Far Afield in Lexical Fields: The English Prepositions

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1. Introduction

In both psychology and linguistics, the lexicon is widely viewed as a type of mental coordinate system comprised of diverse lexical-conceptual *fields*. Conceptually-related lexical items, irrespective of their grammatical category, are claimed to be associated within such mental fields. Lexical "field work" has traditionally focused on folk taxonomies of concrete (and usually nominal) categories such as plant and animal names, cooking terms, and the like. Figure 1 represents a textbook example of a lexical field for the item FURNITURE. Inter-lexemic field analyses such as this usually posit the existence of structural hierarchies made up of superordinate, subordinate, and basic level items. At the basic level one finds prototypic exemplars, which are accorded special status within a field representationally due to their early acquisition and ease of retrieval in processing tasks [Lehrer 1974; Rosch 1975]. Categorization research in what has come to be called "prototype theory" has strongly suggested that, within a lexical field or conceptual category, speakers can distinguish between central and peripheral members. Prototype theorists thus argue that no specific criterial properties can be posited which apply to all members equivalently. This indeterminateness is especially troublesome if you consider that not all lexical categories are as analytically straightforward as concrete nominals. Relational predicates such as verbs and prepositions, because of subcategorization requirements, present additional problems for lexical semantic analyses.

Despite nearly 75 years of research on lexical field semantics (see Lehrer 1974, Miller & Johnson-Laird 1976 for overviews) or on **semantic networks**, to use the more contemporary cognitive psychology term, there have been few attempts to apply prototype-based categorial notions (like the concept of a field filled with generalized, canonical, and fairly unique tokens) to intra-lexeme semantics. No doubt because of their so-called "high semantic density," the best-known of these studies have been concerned with the semantics of prepositions in English, French, Dutch, and German (viz. Lindner 1981, Brugman 1981, Herskovits 1986, Vandeloise 1991, Colombo & Flores d'Arcais 1986, Wesche 1988, Jackendoff 1990, Rauh 1991). In this paper, I take the spatial metaphor of a lexical field or network and apply it internally to the English prepositions *at*, *on*, and *in*--three especially "adventurous" lexical items, semantically-speaking. Each of these prepositions has precise and indisputable spatial meanings, but more importantly, large numbers of temporal and other non-spatial meanings as well. It is these latter meanings that motivate the present analysis, which assumes that each preposition invokes its own lexical field and that lexical fields are best analyzed using lexical network models. First, let me compare a variety of network models currently being proposed in the literature.

2. Various Network Models

Brugman 1988, in her analysis of HAVE (as well as in her earlier study of OVER), proposes a multidimensional **lexical network** which she defines as a "structured cluster of lexical entries which have the same lexemic head and which are understood as together constituting a category of related senses (p. 194)." Most such networks have the following properties: related senses radiate from a core or prototypic meaning; the nodes in such a network represent different senses which vary according to the particular syntax or semantics of the lexeme in a give application; the nodes are interrelated and the strength of the relation between different senses is understood in terms of the distance between nodes and the directionality of links. While this description may sound intuitively appealing, it describes a variety of network architectures which in turn could all represent significant portions of the same data set. Sample networks are presented in Figures 2 through 8 and briefly discussed below.

Figure 2 represents a purely hierarchical network along the lines of what we might find in a dictionary entry. The nodes numbered 2-5 might represent distinct subentries, each of which has its own subentries. For all intents and purposes, the various major senses could be construed as unrelated and homonymous. Figure 3 is an idealized model of a radial category, described in Lakoff 1987. Its properties include a single core meaning, more precisely, an actual usage type, whose selection might be arbitrary. This core sense, labelled 1 in Figure 3, is usually designated the prototype and serves as a home base from which to extend (or relate) all other senses. Lakoff does not allow schematic senses in his network although Brugman does admit the possibility that they develop over time. This point will be addressed later. The network in Figure 4 is a rendering of the actual radial network Brugman developed in her 1981 Masters thesis for representing the various senses of OVER. It is taken from Lakoff 1987 where it was included as a case study concerned with the nature of the links between nodes. Lakoff proposes that cognitive mechanisms, which he terms *image-schema transformations*, are responsible for the meaning alternations represented by the various extended senses. These transformations effectively link different specific usages. I, too, am interested in the nature of the links or the conceptual relations holding between nodes in a network. At the present, I view these links as representing all-purpose categorizing relationships which either subsume several senses under a single sense or instantiate new senses of a lexical item, depending on the direction of the links. However, we have yet to establish which nodes are linked together in any network model of a lexeme. I suspect that <u>several</u> core senses coexist and influence the shape and size of a network. Until we have verified which nodes are relevant or conceptually real for a majority of speakers, we will only be positing the most subjective of lexical networks.

Despite the apparent inconsistencies between certain lexical network models, I want to promote them nevertheless. As a representational device, they afford partial resolution of what I think is an unnecessarily divisive theoretical debate between three usually competing theories of lexical meaning, **monosemy**, **polysemy**, and **homonymy**. These are summarized in

Figure 5 and discussed in Rice 1992. Network models, depending on the types of nodes and links posited, could be congruent with all three hypotheses. It all boils down to the level of granularity and the perspective on the data one wishes to take. While network models hold some promise for unifying opposing lexical camps, many problems remain, which, as I eventually hope to demonstrate, are really empirical problems. For example, does polysemy refer to clearly related <u>minor</u> variations on a single sense or to <u>major</u> variations which may only show some hint of relatedness? If only to the former, then I see no reason not to posit a single node per meaning type and pursue the development of a theory of conceptual adjustment that seeks to understand how context or construal parameters fill in the "missing meaning." This seems to be the approach taken by Herskovits 1986, Ruhl 1989, Jackendoff 1990, and Deane 1992 in their analyses of prepositional meaning. In contrast, the approach to polysemic variation advocated by Lakoff 1987 and Brugman 1988 is usually criticized on grounds that they have misdirected their energies by trying to account in painstaking detail for the conceptual adjustments needed for minor variations in prepositional meaning or application type. Many speakers (and linguists) do not see these usages as necessarily distinct from a richly specified prototype. (Most advocates of the minor variation view of polysemy attend exclusively to the prepositions' spatial senses. This neglect towards other usage types only serves to magnify theoretical biases and idiosyncratic sensitivity to the data.)

On the other hand, if polysemy is taken to mean major variations in meaning subsumed under a single lexemic head, then it is incumbent upon the linguist or psychologist to demonstrate that speakers attribute both a sufficient degree of relatedness and distinctiveness between multiple senses. Advocates of this brand of polysemy, and I include myself here, usually assume a certain level of semantic unity afforded by phonological similarity alone. Admittedly, this could be construed as a rejection of homonymy on essentially folk taxonomic grounds: all lexical items having the same form should be taken as semantically related. I am willing to adopt this position as the simplest null hypothesis until the data or speakers' behavior indicates otherwise. This assumption is supported by a view of lexical networks that does not put a priori restrictions on the content represented by nodes or links between those nodes and it is reinforced by a view of grammar that assumes all linguistic units are bipolar--containing both phonological and semantic information (see Langacker 1991 for an overview of the Cognitive Grammar framework). Assuming that phonological information is present in any lexemic network, the fact that identical phonological specifications extend to all of the nodes in the network effectively encourages one to assume semantic unity as well, at least in the absence of evidence to the contrary.

Let me add a few properties to the general network concept and show how these additions resolve some of the dispute between monosemic, polysemic, and homonymic accounts of word meaning. That is, if formulated properly, network models allow you to have your cake and eat it, too. To Brugman's schematic network, I would include properties which recognize that distinct regions of the network may be identified which could potentially correspond to syntactically or semantically relevant groupings. These groupings or regions may be viewed as generalizations over individual

cases and, in time, they may come to be identified with a schematic meaning, as suggested by Langacker 1991:266-272. As illustrated in Figure 6a, he advocates three types of nodes within a network: **prototypes**, **extensions**, and **schemas**. Once extensions are formed, that is, once a lexical item starts to get used regularly, in new and distinct ways, an overarching schema develops which may sanction both the prototype and the extended sense. As extended usages develop or as specialized usages come into being, the network gradually changes shape and enlarges to encompass the multiple senses (as shown in Fig. 6b). Note that some nodes have multiple connections indicating multiple motivations for their use type. It should be mentioned, however, that a lexical network doesn't expand indefinitely. Some regions of the network may actually shrink in the long run or get subsumed by other usage types. Actual growth or contraction in the network may only be evident during acquisition.

I would like to propose, therefore, a 3-dimensional, irregular, and somewhat amorphous lexical network along the lines of those presented in Figures 7 and 8 (which represent different viewpoints of the same type of network). The virtue of such a model is that it allows one to account for abstract, specific, and highly novel senses of a lexical item at the same time. Node types are distinguished on the basis of centrality, productivity, and schematicity. For example, schema nodes, labelled S, represent abstractions over individual cases with prototype (**P**) or extension (**E**) nodes representing separate subcases or actual usage tokens. These are just the types of sense relations we find associated with prepositions in the language, listed or exemplified in the dictionary, and debated over in the theoretical literature. In addition, such a network allows us to capture, using size of the node and length or solidity of the links as a metric, a sense of the productivity of an extension and whether or not it comes to function as a sort of local prototype. Potentially, this network model will allow us to convey the relative uniqueness or ubiquity of a usage type. A node marked N, for example, represents a highly novel usage that hasn't yet become conventionalized in the language, but which speakers recognize as related to other more common usages.

My working assumption, then, is that each prepositional form is a complex category with internal structure representing a consortium of individual cases. The question which looms large is: How are these distinct usages best represented in a way that is consistent with the data and with speakers' judgments about those data? To that end, I'll provide a small sampling of usage types for these prepositions in the next section and run through some corpus-based arguments for a network model. This corpus is based on thousands of attested usages compiled over the past several years from a variety of written and oral sources. Then, I'll briefly discuss the type of experimental evidence that will allow us to construct and test actual lexical networks for these prepositions that won't be vulnerable to the analyst's theoretical biases or to his or her hyper- or hypo-sensitivity to the data. Eventually, these network models will serve as a map, if you will, of the lexical fields represented by the lexemes, *at*, *on*, and *in*. These models should give us a sense of the general regions and individual sites within these fields. Cross-preposition and cross-network comparisons can then be

made since the potential for generalization between lexical items is greatly enhanced using network models. I predict that we'll find analogous patterns of polysemy and metaphoric extension for these so-called contact prepositions, which are usually distinguished on topological grounds only (viz. Hawkins 1984, Herskovits 1986). Thus, we should achieve the ultimate in a unified analysis by vindicating at a very abstract level, the monosemous view, but accounting for, at a very specific level, all the senses associated with the lexical form.

3. An Overview of *At*, *On*, and *In*: Basic and Extended Senses

At this time I am only proposing the idea of a certain type of network model. There are too many outstanding questions that even a large corpus of use types cannot answer. For instance, which meanings are central? Inarguably, these 3 prepositions participate in a wide variety of constructions. Furthermore, they appear to be associated with a wide range of meanings which seem quite unrelated. There's no question that there are syntactic differences among the various usages which, taken with the apparent meaning differences, might encourage one to take a homonymous solution or pare down the cases to be analyzed to only those with spatial content. This is certainly what most studies of the prepositions have done. Figure 9 represents some monosemic meanings that have been proposed for these prepositions. But one needs to ask, do these meaning relations represent the meaning or merely a central meaning? Are core or central meanings the earliest acquired or the most frequent? One can imagine how daunting the task of determining usage frequency will be. Moreover, how far can a central meaning be extended before the motivation for the extension is lost or before intermediate senses must be posited? I believe that a fine-grained analysis of all the various senses can reveal underlying similarities and relatedness among most of the usages. Below, I present some selected data, demonstrating that even a monosemic or ideal analysis works if one can posit cognitive mechanisms, such as changing perspective, selected attention, generalization, and metaphorization (which constantly restructures the background domain in spatial terms). However, at some point, the single meaning analysis collapses and we require a multiple-meaning system to motivate extension at the very local or novel level.

Under a monosemic or ideal analysis, single, possibly topological, possibly abstract senses have been posited for these lexical items corresponding to their "prepositional" or basic locative function. It is assumed that these senses can be modulated by context. Indeed, the fundamental basis for the contrast between these prepositions seems to be maintained in a variety of non-spatial, but similarly-conceived contexts. For now, let's assume that the essential spatial contrast is based on differences in dimensionality of the object of the preposition, as exemplified in (1):

(1)   *Your favorite coffee cup is*
        at your place/at your office.   POINT; 0-D
        on the table/on its saucer.   SURFACE; 2-D
        in the cupboard/in the kitchen.   CONTAINER; 3-D

Physical dimensionality, per se, breaks down in other locative or geographic usages unless one resorts to some sort of metaphor whereby, for example in (2), college campuses are construed as dimensionless or as being dimensionally irrelevant. At the same time, in English at least, islands are usually conceived of 2-dimensionally while cities and countries conventionally receive 3-dimensional construal:

(2)   *She met him*   *at UCLA.*
                    on Guam/on the island of Fiji.
                    in Singapore/in Fiji.

This dimensional difference is somewhat maintained in the temporal domain:

(3)   *He died*   *at 6:01/at dawn/at Christmas.*   BRIEF MOMENT
                    on Sunday/on the 12th.   SHORT PERIOD
                    in May/in summer/in 1897.   LONG EXPANSE OF TIME

But what about certain event or "situational" usages? Surely if dimensionality can be relaxed to mean a relative difference between a brief moment vs. a short period of time vs. a larger expanse of time then the differential use of *at*, *on*, and *in* (3) and (4) can at least be partially motivated (given that trips usually last longer than parties and graduate school is inevitably construed as a lengthy if not unending expanse of time):

(4)   *She met him*   *at the party*
                    on the trip
                    in graduate school

I have argued elsewhere that the "linguistically relevant" dimensionality of a referent object is, for the most part, experientially grounded [Rice 1992]. That is, in large measure, dimensionality is not related to objective reality, but to aspects of the particular viewing situation. The closer one is to something, the larger and more enveloping it appears, while the farther one is, the smaller and more pointlike one's perspective becomes. Thus, the classic deictic contrast as given in (5) is resolved and the ideal contrastive meanings still obtain:

(5)   a. *He's*   *at the store*   DISTAL --> POINT
                in the store   PROXIMAL --> CONTAINER
    b. *He's*   *at the beach*   DISTAL --> POINT
                on the beach   PROXIMAL --> SURFACE/FACE/FIELD

This contrast may also be maintained when speaking about an external or internal viewing arrangement. So I might utter (6a) if I'm taking an external perspective, that is, I haven't yet started or I have just finished Chap. 5, but I'd be more likely to utter (6b) if I'm still in the process of reading Chap. 5:

(6)   a. *Don't tell me the ending, I'm still at Chapter 5.*   EXTERNAL
    b. *Don't tell me the ending, I'm still on/in Chapter 5.*   INTERNAL

Likewise, in the domain of perception and cognition, perception seems to be a superficial and external process, while conceptualization suggests a deeper involvement and internal understanding. Phrasal verbs of perception and communication <u>tend</u> to form with *at* and *on*, while phrasal verbs of contemplation and emotion <u>tend</u> to form with *in*. Compare the pairs in (7):

(7) a. *They looked at the map.*   POINTLIKE PERCEPTUAL FOCUS?
     b. *He yelled at them.*

     c. *He focused on the TV.*   SHALLOW PERCEPTUAL FOCUS?
     d. *Let's eavesdrop on their conversation.*

     e. *I believe in the new reforms.*   DEEP CONCEPTUAL FOCUS?
     f. *We take pride in our schools.*

and note how strange these predicates become if a different preposition is substituted, as shown in (8):

(8) a. *They looked ??on/*in the map.*
     b. *He yelled *on/*in them.*
     c. *He focused at/*in the TV.*
     d. *Let's eavesdrop *at/?in their conversation.*
     e. *I believe *at/*on equal pay for equal work.*
     f. *We take pride *at/??on our schools.*

English is also full of contrasts which turn on the nature of the interaction between an entity and an abstract domain. In the case of (9), the difference depends on whether the involvement is internal or external, as signalled by *in* and *on* respectively.

(9) *He complained that store owners spend 90% of their time in the business and 10% on it when it should be the other way around.*

Or compare the sentences in (10). Taken together as commentary on a speech, they could be construed as representing a cline between indifference and interest. (10a) might be uttered if the speaker was not listening to or was perhaps bored by the candidate and was thus remaining external to the situation, while (10b-c) could only be uttered if the speaker was actively involved and paying a lot of attention to the content of the speech:

(10) a. *The candidate spoke at great length.*
     b. *The candidate spoke on many subjects.*
     c. *The candidate spoke in great detail.*

Other usage types shared by these prepositions include expressions of cognitive ability as exemplified in (11). It is <u>very</u> difficult to see the connection between these usages and our single ideal meanings. One needs to ask whether the non-substitutability of the three prepositions is based on semantic or conventional grounds.

(11) a. *He's good {at math/in math/*on math}.*
     b. *He's having trouble {in math/?at math/*on math}.*
     c. *He did well {on/?at/*in} his math test.*

Worse, there are other usages, rejected as completely grammaticized or idiomatic non-locative adverbial usages for which the choice of preposition <u>does</u> seem entirely the result of convention, as in (12),

(12) a. *The man is {at risk, at peace, at ease}.*
     b. *The man is {on drugs, on good behavior, on duty}.*
     c. *The man is {in trouble, in custody, in pain}.*

even though similar expressions may maintain some vestige of their old spatial sense, as shown in (13):

(13) a. *The countries are at war.*
     b. *The countries are on a war footing.*
     c. *The countries are in a state of war.*

Finally, when used with participles, in many contexts any of the three prepositions is acceptable. Consider the sentences in (14):

(14) a. *They became quite upset {at/on/in} seeing him again.*
     b. *{At/On/In} hearing that, she turned and left the room.*

However, under more careful scrutiny, we find differences in acceptability that we might be able to relate to the length or brevity of the action predicated by the participle or derived nominal. Again, the size or dimensionality of the background domain (here, an event) does seem relevant, but its dimensionality can only be motivated in very abstract, even aspectual terms. If the event is very brief, then *in* seems infelicitous with a participial form or derived nominal as illustrated in (15). Likewise, participles for events of long duration disfavor *at*, as shown in (16):

(15) a. *{At/?On/*In} the sight of blood, he always faints.*
     b. *{At/?On/*In} finishing the book, he started to cry.*

(16) a. *{In/?On/*At} sharing a meal, they found they had a lot in common.*
     b. *{In/?On/*At} finishing the book, he'd finally read all of Proust.*

One final point. Unlike a strictly monosemic account, the network model being advocated here allows for novel extensions that seem to bear little relation to either schematic or prototypic exemplars. It does so because it posits the existence of intermediate sense types that may only extend to a small set of usage tokens. For example, many usages of *at* have a decidedly antagonistic sense, as shown in (17):

(17) a. *She's at him again about his long hair.*

b. *She stuck her tongue out at him.*
c. *He got {mad at/*nice at/*happy at/*depressed at} all of them.*
d. *She looked daggers at him.*
e. *The lawyer involved in the case is at odds with the police.*

which may motivate the seemingly bizarre usage in (18):

(18)   Ignoring him when she knew he wanted to talk, she persistently and maliciously watched TV at him.

At is also used with superlatives of all kinds, as shown in (19):

(19)   a.   At the least, let me help pay for groceries.
b.   He's at his heaviest weight ever.
c.   They'll order one dessert at most for a table of six.
d.   At last, no more kids to pick up after.
e.   He's at his worst around his in-laws.

which, again, may motivate the novel usage in (20):

(20)   The film features Rowan Atkinson at his nastiest self.

One final bit of evidence in support of a network model. Both Elizabeth Traugott and Eve Sweetser have written on the nature of semantic change as a unidirectional and metaphoric extension across various domains. For Traugott 1982, the domains traversed are propositional, textual, and expressive. For Sweetser 1990, spatial notions felicitously extend to temporal domains, but also from perceptual to epistemic domains, and from physical to interpersonal domains. Taking the case of *at* once again, we find an extension from a simple locative usage in (21a), to real motion or approach in (b), to projected motion or approach in (c), to perceptual approach in (d), and finally to a sort of conceptual approach in (e):

(21)   a.   He's at home.
b.   He arrived at the station.
c.   He pointed his finger at her.
d.   He stared at her.
e.   He guessed at the answer.

By not placing a priori restrictions on the usage types to be incorporated by the lexical network, and by examining a very large corpus of tokens in context, we can begin to address questions like the following:

(i)   How do we determine which usages of *at, on,* and *in* are canonical?
(ii)   Which defining features are relevant?
(iii)   Should the central meaning(s) posited be spatial or abstract? Specific or schematic?
(iv)   If definitional schemas are initially abstract, where do they come from? How are they built up developmentally from specific instances

that seem quite unrelated?
(v)   What cognitive processes allow us to extend spatial meanings to abstract usages?
(vi)   Why do speakers consistently behave as if there are both meaning differences and similarities between some usages?

4.   Concluding Remarks: The Need for Experimental Evidence

In conclusion, I have tried to convey here the promise that network models hold for doing lexical semantics, especially for complicated word classes like prepositions. However, it's one thing to propose networks and another thing to construct and validate them. In order to begin addressing some of the representational issues discussed in this paper and to finally formulate and test actual network models, I have started to develop and run pilot experiments along the lines of those proposed in Miller 1971 and Colombo & Flores d'Arcais 1984. Thus far, I've had small groups of subjects perform categorization tasks on sentences they or other subjects have provided containing a particular preposition. Subjects have also had to give similarity ratings on large sets of sentence pairs containing the same preposition. These pairwise comparisons have demonstrated that some spatial and non-spatial (often termed lexical and grammatical) usages are considered related while other paired spatial senses are distinguished. In general, this methodology looks promising for addressing some of the issues I've discussed in this paper. Speakers are able to do these tasks with a high degree of within- and between-subject consistency. A series of large-scale experiments (yet to be run) will allow us to fine-tune the prototypic value(s) we ascribe to certain lexical items in order to pinpoint the speaker-relevant extensions. While I'm not reporting on the experimental findings here, I want to emphasize the importance of this component of the overall research program. Until lexical models are subjected to speaker validation, they remain speculative and, inevitably, controversial.

As with other experientially-based notions like foreground and background, perspective is everything. For depending on the perspective and level of granularity applied in an analysis, the perceptual salience and conceptual independence of entities and their relative uniqueness or ubiquity become less a matter of theory and more a matter of fact. Like a biologist mapping out an ecosystem, expect to find both diversity and systematicity in the lexicon. They each need to be accounted for rather than either of them selectively ignored.

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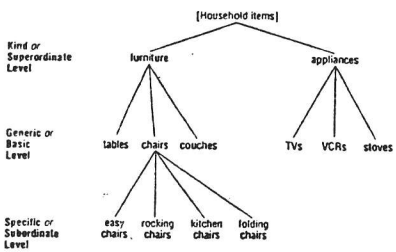
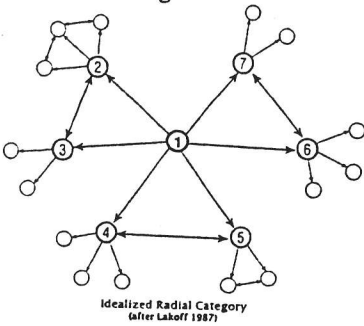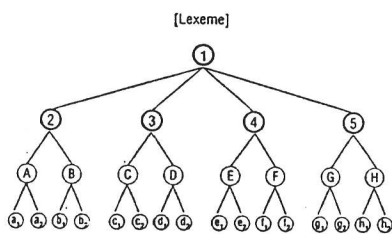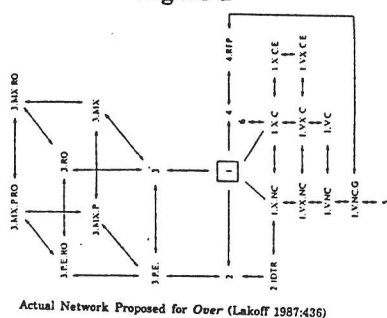A Typical Semantic Network: Furniture

Figure 1

A Hierarchical Network
(typical dictionary entry)

Figure 2

Idealized Radial Category
(after Lakoff 1987)

Figure 3

Actual Network Proposed for *Over* (Lakoff 1987:436)

Figure 4

| LEXICAL HYPOTHESIS	MONOSEMY <—— POLYSEMY ——> HOMONYMY			
TYPE OF MEANING POSITED FOR LEXEME	single	ideal	multiple, related "unified"	multiple, unrelated
MAJOR PROPONENTS	Jackendoff 1983/1990 Ruhl 1989	Talmy 1983 Hawkins 1984 Herskovits 1986 Wege 1991	Lindner 1981 Brugman 1981 Rauh 1991 Rice 1992	dictionaries
IMPLICATIONS FOR PREPOSITIONS	other meanings due to context	conceptual adjustments allow other senses	incorporates most usages within one complex category	one meaning per entry

Figure 5

Node Types in Langacker-type Network (1991:271)

Growth of a Network
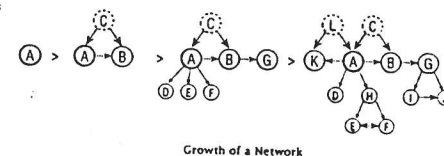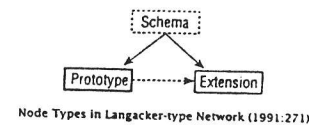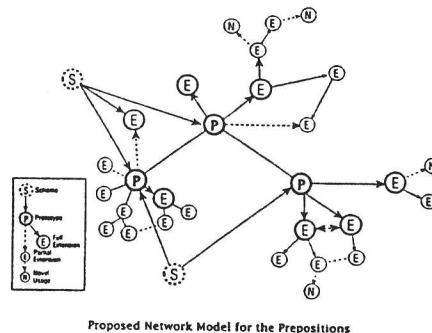
Figure 6

Proposed Network Model for the Prepositions

Figure 7
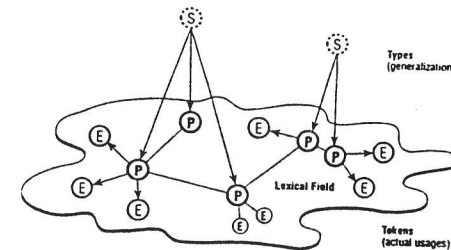
Figure 8

SOME PROPOSED BASIC SCHEMAS

	Topological	Non-topological
AT	figure coincides with 0- or 1-D ground (POINT or LINE)	figure and ground in a relationship of contiguity
ON	figure coincides with 2-D ground (SURFACE)	figure and ground in a relationship of support
IN	figure coincides with 3-D ground (CONTAINER)	figure and ground in a relationship of containment

Figure 9