	1
16	over	2	1	0	2	0	5
17	through	0	0	1	0	0	1
18	without	1	0	2	1	0	4
19	under	4	0	1	0	0	5
20	against	1	1	2	1	0	5
	Total	32	7	29	30	4	102

interpretation of an event or state from various perspectives.

Finally, as would be expected, metonymy is very rarely used accounting for only 7 percent of all instances. Since metonymy is a small step change not involving domain changes (contra metaphor), this low representation seems reasonable for changes across domains. The instances, small as they are in number, have to do with the contiguity along the conceptual chain of LOCATION - DIRECTION - MOTION, i.e. language users view a location as one with potential motion. This suggests that conceptual chain may be formed across domains, and therefore, metonymic changes may in fact involve crossing domain boundaries.

4.3. Micro-structure

In micro-structure we deal with individual meanings of prepositions. Since a single preposition can have many sense designations, e.g. 32 senses with *of*, and the total sense entries in OED for the 20 prepositions under discussion is 323,[14] a detailed discussion of each sense of individual prepositions should be well beyond the limit of this paper. Therefore, we shall look at the mechanisms involved in the emergence of new senses, with reference to the semantic change mechanisms we discussed in §3.

In determining extension mechanisms, a mention of caveat is in order. The first is that the mechanisms are not entirely mutually exclusive, and therefore, a single change may be interpreted as a product of more than one mechanism. For example, the situational/positional meaning of *in* (as in *in silence*) attested in the 10th century data, becomes extended to the purposive meaning (as in *in answer* or *in search*) in the 9th century. This change seems equally amenable to the interpretations of either as an instance of metaphor or as an instance of subjectification. Likewise, FFV can sometimes be related to metonymy, because elements viewed in a schematic representation per FFV may also be viewed as related by contiguity either for physical or conceptual relationship. When multiple mechanisms are equally viable options, all relevant mechanisms are counted, though such instances are relatively few. However, if one option is clearly better than the other(s), only the best option is counted, where subjective judgment becomes unavoidable. Further, in order to keep the count representative of micro-structure only, the count is limited to the mechanisms within each domain. The result of count with these guidelines in mind is as in <Table 3>.

The quantitative analysis of micro-level semantic changes produces the following generalizations.

First, frame-of-focus variation (FFV) is still a very productive mechanism, even more so than it is for macro-level changes. This suggests again that FFV is a powerful mechanism operative at any level of semantic change. Secondly, the number of metaphoric change, though still large as compared to other mechanisms, becomes smaller at the micro-level changes. This is as expected, because metaphors involve domain changes (contra metonymy), and therefore, they are expected to occur less frequently at the micro-level.

14) See following discussion for numeral discrepancy.

Table 3. Semantic Extension Mechanisms at Micro-Level

	Preposition	Metaphor	Meton.	FFV	Subj.	Gen	Total
1	of	11	1	15	7	0	34
2	in	10	0	7	4	1	22
3	to	4	1	21	14	0	40
4	for	2	1	6	17	1	27
5	with	4	1	19	19	0	43
6	on	15	7	3	10	3	38
7	by	5	5	24	17	3	54
8	at	16	3	12	13	0	44
9	from	2	0	7	3	0	12
10	into	3	1	4	1	0	9
11	about	2	1	1	9	4	17
12	than	1	0	0	0	0	1
13	after	2	0	2	7	0	11
14	like	2	0	2	3	1	8
15	between	0	0	9	0	0	9
16	over	3	1	8	3	2	17
17	through	3	0	9	1	1	14
18	without	4	0	6	7	0	17
19	under	21	1	3	8	2	35
20	against	3	0	7	7	0	17
	Total	113	23	165	150	18	469

Finally yet very importantly, metonymy turns out to be still unproductive, accounting for only 5 percent of total instances. This is quite unexpected from what is generally believed to be the case, i.e., metonymy is a very common mechanism at micro-level semantic change. Indeed, according to the metaphoric-metonymic model of semantic change (Heine et al., 1991), semantic changes have Janusian faces in that if they are viewed at a higher level (with long temporal lapse), semantic changes often seem to warrant metaphoric characterization, but at a lower level (with a short temporal lapse) the changes are constantly moving in small steps (thus, metonymy) with the help of context-induced reinterpretation.

The observation from the semantic change mechanisms in the present study suggests that such metonymic apparatus operates at the even lower

level than the word's lexicographic sense designations. Since context-induced reinterpretation works with cases that have pregnant uses interpretable differently from the conventional ones, metonymic operations may indeed be invisible.

5. Conclusion

This paper investigated the holistic semantic structure of 20 high frequency English prepositions from a grammaticalization perspective. Based on the lexicographic sense designations in OED and frequency literature, this paper analyzed these prepositions both at macro- and micro-structure levels to determine the semantic network patterns. A large number of these high frequency prepositions do not show recognizable lexical sources, but among those with lexical sources, it was found that spatial nouns constitute the major lexical source category. The notion LOCATION is the most central source meaning, followed by its closely related MOTION. From these central senses, meanings extend across other domains by way of semantic change mechanisms such as metaphor, frame-of-focus variation, and subjectification. Contrary to expectations, these three mechanisms account for majority of the attested semantic changes both at the macro-level and the micro-level; and while metonymy is normally expected to operate at the micro-level semantic change, the result shows otherwise. It is hypothesized, therefore, that the plane where metonymy operates is considerably lower than many would suppose, and indeed metonymy may be operative even below the level of lexicographic designations of word meanings. Validating the claims advanced in the present holistic study by way of analyzing individual prepositions merits future research.

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