9 From the spatial to the non-spatial: the ‘state’
lexial concepts of in, on and at

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1 Introduction

This paper is concerned with modelling the lexical representation of spatial relations,
particularly as encoded by English prepositions, and examining how these spatial
relations give rise to non-spatial meanings. In previous work Andrea Tyler and I
(Evans and Tyler 2004a, 2004b; Tyler and Evans 2001, 2003) modelled the extensive
polysemy exhibited by prepositions, and sought to provide a principled framework
for characterising their distinct sense-units. We also sought to establish boundaries
between senses as they inhere in semantic memory. In so doing, we attempted to
account for this polysemy in a motivated way, as an outcome of situated language use,
the nature of human socio-physical experience and the relevant cognitive mechanisms
and processes.

Nevertheless, the framework of Principled Polysemy we developed was not prima-
ry concerned with modelling the complexity of the spatio-geometric and functional
semantic properties, and the extremely complex functional knowledge that prepositional
sense-units assist in conveying. This follows as it was primarily concerned with address-
ing perceived methodological weaknesses in early work in cognitive lexical semantics,
as exemplified by the work of Brugman and Lakoff (Brugman [1981] 1988; Brugman
and Lakoff 1988; Lakoff 1987). In particular, it is becoming clear that Tyler and I, in
our work on Principled Polysemy, may, in fact, have underestimated the functional
complexity that ‘spatial’ prepositional sense-units provide access to.

Accordingly, the goal of this paper is to present a more recent theory of lexical
representation which builds on and refines the framework of Principled Polysemy. This
approach, I argue, better accounts for some of the complexities I will be describing with
respect to the sorts of knowledge structures that prepositions provide access to in the
minds of language users, as evidenced in language use. Following Evans (2004a 2004b;
see also Evans 2006, to appear), this theory employs two central constructs, the notion
of the lexical concept, and the cognitive model. In brief a lexical concept is a relatively
complex sense-unit which is conventionally associated with a specific form. Moreover,
certain kinds of lexical concepts afford access to large-scale multi-modal knowledge
structures. These I refer to as cognitive models. Cognitive models constitute relatively
stable, non-linguistic knowledge structures, which are subject to ongoing modification
as we continue to interact in the world and in communicative settings. Moreover,
cognitive models provide the complex informational characterisation lexical concepts
invoked in meaning construction processes. As the constructs of the lexical concept and
the cognitive model are of central importance, the theory of lexical representation to
be presented is termed the theory of *Lexical Concepts and Cognitive Models*, or LCCM
Theory for short. The theoretical discussion presented later in the paper is based on

The main analytical focus of the paper is the so-called ‘state’ senses of English prepo-
sitions, as associated with prepositions such as *in*, *at*, and *on*. While these sense-units
presumably derive from, and are certainly related to ‘spatial’ senses encoded by the same
forms, they are not, in and of themselves, primarily spatial in nature. Representative
examples are provided below.

(1) We are in love/shock/pain                ‘state’ sense
   cf. We are in a room                    ‘spatial’ sense

(2) We are at war/variance/one/dagger’s drawn/loggerheads   ‘state’ sense
   cf. We are at the bus stop              ‘spatial’ sense

(3) We are on alert/best behaviour/look-out/the run        ‘state’ sense
   cf. We are on the bus                   ‘spatial’ sense

In these examples, *in*, *at* and *on* mediate a relation between human experiencer(s) and a
particular state. While some of these expressions, for instance, to be ‘at daggers drawn’
are clearly idiomatic, the contention of cognitive lexical semantics is that while such
expressions may be highly conventionalised, and the source of the idiom may not be
accessible to contemporary language users, the fact that *at* is employed is, diachronically
at least, motivated (see Evans and Green 2006: chapter 10, for a review; see also Evans,
Bergen and Zinken 2007).

If the perspective offered by cognitive semantics is correct, namely that the use of
*in*, *at* and *on* to encode a ‘state’ meaning is motivated, deriving from historically earlier,
and synchronically, perhaps, more primary ‘spatial’ senses, then there are a number
of issues which await explanation. Firstly, how do we account for the derivation of non-spatial, what we might dub ‘abstract’ senses from historically earlier spatial senses? One solution to this problem has been to posit underlying conceptual metaphors as the
solution (Lakoff and Johnson 1999). That is, due to the conceptual metaphor, qua sub-
symbolic knowledge structure, of the sort glossed as *states are locations*, states of
the type captured in (1) to (3) inclusive are conceptualised as locations. On the metaphor
account, the existence of an independently motivated conceptual metaphor licenses the
development of new polysemous senses associated with *in*, *at* and *on*.

Despite the intuitive appeal of the conceptual metaphor account, this cannot be the
whole story. After all, each of the ‘state’ senses associated with the prepositions evident
in (1)-(3) exhibit distinct patterns in terms of the semantic arguments with which they
collocate. Put another way, the ‘state’ senses associated with the different prepositional
forms: *in*, *on* and *at*, are not equivalent. For instance, the ‘state’ sense associated with *in*
relates to semantic arguments which have to do with emotional or psychological ‘force’
such as being ‘in love’, ‘in pain’ and so on. In contrast, the semantic arguments associated
with at have to do, not with emotional force but, rather, with mutual (or interpersonal)
relations, such as being ‘at war’. Meanwhile, on relates to semantic arguments that have
to do with time-restricted activities and actions which involve being currently active in
some sense. These include being ‘on alert,’ ‘on duty,’ and so forth. That is, the semantic
arguments associated with each of the ‘state’ senses for these prepositions is of a quite
different kind. This suggests that the ‘state’ meanings conventionally associated with each
of these prepositional forms is also of a distinct kind. While this does not preclude a
conceptual metaphor account as part of the story, positing a unified metaphoric account
for examples of the kind provided in (1) to (3) does not, in itself, adequately account
for the linguistic facts.

The challenge, then, for a theory of lexical representation, which assumes that the
‘state’ sense-units are motivated and related, is to account for the fact that i) each of
these prepositions exhibits a conventional ‘state’ lexical concept, and ii) that each of the
‘state’ lexical concepts diverges. Put another way, we must account for the differential
motivation that gives rise to the similar, yet distinct, ‘state’ lexical concepts associated
with each of these prepositions. Thus, the ‘state’ lexical concepts present an intriguing
challenge which, I shall argue, existing theories of lexical representation, notably the
theory of Principled Polysemy, cannot, at present provide an account for. For this reason,
we require a more sophisticated account of lexical representation.

I will employ linguistic data associated with these ‘state’ lexical concepts in order
to provide a reasonably detailed illustration of how LCCM Theory accounts for the
functional complexity of the semantics involved. I argue that LCCM Theory facilitates
i) a revealing descriptive analysis of the ‘state’ lexical concepts of these prepositions,
including the way in which these sense-units are in fact distinct from one another; and
ii) a revealing account of the spatio-geometric and functional knowledge that the core
’spatial’ lexical concepts associated with in, at and on encode; and finally, in view of this,
iii) a revealing account of how each of the ‘state’ lexical concepts involved is motivated
by, and related to, the core ‘spatial’ lexical concepts associated with each preposition.

A further reason for selecting the ‘state’ lexical concepts as a case study is as follows.
While there is now a voluminous literature on spatial semantics, especially within cogni-
tive lexical semantics, this work has primarily been concerned with examining the range
of distinct sense-units associated with a given preposition, including a now impressive
body of research which has focused on principles for determining sense-boundaries,
including psycholinguistic and corpus-based approaches (e.g., Sandra and Rice 1995
and Gries 2005 and the references therein). However, hitherto, there has been, in relative
terms, comparatively little research on the non-spatial lexical concepts associated with
prepositional forms, and how they are related to one another and derived from spatial
lexical concepts. This lack of research makes an examination of the ‘state’ lexical concepts
of different prepositions an issue worthy of attention.

There are two claims that I make, and which the findings presented serve to
substantiate. Firstly, ‘new’ lexical concepts derive from already extant lexical con-
cepts by virtue of inferential processes, relating to situated instances of language use.
Hopper and Traugott (1993) refer to such a mechanism as pragmatic strengthening;
an inferential process whereby a new semantic representation is abstracted from an
extant semantic representation in what has been referred to as a *bridging context* (N. Evans and Wilkins 2000). A bridging context is a context of use in which the new lexical concept emerges as a situated inference (or an ‘invited inference’, Traugott and Dasher 2004). A polysemous relationship thereby holds between the extant and the derived lexical concept. I argue that the polysemous lexical concepts associated with the prepositional forms to be examined arise due to new *parameters* being encoded, giving rise to distinct lexical concepts. These parameters arise due to the functional consequences of spatio-geometric properties in situated language use, about which I shall have more to say below.

The second claim is as follows. The ‘state’ lexical concepts for each prepositional form are distinct, as revealed by an examination of their *lexical profiles*: the semantic and grammatical selectional tendencies exhibited. Moreover, each form has a number of conventional ‘state’ lexical concepts associated with it, which are different from one another. Put another way, there are clear differences in terms of ‘state’ lexical concepts both across and within the prepositions I address here.

2 The functional nature of the spatial semantics of prepositions

The point of departure for this study relates to the functional nature of the semantics associated with spatial relations as lexicalised by prepositions. Recent work in the framework of cognitive semantics (e.g., Herskovits 1986, 1988; Vandeloise 1991, 1994) has shown that the received or traditional view is descriptively inadequate in terms of accounting for how the core, prototypical or ideal ‘spatial’ sense-units associated with prepositions are actually used. The received view, which following Herskovits I refer to as the *simple relations model*, holds that the prototypical sense-unit associated with a given preposition straightforwardly encodes purely spatio-geometric properties, i.e., ‘simple’ relations.

My purpose in this section is to make the case for a functional characterisation of the ‘spatial’ lexical concept associated with a given preposition. By ‘functional’ I mean the following. To understand how language users employ the core ‘spatial’ lexical concept of a preposition we must also allow for non-spatial parameters which form part of the linguistic content encoded by the lexical concept. The use of the term ‘functional’ is motivated by the observation that such non-spatial parameters are a functional consequence of humanly relevant interactions with the spatio-geometric properties in question. Moreover, the way ‘spatial’ lexical concepts are ordinarily employed by language users would appear to require such a functional understanding if ‘spatial’ lexical concepts are to be correctly interpreted in context.

Providing a functional account is of further importance as the derived lexical concepts which result from sense-extensions (such as the ‘state’ lexical concepts of *in*, *on* and *at*), cannot be adequately accounted for without first recognising that in addition to spatio-geometric parameters, the core ‘spatial’ lexical concept associated with a prepositional form also includes functional information. That is, if we assume that the derived lexical concepts are motivated by the prototypical lexical concept, as is the
In cognitive lexical semantics, then we must assume a relatively complex (albeit schematic) body of ‘functional’ knowledge, if we are to account for the derivation of extended lexical concepts.

In this section, therefore, I briefly review some of the arguments made by Herskovits, and Vandeloise for thinking that functional information also constitutes part of the linguistic content associated with ‘spatial’ lexical concepts for prepositions (see also Coventry and Garrod 2004; Deane 2005, and Feist This volume for a related perspective).

I begin with Herskovits. In her work she observes that the received view has assumed that the ‘basic’ function of the spatial sense-units associated with prepositional forms is to encode purely spatial relations. On this view, the semantic contribution of any given spatial use of a preposition relates to spatio-geometric properties, typically designating a relation involving notions such as dimensions, axes or proximity (e.g., Bennett 1975; Miller and Johnson-Laird 1976 for representative examples).

This general approach, particularly as has been evident in formal and computational accounts of prepositions, as noted above, Herskovits (e.g., 1988) refers to as the simple relations model. Yet, as Herskovits shows in detail, the simple relations model is descriptively inadequate. That is, the ‘simple’ spatial relations posited are unable to account for the range of spatial representations that prepositions ordinarily designate. Some of the descriptive shortcomings of the simple relations model relate to phenomena such as the following.

Firstly, the same preposition often appears to include quite distinct geometric descriptions:

(4) a. the water in the vase
    b. the crack in the vase

The example in (4a) relates to an entity: the water, the trajector (TR), ‘contained’ by the landmark (LM), the vase. That is, it relates to the volumetric interior of the LM. In contrast, in (4b) the semantic contribution of in concerns a relation between a ‘negative’ region, namely a lack of substance, a crack, which is not part of the volumetric interior of the vase, but rather forms part of the landmark-boundary, namely the physical structure of the vase. Put another way, in relates to quite distinct spatio-geometric relations in these examples. This is problematic for the simple relations model which assumes that a given preposition encodes a single spatio-geometric relation.

Secondly, the spatial relations encoded by prepositions often appear to diverge from straightforward ‘simple’ relations. For instance, the following expression:

(5) the dictionary on the table

can be used unproblematically to refer to a dictionary placed on top of another book which is ‘on’ the table. That is, the dictionary is not actually ‘on’ the table, but rather ‘on’ the book which is in direct contact with, and therefore ‘on’, the table.

Thirdly, there often appears to be what Herskovits refers to as ‘added constraints’ which apply to prepositions. For instance, in examples of the following kind:
the relation implied is more specific than ‘simple’ spatio-geometric relations. That is, the example in (6a) implies, and is understood to mean, that not only is the TR in question, the man, in close proximity to his desk, but he is also working at his desk (or at least in a position to do so). Similarly, in (6b), in addition to the co-locational relation, this expression implies that the schoolboy is ‘waiting’ at the bus-stop, presumably for a bus. In other words, part of the meaning of these utterances is functional in nature. The schoolboy is co-located with the bus-stop in order to catch a bus. Implications such as these are not explained by the simple relations model. In fact, we seldom employ prepositions simply to describe a purely spatio-geometric relationship.

Fourthly, there are often unexplained context dependencies associated with prepositions which the simple relations model fails to account for. In an example such as the following:

(7) Max is at the crèche

this utterance appears only to work when both speaker and addressee are not also present at the crèche. In the case when the speaker and addressee are located at the crèche, the following would be more likely:

(8) Max is (somewhere) in the crèche

Finally, there are a number of other restrictions which appear to relate to discursive salience and/or relevance. Again, these are not accounted for by the simple relations model. For instance, in a scenario such as that represented by Figure 1, in which there is an apple located beneath an upturned bowl, the following expression is semantically anomalous:

(9) #the apple in the bowl

Figure 1. The apple beneath the bowl

Herskovits argues that in view of the failure of the simple relations approach a modified view of the lexical representation for spatial prepositions is required.

A related perspective has been presented by Vandeloise in his work. Vandeloise (1991, 1994) argues compellingly that any account of spatial semantics that leaves out the functional nature of prepositional lexical concepts fails to properly account for
how they are actually employed. That is, spatio-geometric relations have functional consequences, consequences which arise from how we interact with objects and entities in our physical environment, and in our daily lives. To illustrate, take the mundane example of a cup of coffee. Imagine holding it in your hand. If you move the cup slowly up and down, or from side to side, the coffee moves along with the cup. This follows as the cup is a container with a bottom and sides and thus constrains the location of any entity within these boundaries. Tyler and I (2003) referred to this property of bounded landmarks as ‘location with surety’.

The force-dynamic properties associated with a cup as a container also show up in linguistic content, as illustrated by the semantic contribution of the preposition in.

Consider the diagram in Figure 2 drawn from the work of Vandeloise (1994).

![Figure 2. A bottle or a light bulb? (adapted from Vandeloise 1994)](image)

Vandeloise observes that the image depicted in Figure 2 could either represent a bottle or a light bulb. As example (10) shows, we can use the preposition in to describe the relation between the light bulb (TR) and the socket (LM).

(10) The bulb is in the socket

In contrast however, we cannot use in to describe the relation between a bottle and its cap, as illustrated by (11).

(11) #The bottle is in the cap

Vandeloise points out that the spatial relation holding between the TR and LM in each of these utterances is identical, and yet while (10) is a perfectly acceptable sentence (11) is semantically odd. Vandeloise suggests that it is not the spatial relation holding between the TR and LM that accounts for the acceptability or otherwise of in. He argues that the relevant factor is one of force-dynamics: ‘[W]hile the socket exerts a force on the bulb and determines its position, the opposite occurs with the cap and the bottle’ (Vandeloise, 1994: 173). In other words, not only is the position and the successful function of the bulb contingent on being in (contained by) the socket, but the socket also prevents the bulb from succumbing to the force of gravity and falling to the ground. In contrast, the position and successful functioning of the bottle is not contingent on being in the cap. This suggests that our knowledge of the functional consequences associated with located containment affects the contextual acceptability of a preposition such as in.
3 Principled polysemy revisited

Having begun to consider the functional nature of the spatial semantics of prepositions, I now reconsider the model of Principled Polysemy as an account of spatial semantics. In developing this model Tyler and I (e.g., Tyler and Evans 2001, 2003) sought to model the nature of the lexical representations associated with spatial particles such as prepositions. In so doing we were concerned with two sorts of issues. Firstly, we were concerned with accurately describing the nature and range of the distinct (albeit related) lexical concepts (what we referred to as 'senses') associated with lexical categories such as prepositions. That is, we were concerned with providing a constrained (i.e., principled) methodology for establishing sense-units and thus sense-boundaries.

Secondly, we were concerned with accounting for how sense-units (lexical concepts in present terms) arise. We posited that the lexical concepts which populate a semantic network for a given preposition are diachronically related, and the derivation of 'new' lexical concepts (i.e., sense-extension) is motivated (see Evans and Tyler 2004a in particular). Both these issues required detailed analysis of the lexical representations associated with the various lexical concepts for a given preposition. Moreover, this in turn entailed examination of spatio-geometric, and non-spatio-geometric, aspects of prepositional lexical concepts.

For instance, while an important part of the semantic representation for *over* in (12) has to do with the spatio-geometric relationship holding between the TR and the LM, in (13) an important part of the lexical representation relates to non-spatio-geometric aspects, i.e., occlusion.

(12) The picture is over the sofa

(13) The veil is over her face

In (12) the semantic contribution of *over* relates to an 'above' relation, which concerns the spatio-geometric relationship in a 3-dimensional region holding between the TR and LM. In (13), while part of the linguistic content of *over* must also encode spatio-geometric information – as occlusion is a consequence of a physical relationship holding between artefacts and the vantage point of a perceiver from which the artefacts are viewed – nevertheless, the semantic contribution of *over* is more saliently identifiable as the functional notion of 'occlusion.' Examples such as this, in which *over* is not interpreted as providing a semantic contribution relating to 'above' but rather 'occlusion,' provide good evidence that the occurrence of *over* in (13) is sanctioned by a distinct lexical concept: we are dealing with a lexical concept which is distinct vis-à-vis the 'above' lexical concept which sanctions the use of *over* in (12).

In our analyses, Tyler and I made the point that functional lexical concepts such as what we referred to as the Covering Sense of *over* (i.e., the [OCCLUSION] lexical concept in present terms), obtain because spatial experience is inherently meaningful for humans. That is, as human beings we interact with objects around us in our spatial environment (see Johnson 1987; 2007). Particular spatial relations, as manifested by the linguistic
content encoded by prepositional lexical concepts, have functional consequences. These
functional consequences we described as arising from experiential correlations, an idea
we borrowed, and adapted from the work of Grady (1997).

For instance, a consequence of the spatio-geometric property associated with over
in examples such as (12), i.e., an ‘above’ relation, is that in certain contexts, occlusion
occurs. To illustrate consider (14):

(14) The tablecloth is over the table

In this example, the use of over is sanctioned by a lexical concept that encodes a spatio-
geometric relation in which the TR is in an ‘above’ relation with respect to the LM.
However, a functional consequence of how we interact with TRs such as tablecloths,
and LMs such as tables, and given the dimensions of tablecloths, such that they often
draw a greater extension than tables, is that by virtue of being over (i.e., above), the
tablecloth thereby occludes the table. Thus, we argued that due to such contexts of
use, over can, by virtue of the process of reanalysis termed pragmatic strengthening
(as briefly introduced above), lead to the ‘occlusion’ reading becoming ‘detached’ from
the context in which it grounded, and reanalysed as a distinct sense-unit of over in
its own right.

A related idea that was important in the Principled Polysemy framework was the
notion of a functional element, an idea inspired by the work of Vandeloise (e.g., 1991,
1994) in his functional approach to spatial semantics. This notion related to the central
or core sense in a semantic polysemy network. Such lexical concepts we termed proto-
scenes. The proto-scene for over, what we termed the Above Sense as exemplified in (12),
constitutes an abstraction over spatio-geometric properties associated with the range
of spatial scenes in which a given preposition, such as over, is used.

However, as already noted, a large part, perhaps the majority, of uses of the proto-
scene of a given prepositional form relate to usages which are not purely or even wholly
spatio-geometric in nature (see Vandeloise 1991, 1994 and especially Herskovits 1986,
1988 as described above). Thus, Tyler and I argued that functional information forms
part of the semantic representation of any given proto-scene (see Evans and Tyler 2004a;
Tyler and Evans 2003 for details).

In sum, Principled Polysemy posits two kinds of lexical concept which populate
a prepositional polysemy network. The first kind, the proto-scene, is primarily
spatio-geometric in nature. Moreover, the proto-scene corresponds – for most of the
prepositions we surveyed – to the historically earliest lexical concept associated with
a given prepositional form (Tyler and Evans 2003). Nevertheless, proto-scenes include
a functional element, reflecting the way in which proto-scenes are ordinarily used.
That is, language users typically employ proto-scenes in ways which draw upon the
functional consequence of interacting with spatial scenes of certain kinds in humanly
relevant ways. Thus, linguistic knowledge associated with proto-scenes appears to
involve more than simply knowing the particular spatio-geometric properties encoded
by a particular form.
The second sort of lexical concept – the remainder of the senses in a prepositional polysemy network – we hypothesised as being motivated by, and ultimately derived from, the proto-scene. This said, we observed that the derivation is often complex and indirect (see Tyler and Evans 2003 for detailed discussion). These derived lexical concepts we referred to as sense-extensions. These ‘new’ lexical concepts, we argued, were derived by virtue of the process of re-analysis (pragmatic strengthening) due to experiential correlations of the sort described above for the development of the Occluding Sense from the Proto-scene (i.e., the Above Sense).

One issue which Tyler and I largely side-stepped, in the version of Principled Polysemy which appeared as Tyler and Evans (2003), concerned how best to account for ‘common’ lexical concepts of different prepositions, such as the ‘state’ lexical concepts for in, on and at, illustrated above in the examples in (1) to (3). The difficulty here is that as the ‘state’ lexical concepts associated with in, at and on, for instance, are all identified by a common label, this might be construed as suggesting that there is common semantic representation. Yet, the ‘state’ lexical concepts appear, on the contrary, to be distinct sense-units as evidenced by the distinct semantic arguments with which they each collocate: their lexical profiles, in present terms. What is required is a theory of lexical representation which has methodological tools for distinguishing between ostensibly ‘similar’ lexical concepts associated with different forms.

A further difficulty is that it is unclear, in Principled Polysemy, what the nature of the functional relationship is holding between the lexical representation associated with the proto-scene, and the diverse ‘functional’ lexical representations associated with the range of derived senses we posited. That is, while Principled Polysemy posited a single functional element associated with each proto-scene, it is not clear how this would motivate the functional complexity apparent in the plethora of functionally diverse extended senses, posited for each prepositional form.

Thus, while an important construct, there is good reason, therefore, to think that the notion of a functional element associated with the proto-scene, as presented in Evans and Tyler (2004b) and Tyler and Evans (2003) actually underestimates the functional complexity that must be readily available to language users, as encoded by the range and various combination of parameters associated with the distinct ‘state’ lexical concepts across and within prepositions.

Ultimately, the difficulty for the Principled Polysemy framework is that while it attempted to provide a detailed account of lexical representation, because of its primary concern with detailing a rigorous methodology for establishing distinct sense-units, it failed to work out the implications of the functional nature of spatial semantics for lexical representation.¹
4 The lexical concepts and cognitive models (lccm) approach to lexical representation

In recent work (Evans 2006, to appear), I have begun to develop an approach to lexical representation which is consistent with the context-dependent nature of the meanings associated with words. Indeed, part of the focus of this particular research programme is to develop an account of how lexical representations give rise to situated meaning construction, and thus to provide a cognitively-realistic approach to meaning construction. While the issue of situated meaning construction is less relevant to the analysis of how best to represent the ‘state’ lexical concepts in the present paper, and won’t be addressed further, Evans (2006) constitutes an attempt to model lexical representation that is relevant for any lexical class, including prepositions.

The starting point for the LCCM Theory account is the premise that linguistic knowledge is usage-based. That is, I assume that the organisation of our language system is intimately related to, and derives directly from, how language is actually used (Croft 2000; Langacker 2000; Tomasello 2003). Through processes of abstraction and schematisation (Langacker 2000), based on pattern-recognition and intention-reading abilities (Tomasello 2003), language users derive linguistic units. These are relatively well-entrenched mental routines consisting of conventional pairings of form and semantic representation. The semantic representations conventionally associated with a given unit of form, I refer to, as already noted, as a lexical concept.

While lexical concepts are mental representations, they underspecify the range of situated meanings associated with a given form in an individual utterance. Thus, I make a fundamental distinction between lexical concept as a mental unit, and its context-dependent realisation in an utterance. This is akin to the distinction in Phonological Theory between the abstract notion of a phoneme and the actual unit of realised context-dependent sound, the allophone. My claim is that there is an essential distinction between lexical representation and meaning. While meaning is a property of the utterance, lexical representations are the mental abstractions which we infer must be stored as part of the language user’s knowledge of language, in order to produce the range of novel uses associated with situated instances of a particular word such as a preposition. The meaning associated with an utterance I refer to as a conception. Thus, conceptions are a function of language use.

There are a number of important properties associated with lexical concepts. I briefly review some of the most relevant here (for detailed discussion see Evans to appear). Firstly, and as noted above, linguistic units, as I use the term, are conventional pairings of form and meaning. From this it follows that lexical concepts are form-specific. Secondly, as mentioned above, although lexical concepts are form-specific, a single form can be conventionally associated with a potentially large number of distinct lexical concepts which are related to degrees as attested by the phenomenon of polysemy. That is, forms are not lexical concept-specific. A consequence of this is that the lexical concepts which share the same form can be modelled in terms of a semantic network (see Evans and Green 2006: chapter 10 for discussion).
Thirdly, the definitional property of any given lexical concept is that it has a **lexical profile**, its unique 'biometric' identifier. A lexical profile is an extension of criteria presented in Evans (2004a), and akin to the notion of an 'ID tag' (Atkins 1987) and 'behavioural profile' (Gries 2005). While a lexical concept associated with a particular form can be provided with a semantic gloss, as in the case of lexical concepts associated with *over*, an example of which I glossed as [above] or the lexical concepts associated with *in*, *at* and *on* to be examined later which I preliminarily gloss as [state], whether a particular usage of a form relates to one lexical concept rather than another is a matter of examining the 'selectional tendencies' (the lexical profile) associated with a given usage. While any given usage of a lexical concept will have its own unique collocational pattern, general patterns can be established, and form part of the conventional knowledge associated with a particular lexical concept.

Two sorts of information form a lexical concept's lexical profile. The first relates to semantic selectional tendencies. In Evans (2004a) this was referred to as the Concept Elaboration Criterion. The second relates to formal or grammatical selectional tendencies. In Evans (2004a) I referred to this as the Grammatical Criterion. Gries (2005) has advocated the way in which corpus methodologies can be used to examine the lexical profile associated with a specific lexical concept. For instance, each of the 'state' lexical concepts associated with *in*, *at* and *on* have distinct lexical profiles. In the remainder of this chapter I primarily rely on semantic selectional tendencies for adducing distinct lexical concepts.

To provide a preliminary illustration of the construct of the lexical profile, I briefly consider two lexical concepts, both of which I provisionally gloss as [state] – although I revise this gloss later in the chapter – and which are conventionally encoded by the English prepositional forms *in* and *on*. These are evidenced by the following examples:

(15) a. John is in trouble/danger
b. Jane is in love/awe
c. Fred is in shock
d. Jake is in a critical condition

(16) a. The guard is on duty
b. The blouse is on sale
c. The security forces are on red alert

While both *in* and *on* have 'state' lexical concepts conventionally associated with them, the lexical profile for each is distinct. For instance, the [state] lexical concept associated with *on* selects semantic arguments which relate to states which normally hold for a limited period of time, and which contrast with salient (normative) states in which the reverse holds. For instance, being 'on duty' contrasts with being off-duty, the normal state of affairs. Equally, being 'on sale' is, in temporal terms, limited. Sales only occur for limited periods of time at specific seasonal periods during the year (e.g., a winter sale). Similarly, being 'on red alert' contrasts with the normal state of affairs in which a lesser security status holds. Further, the states in question can be construed as volitional, in...
the sense that to be ‘on duty/sale/red alert’ requires a volitional agent who decides that
a particular state will hold and takes the requisite steps in order to bring such a state
of affairs about.

In contrast, the semantic arguments selected for by the [STATE] lexical concept for
in relates to states which do not necessarily hold for a limited period of time, and do not
obviously contrast with a ‘normal’ state of affairs. Moreover, while states encoded by on
are in some sense volitional, states associated with in are, in some sense, non-volitional.
That is, we do not usually actively choose to be in love, shock or a critical condition,
nor can we, by a conscious act of will, normally bring such states about. That is, these
states are those we are affected, constrained and influenced by, rather than those which
are actively (in the sense of consciously) chosen.

The fourth and final property of lexical concepts that I review here concerns the
position that they have bipartite organisation. That is, lexical concepts encode linguistic
content and facilitate access to conceptual content. Linguistic content represents the
form that conceptual structure takes for direct encoding in language, and constitutes
what might be thought of as a ‘bundle’ of distinct knowledge types. There are a large
number of different properties encoded by linguistic content which serve to provide a
schematic or skeletal representation, which can be encoded in language (for a review
see Evans to appear: chapter 6). The one which is relevant for the present study relates
to the notion of parameterisation.

One way in which knowledge, in general terms, can be represented is in terms of
richly inflected nuances that serve to reflect the complexity of experience. An alternative
way is to ‘compress’ such fine distinctions into two, three or more, much broader, and
hence, more general distinctions. These I refer to as parameters. Linguistic content
serves to encode content by adopting the latter strategy, which is to say, to employ
parameterisation. Parameters are hence part of the ‘bundle’ of information that a lexical
concept encodes.

To illustrate this notion, consider the complex range of expressions that a language
user might employ, in English, in order to ‘locate’ themselves with respect to time,
thereby facilitating time-reference. Any one of the following could conceivably be
employed, depending upon context: today, January, 2008, the day after yesterday, the day
before tomorrow, this moment, now, this second, this minute, this hour, today, this week,
this month, this quarter, this year, this half century, this century, this period, the 8th day
of the month, this era, this millennium, and so on. A potentially unlimited set of finer
and finer distinctions can be made (e.g., 1 second ago, 2 seconds ago, 1 hour 4 minutes
and 3 seconds ago, 2 days ago, etc.), reflecting any manner of temporal distinction we
might care to make.

In contrast, parameterisation functions by dividing all the possible distinctions relating
to a given category, such as time-reference, into a small set of divisions: parameters.
Such parameters might distinguish between the past, for instance, and the non-past.
Indeed, this is the basis for the tense system in English, as illustrated by the following:

(17) a. He kicked the ball Past
    b. He kicks the ball Non-past
English encodes just two parameters that relate to Time-reference: Past versus Non-past, as exhibited by the examples in (17), and thus manifests a binary distinction. Some languages, such as French, have three parameters: Past, Present and Future. Some languages have more than three parameters, distinguishing additionally remote past from recent past, for instance. The language with the most parameters for linguistically encoding time-reference is an African language: Bamileke-Dschang with eleven. Crucially, parameters are encoded by specific lexical concepts, and thus form part of the knowledge ‘bundle’ that constitutes a lexical concept. For instance, the parameter ‘past’ is encoded by the lexical concept associated with the –ed form in (17a). However, other lexical concepts also include the parameter ‘past’ such as the lexical concepts associated with the following forms: sang, lost, went, etc.

I argue, then, that a key feature of linguistic (as opposed) to conceptual content is that it only encodes knowledge in parametric fashion. This is not to say that conceptual content does not parameterise knowledge. Indeed, parameterisation is simply a highly reductive form of abstraction: it serves to abstract across the complexity exhibited by a particular category. The point, however, is that the parameters encoded by linguistic content serve to ‘strip away’ most of the differences apparent in the original perceptual experience, thereby reducing it to a highly limited number of parameters.

In addition to encoding linguistic content, a subset of lexical concepts – those conventionally associated with open-class forms (see Evans to appear for discussion of this), serve as access sites to conceptual content. Conceptual content relates to non-linguistic information to which lexical concepts potentially afford access. The potential body of non-linguistic knowledge, what I also refer to as a lexical concept’s semantic potential, is modelled in terms of a set of cognitive models. I refer to the body of cognitive models, and their relationships as accessed by a given lexical concept, as the cognitive model profile. A design feature of language is that it involves a bifurcation of lexical concept types: those which are relatively more schematic in nature, such as those associated with prepositional forms, the subject of the present study, and those which are relatively richer in nature. As I am dealing with lexical concepts associated with closed-class forms in this study, namely prepositions, I will have little more to say about cognitive models in the remainder of this chapter.

5 Two factors in accounting for ‘state’ lexical concepts: lexical profiles and parameters

In the Principled Polysemy framework the prototypical (i.e., spatial) sense with respect to which a semantic network is structured is a proto-scene. As we saw earlier, proto-scenes have a single functional element associated with them. In LCCM Theory in contrast, lexical representations, and thus proto-scenes, are representationally more complex than this, especially with respect to their functional properties. In this section I briefly reconceptualise the nature of the core lexical concept associated with a prepositional polysemy network in the light of LCCM Theory.
The prototypical semantic representation associated with a preposition, like the other lexical concepts in the prepositional polysemy network, is a lexical concept. As we saw in the previous section, lexical concepts have bipartite organisation: they facilitate access to conceptual content and encode linguistic content. As prepositional lexical concepts are associated with prepositions: closed-class forms, they constitute closed-class lexical concepts. As such, while they encode linguistic content they do not serve as access sites to conceptual content.

There are two aspects of linguistic content that will be relevant for the discussion of the polysemy exhibited by the range of ‘state’ lexical concepts in this study. The first concerns the lexical profile exhibited by lexical concepts, as manifested by distinct collocational patterns in language use. As we saw earlier in the chapter, two sorts of information form a lexical concept’s lexical profile: semantic selectional tendencies, and formal or grammatical selectional tendencies. In this study I employ distinctions in the semantic arguments which, I hypothesise, collocate with distinct ‘state’ lexical concepts to uncover distinctions in lexical concepts both within and between prepositions.

The second aspect of linguistic content that will be relevant relates to parameterisation. One characteristic that serves to distinguish between lexical concepts, both across prepositions and within a single preposition, relates to the parameters encoded. For instance, the prototypical ‘spatial’ lexical concept associated with in, which I gloss as [enclosure], encodes the parameter Containment, as evidenced by the example in (18). In contrast, the [emotion] lexical concept – one of the ‘state’ lexical concepts associated with in – encodes the parameter Psycho-somatic State, as evidenced in (19), but not the Containment parameter.

(18) The kitten is in the box  Parameter: Containment
(19) John is in love  Parameter: Psycho-somatic state

That is, the [enclosure] lexical concept in (18) encodes a schematic dimension abstracted from sensory-motor experience in which a TR is contained by the LM. Notice that the relation encoded is highly schematic in nature; it says nothing about whether there is contact or not between the TR and LM as in (20), nor as to whether the TR represents part of the LM or not as in (21):

(20) a. The fly is in the jar  (i.e., flying around)
    b. The fly is in the jar  (i.e., stationary on one interior surface)
(21) There’s a crack in the vase

Indeed, the precise spatio-geometric nature of the TR, LM and their relationship is a function of the TR and LM and their possible forms of interaction, rather than the abstract parameter encoded by the [enclosure] lexical concept associated with the prepositional form in. This information derives from the semantic potential accessed
via the open-class lexical concepts, as mediated by compositional processes (see Evans to appear for details).

In contrast, the [EMOTION] lexical concept associated with in encodes the parameter Psycho-somatic state. This information is highly schematic in nature. That is, the parameter encoded does not determine which sorts of psycho-somatic states can collocate with this lexical concept. This is a function of the lexical profile: knowledge relating to the semantic selectional tendencies associated with this lexical concept, and hence the range of psycho-somatic states which can co-occur with the [EMOTION] lexical concept. Hence, while the parameters encoded by a lexical concept determine the possible range of semantic arguments that can co-occur, the lexical profile, which relates to stored knowledge based on usage-patterns, provides information relating to the range of permissible states which can co-occur with this lexical concept.

6 Functional consequences of parameters

I now consider how the ‘state’ lexical concepts arise from historically earlier spatial lexical concepts, giving rise to the phenomenon of polysemy. Put another way, polysemy is a consequence of new, or derived lexical concepts emerging, thereby exhibiting a semantic relationship with a synchronically present – albeit diachronically antecedent – lexical concept.

Based on arguments developed in Tyler and Evans (2001, 2003) I argue that the spatio-geometric knowledge, encoded, in present terms, as abstract parameters by the ‘spatial’ lexical concepts associated with prepositional forms gives rise to the development of non-spatial lexical concepts. In other words, ‘state’ lexical concepts emerge by virtue of parameters such as that of Psycho-somatic state arising as a functional consequence of spatio-geometric properties, in particular usage contexts. Hence, the emergence of derived lexical concepts is a consequence of the functional consequences of spatio-geometric parameters in a specific context of use. Such contexts of use Tyler and I (2001, 2003) referred to as spatial scenes.

For instance, there are a large number of distinct sorts of spatial scenes that involve the prototypical spatial lexical concept: [ENCLOSURE], associated with in, and which hence encode the parameter Containment. This follows as different bounded landmarks – a landmark which exhibits the structural properties interior, boundary and exterior – have different functions, are employed for different ends and are viewed from different vantage points. For instance, while a playpen, prison cell and a coffee cup all restrict the containee to a specific location, they do so in service of different objectives, respectively: safety, punishment and consumption. Hence, without understanding the functional consequence of being located ‘in’ a bounded landmark such as a prison (cell), the question in (22) would be uninterpretable:

(22) What are you in for?
After all, _in_, here, does not relate directly to a given spatial relation, but rather to the specific sets of knowledge systems relating to the ‘containment’ function of prison in a particular society. Thus, in (22), being ‘in’ relates not purely to containment, a functional consequence of the [enclosure] lexical concept, but rather, and in addition, to punishment, a functional consequence of being contained in enclosures (i.e., bounded landmarks) of a certain kind, i.e., prisons, which occupy a certain position, and fulfil a specified role in the socio-cultural and legal institutions of a particular society.

Now consider a different sort of functional consequence associated with the [enclosure] lexical concept for _in_. One consequence of certain sorts of bounded landmarks is their utility in providing security. This is evident in the scenario involving a very small child in a playpen for instance. But it is also true of bounded landmarks such as safes used to safeguard valuable commodities such as money or jewels. Indeed, a functional consequence of bounded landmarks of this sort is that the contents are occluded. This of course assumes that the vantage point from which the bounded landmark is viewed is exterior with respect to the volumetric interior of the bounded landmark in question, here the safe. Thus, ‘containment’ or ‘location with surety’ is a functional consequence of the spatial relation (i.e., the lexical concept) conventionally associated with _in_, i.e., of [enclosure].

The point is, then, that when _in_ is employed in any given utterance, the conception which derives will almost certainly always relate to a functional consequence attendant on a specific sort of spatial scene, involving a containment relation, but doing so in service of objectives and consequences specific to the sort of spatial scene in question. Put another way, bounded landmarks are of many different kinds, a consequence of the many different ways in which we interact with, and the complex range of functions to which we put, bounded landmarks.

In terms of the phenomenon of polysemy, which is to say the emergence of derived lexical concepts, it is precisely functional consequences of this sort which give rise to new parameters. Such new parameters become conventionally associated with a lexical form, and hence contribute to the formation of a new lexical concept. The occlusion afforded by certain kinds of bounded landmarks, such as a jeweller’s safe, is a consequence of placing valuables in a landmark that serves to protect the commodity in question. Typically, such landmarks are made of materials that serve to occlude the contents, a consequence – rather than the objective – of employing the types of materials used for constructing the safe. This functional consequence has become abstracted from such spatial scenes to give rise to a distinct parameter. This forms part of the linguistic content encoded by a distinct lexical concept. Evidence for this comes from examples of the following sort:

(23) The sun is in

This utterance relates to lack of visibility of the sun, rather than the sun, the TR, being enclosed by a bounded LM of some sort. That is, the functional consequence of certain sorts of containment relations has given rise to a distinct lexical concept which has a Lack of Visibility parameter encoded as part of its linguistic content.
7 Lexical concepts for *in*

In this section I present an LCCM analysis of the ‘state’ lexical concepts associated with *in*. That is, I argue that there is more than one distinct ‘state’ lexical concept conventionally associated with the prepositional form *in*. I also show how these ‘state’ lexical concepts relate to and are motivated by the functional consequences attendant upon the range of spatial scenes which involve usages of *in* sanctioned by the [ENCLOSURE] lexical concept.

7.1 ‘Spatial’ lexical concepts for *in*

As noted above, the central ‘spatial’ lexical concept associated with *in* I gloss as [ENCLOSURE]. This lexical concept encodes the parameter Containment. This parameter constitutes an abstraction across the spatio-geometric properties associated with bounded landmarks, such as a box, as lexicalised by the example in (18). The key spatio-geometric components associated with a LM such as a box is that it has the structural elements interior, boundary and exterior (see Tyler and Evans 2003: chapter 7 for detailed discussion). There are a diverse range of complex conceptualisations across which the parameter Containment is abstracted. This includes, at the very least, experiences relating to a TR: the entity enclosed, and a bounded landmark which serves to enclose the TR. Bounded landmarks themselves consist of many types even in everyday experience. For instance, a bounded landmark includes an interior, which further subsumes an interior surface, and the volumetric interior bounded by the interior surface. It also subsumes a boundary, which can be rigid, as in a metal safe, or non-rigid, as in a plastic carrier bag. The boundary also has other physical characteristics such as permeability and degrees of opacity. Finally, the bounded landmark has, by definition, an exterior: that region which constitutes the inverse of the volumetric interior. Accordingly, part of the exterior includes the exterior surface.

As observed earlier, due to our interaction involving enclosures, *in* is associated with a number of functional consequences. That is, there are a number of identifiably distinct sorts of functional categories associated with spatial scenes involving enclosure. These include Location with Surety, Occlusion and Affecting conditions. Bounded landmarks that are specialised for providing a Location with Surety function are known as ‘containers’. These can provide a support function by virtue of containing (i.e., holding and restricting) the location of the TR. This was illustrated with the discussion of the light bulb in the socket example earlier. Alternatively, containers can restrict access (and escape), as in the case of prisons, and safes. The second functional category mentioned relates to Occlusion. A consequence of certain bounded landmarks, due to the opacity of the material which forms the boundary, is that the figure located on the volumetric interior is occluded, and hence hidden from view. The third functional category, that of Affecting conditions, relates to the fact that an enclosure provides a delimited environment which thereby affects the TR located on the volumetric interior. For instance, a prisoner held in solitary confinement in a windowless sound-proofed room is thereby...
subjected to a particular sensory environment, which is a direct consequence of the nature of the bounded landmark in which s/he is located.

I suggest that it is these functional categories, which arise from the spatio-geometric property of Enclosure, that serve to become abstracted as distinct parameters. Put another way, abstracting across different sorts of sense-perceptory experiences, namely the spatio-geometric properties associated with enclosures, gives rise to an Enclosure parameter. Abstracting across re-occurring functional consequences of the spatio-geometric properties associated with enclosure gives rise to further parameters notably Location with Surety, Occlusion and Affecting Conditions. These parameters, which arise from spatial scenes involving enclosure, are diagrammed in Figure 3.

I suggest that the emergence of the parameters: Location with Surety, Occlusion and Affecting Conditions, associated with the linguistic content encoded by *in*, can, under certain conditions, give rise to new ‘state’ lexical concepts. While the parameter Enclosure, entails, under certain conditions, all of the other parameters illustrated in Figure 3, the other parameters do not necessarily entail the Enclosure parameter. For this reason, as I shall argue, the Enclosure parameter can be seen to be primary; the other parameters arise from spatial scenes in which Enclosure is a key attribute.

The means whereby new lexical concepts arise is due to a disjunction between the various parameters. I illustrate this with the examples below which reveal the disjunction between the Enclosure and Location with Surety parameters.

To do so, consider examples of the following kind:

(24) The toy is in the box

(25) a. The bulb is in the socket
    b. The flower is in the vase
    c. The umbrella is in his hand

The example in (24) is, I suggest, a consequence of the two parameters: Enclosure and Location with Surety. That is, by virtue of being located in the interior portion of the...
bounded landmark, the TR is thereby enclosed. Moreover, by virtue of being enclosed, the TR is located with surety: if the box is moved, so also, is the TR – the toy – as a direct consequence. This is what it means to say that Location with Surety is entailed by Enclosure.

Evidence for thinking that the Location with Surety and Enclosure parameters are, nevertheless, distinct units of knowledge encoded as part of a lexical concept’s linguistic content comes from spatial scenes involving partial enclosure. In the examples in (25), the TR is only partially enclosed by the bounded landmark: only the base of a bulb is enclosed by the socket as illustrated in Figure 2, above, only the stem, and not the whole flower, is enclosed by the vase (see Figure 4); and only the umbrella handle is enclosed by the hand (see Figure 5). Indeed, the reason that the form in can relate to spatial scenes involving partial, as well as full, enclosure is due to the parameter of Location with Surety. It is precisely because the bounded LM that partially encloses the TR serves to provide location with surety that the form in is sanctioned in these instances.

Figure 4. The flower is in the vase

Figure 5. The umbrella is in his hand

On the basis of the examples in (24) and (25), there is no reason, however, to be convinced that Enclosure and Location with Surety constitute distinct parameters, and hence distinct knowledge units encoded as part of the linguistic content associated with the [ENCLOSURE] lexical concept.

However, the example in (26) illustrates a crucial disjunction between the two. While the TR, the bottle, is partially enclosed by the bounded LM, the cap, in exactly the same way as the relationship between the bulb and the socket, this use of in in (26)
is semantically anomalous, as indicated by the hash sign. In the spatial scene described
by this example, the bottle is not located with surety by virtue of being partially enclosed
by the cap. That is, the bottle's location is not determined by being partially enclosed by
the cap – although access to its contents are. Hence, in a situation where partial enclosure
applies, but location with surety does not, the [ENCLOSURE] lexical concept associated
with in cannot be applied. This reveals that in the absence of the Location with Surety
parameter, in cannot be applied to spatial scenes involving only partial enclosure.

(26) #The bottle is in the cap

The examples thus far considered reveal that the Enclosure parameter entails Location
with Surety. Hence, in spatial scenes in which there is no location with surety, yet
there is (partial) enclosure, as in the spatial scene to which (26) refers, the use of the
[ENCLOSURE] lexical concept cannot apply, as shown by the semantic unacceptability
of (26).

We must next examine whether the Location with Surety parameter can be employed
independently of the Enclosure parameter. If so, then we can posit that there is a distinct
lexical concept, which we can gloss as [LOCATION WITH SURETY], a lexical concept which
encodes the Location with Surety parameter as part of its linguistic content but does not
also feature the Enclosure parameter. Evidence for such a state of affairs is provided by
the following example, which relates to the spatial scene depicted in Figure 6.

(27) The pear is in the basket

Figure 6. The pear is in the basket

In this example, the pear (in the centre of the image) is not enclosed by the basket, as
it is supported by other fruit; although the supporting fruit are enclosed by the basket.
Yet, the form in can be applied to this spatial scene, as is evident in (27). I argue that
this is due to a [LOCATION WITH SURETY] lexical concept which sanctions this particular
usage. While the [ENCLOSURE] lexical concept apparent in (24) and (25) encodes the
Enclosure and Location with Surety parameters, the [LOCATION WITH SURETY] lexical
concept encodes the Location with Surety parameter but not the Enclosure parameter as
part of its linguistic content. This difference in linguistic content between the two lexical
concepts explains the difference in linguistic behaviour in the examples just considered.
The [ENCLOSURE] lexical concept requires full enclosure, or, partial enclosure plus
location with surety. However, in (27) neither full nor partial enclosure is apparent, yet
in is sanctioned. This follows as the independent, but semantically related (and hence
polysemous) [LOCATION WITH SURETY] lexical concept sanctions this use, I suggest.
Thus, we see that there are, plausibly, at least two ‘spatial’ lexical concepts associated with
in, [ENCLOSURE] and [LOCATION WITH SURETY], which encode different configurations
of parameters, and hence, subtly distinct linguistic content.

7.2 ‘State’ lexical concepts for in

I now turn to the ‘state’ lexical concepts, in order to see how these arise from the spatial
lexical concepts. Consider the following examples involving in.

(28) a. The cow is in milk
    b. The girl is in love
    c. John is in trouble/debt
    d. He’s in banking [i.e., works in the banking industry]

While each relates to a ‘state’ of some kind, these examples in fact relate to slightly
different ‘states’: those that have a physical cause, as in (28a) – the state of being ‘in
milk’, which is a consequence of the physical production of milk – those that have a
psychological or emotional cause, as in (28b) – the state is a consequence of a subjective
state, which may (or may not) have physical, i.e., observable, manifestations – those
that have a social/inter-personal cause, as in (28c) – resulting from social/interpersonal
interactions which result in an externally-maintained state – and those that are a result
of a habitual professional activity, as in (28d). Put another way, each of these ‘states’
take distinct semantic arguments, relating a particular entity to quite different sorts
of states. In essence, I argue that these examples are sanctioned by four distinct ‘state’
lexical concepts for in. These distinct ‘state’ lexical concepts, as we shall see below, I
hypothesise to emerge from the functional category Affecting Conditions, which arises
from spatial scenes involving enclosure. I spell out the distinctions between the ‘state’
lexical concepts for in, below, with additional examples.

Physiological state (resulting in a ‘product’)

(29) a. The cow is in milk
    b. The cow is in calf
    c. The woman is in labour

Psycho-somatic state (i.e., subjective/internal state)

(30) a. John is in shock/pain (over the break-up of the relationship)
    b. John is in love (with himself/the girl)

Socio-interpersonal state (i.e., externally-maintained state)

(31) a. The girl is in trouble (with the authorities)
    b. John is in debt (to the tune of £1000/to the authorities)
Professional state (i.e., professional activity habitually engaged in)

(32) a. He is in banking
     b. She is in insurance

The fact that *in* collocates with semantic arguments of the distinct kinds illustrated in (29–32), relating to physiological, psycho-somatic, socio-interpersonal and professional conditions or properties suggests that we are dealing with four distinct lexical concepts. This follows as LCCM Theory claims that each distinct lexical concept has a unique lexical profile.

In addition to evidence based on semantic selectional tendencies, the position that there must be a number of distinct ‘state’ lexical concepts associated with *in*, along the lines illustrated by the distinct examples in (29) to (32) inclusive can also be demonstrated by virtue of ambiguities associated with an utterance of the following kind:

(33) She’s in milk

The utterance in (33) could potentially be interpreted as relating to a woman who is nursing a baby, and thus lactating, or as relating to a woman who works in the dairy industry. That is, given an appropriate extra-linguistic context, an example such as this can be interpreted in at least two ways. The potential for divergent interpretations is a consequence, in part, of our knowledge that *in* has a number of distinct lexical concepts associated with it: what is relevant for this example is the distinction between a [physiological state] lexical concept and a [professional state] lexical concept. Moreover, ambiguities can be generated even when a relatively well entrenched example is employed. For instance, even examples of the following kind:

(34) She is in labour
     (35) He is in love

can be interpreted in alternate ways. For instance, (34) could be interpreted as relating to childbirth or to a professional activity, e.g., the trade union movement. Similarly, (35) could be interpreted as relating to an emotional state or a professional activity, e.g., marriage guidance counselling. The former reading is only possible by virtue of assuming something akin to an [psycho-somatic state] lexical concept which is distinct from a [professional state] lexical concept. That is, both lexical concepts must exist if ‘love’ can be interpreted in these ways in this example.

7.3 Derivation of the ‘state’ lexical concepts

I now consider how the ‘state’ lexical concepts for *in* exemplified in (29) to (32) inclusive may have been extended from the prototypical [enclosure] lexical concept. I observed above that in previous work with Andrea Tyler, Tyler and I argued that polysemy derives
from regular processes of semantic change, in which situated implicatures associated
with a particular context can become reanalysed as distinct semantic components,
in present terms, lexical concepts, which are associated with the relevant preposition
(Hopper and Traugott 1993; Traugott and Dasher 2004; cf. Levinson 2000). That is,
Tyler and I argued for a usage-based approach to language change, a position adopted
by LCCM Theory.

In terms of an LCCM account of the emergence of closed-class lexical concepts such
as the 'state' lexical concepts for in, the trajectory is as follows. Situated implicatures arise
in bridging contexts, as briefly discussed above. These are contexts in which a usage
sanctioned by the relevant 'spatial' lexical concept, such as the [enclosure] lexical
concept, also gives rise to a situated implicature, such as an affecting condition. If the
form is repeatedly used in such bridging contexts, the situated implicature may give
rise to the formation of a parameter: a highly abstract unit of knowledge, specialised
for being encoded as part of the linguistic content associated with a lexical concept, as
discussed earlier. I argue below that bridging contexts, involving the functional category
of Affecting Conditions, give rise to the formation of a number of related but distinct
'state' parameters, and hence lexical concepts.

In order to trace the development of the functional category Affecting Conditions,
we need to consider spatial scenes that might provide appropriate bridging contexts.
To illustrate, consider the following expressions:

(36) a. in the dust
     b. in the sand
     c. in the snow

While dust, sand and snow are physical entities which can 'enclose' they cannot, normally
fulfil the functions provided by, for instance, containers. That is, they do not typically
serve to locate with surety, exceptional circumstances such as quicksand and avalanches
excepted. For instance, dust, sand and snow, by virtue of enclosing, do not normally have
the structural attributes that allow an entity to be supported and thus transported (cf. a
bucket), nor do they normally restrict access in the way a prison cell does, for instance.

Nevertheless, these examples exhibit some of the spatio-geometric properties asso-
ciated with the [enclosure] lexical concept. This is a consequence of the properties
associated with these 'bounded' landmarks: they provide an affecting condition, an
environmental influence which affects our behaviour. For instance, they determine
the kinds of apparel we wear, and how we behave when we are exposed to the dust/sand/snow, and so on. While examples such as sand, snow and dust can be construed
as enclosures with boundaries, there are other related examples of what we might refer
to as Prevailing Conditions which are much less clear-cut in terms of the nature of the
boundaries involved:

(37) a. the flag in the storm
     b. the flag in the wind
I suggest that these instances of *in* are sanctioned by virtue of there existing a distinct parameter Affecting conditions, which forms part of the linguistic content encoded by a distinct [prevailing conditions] lexical concept. Clearly a storm and wind are much less prototypically enclosures, and more saliently provide prevailing conditions which thereby constitute an environment which affects us. As such, spatial scenes involving more prototypical enclosures have given rise to the functional category Affecting Conditions, which has led to the formation of a distinct Affecting Conditions parameter in semantic memory. The existence of a distinct [prevailing conditions] lexical concept, as evidenced by examples in (37) provides suggestive evidence that such a distinct Affecting Conditions parameter must exist, and has come to form the core a distinct [affecting conditions] lexical concept.

I argue that there are a number of distinct ‘state’ lexical concepts associated with *in* that encode the parameter of Affecting Conditions, rather than Enclosure – those evidenced in (29)-(32). Indeed, these lexical concepts are what I have referred to as ‘state’ lexical concepts, as the states invoked all provide, in some sense, affecting conditions. Moreover, all these ‘state’ lexical concepts are relatively, and to degrees, far removed from the physical notion of enclosure from which they most likely originally evolved. In essence, once an Affecting Conditions parameter becomes conventionalised, it can be applied to distinct kinds of affecting conditions, even those that are non-spatial in nature, such as states. This leads to the development of new lexical concepts, with correspondingly new lexical profiles.

The first such ‘state’ lexical concept relates to the physical condition of an organism which thus provides an affecting condition. Such physical conditions include good/ill health, pregnancy, and any salient physical aspect of the organism’s condition which affects and thus impacts on the organism’s functioning. This lexical concept I gloss as [physiological state]. In addition to environmental and physical conditions, affecting conditions can be caused by psycho-somatic states, such as grief, happiness and sadness which are internal in nature. This ‘state’ gives rise to a [psycho-somatic state] lexical concept associated with *in*. In addition, social interactions which give rise to social or interpersonal relationships lead to conditions which may affect the individual. Such extrinsic or socially-induced affecting conditions might include debts, or other sorts of difficult situations which impose conditions on the behaviour of an individual. This set of affecting conditions gives rise, I suggest, to what I gloss as the [socio-interpersonal state] lexical concept associated with *in*. Finally, one’s habitual professional activity provides an affecting condition by virtue of the physical and social interactions that are attendant upon such activities. This provides an affecting condition giving rise to a lexical concept glossed as [professional state] associated with *in*. These are illustrated in Figure 7.
8 Lexical concepts for on

In this section I deal, somewhat more briefly, with on.

8.1 The prototypical lexical concept for on: [contact]

The spatial relation designated by on involves the relation of contact or proximity to the surface of a LM, and so the functional consequence of being supported or upheld by it. I gloss the prototypical 'spatial' lexical concept conventionally associated with on as [contact]. This serves to encode the geometric parameter Contact and functional parameter Support as part of its linguistic content. This lexical concept licenses an example of the following sort:

(38) the apple on the table

Note that evidence that the parameters Contact and Support are both encoded by the lexical concept [contact] comes from the fact that on can only felicitously be employed to describe spatial scenes in which both parameters are apparent. For instance, if an apple is held against a wall by someone, the utterance in (39) is semantically anomalous. However, if the apple is affixed to the wall, for instance by glue, then (39) is entirely appropriate.
(39) the apple on the wall

That is, while the apple is in contact with the wall in both scenarios, in the first scenario it is the person, rather than the wall, that affords support, while it is the wall (and the glue, which employs the wall as a means of affixing the apple) in the second. Hence, the example in (39) applies when there is both physical contact between the TR and the LM, and when the latter has a role in supporting the former.

Indeed, there are a number of distinct ‘support’ lexical concepts associated with on which privilege the Support parameter, at the expense of the Contact parameter, as illustrated by the following examples:

Body part which provides support

(40) a. on one’s feet/knees/legs/back
    b. on tiptoe
    c. on all fours

In the examples in (40), the use of on relates to that part of the body which provides support, rather than being concerned with contact.

Means of conveyance

(41) a. on foot/horseback
    b. on the bus

With respect to the example in (41b), it is worth pointing out, as Herskovits (1988) does, that if children were playing on a stationary bus, for instance, that had been abandoned, then it would not be appropriate to say: \textit{on the bus}, but rather \textit{in} would be more natural. This supports the view that the \textit{[means of conveyance]} lexical concept is a distinct ‘support’ lexical concept encoded by on.

Supporting pivot

(42) The Earth turns on its axis

Drug dependency/continuance

(43) a. Are you on heroin?
    b. She’s on the pill

Psychological support

(44) You can count/rely on my vote

Rational/epistemic support

(45) on account of/on purpose
8.2 The [active state] lexical concept for *on*

There is just one 'state' lexical concept for *on*, which I gloss as [active state]. This lexical concept derives not from the functional category of Support. Rather, it pertains to a functional category concerning 'functionality' or 'activity'. That is, in many spatial scenes, a consequence of contact is that the TR, as it comes into contact with a particular surface, becomes functional. This category I refer to as Functional Actioning. Removing contact precludes functional actioning. Such forms of contact, for instance, invoke scenarios involving physical transmission, such as the very salient one of electricity. Many times a day we plug-in or switch 'on' electrical appliances. It is by facilitating contact between the appliance and the electrical circuit that an appliance is rendered functional. A 'switch' provides a means of facilitating this contact, which is why we employ the term 'switch on' in English. In other words, I suggest that the [active state] lexical concept associated with *on* encodes a Functional Actioning parameter as part of its linguistic content. It is this which makes it distinctive from the 'spatial' lexical concepts of *on* discussed in the previous examples.

The [active state] lexical concept associated with *on* relates to adjectives or nouns of action which involve a particular state which can be construed as 'active' or 'functional', as contrasted with a, perhaps, normative scenario in which the state does not hold. In other words, states described by instances of *on* sanctioned by this lexical concept are often temporally circumscribed and thus endure for a prescribed or limited period of time. In this, the states referred to are quite distinct from those that *in* serves to describe. Here, the notion of being 'affected', apparent with *in*, is almost entirely absent. Consider some examples:

(46) a. on fire  
b. on live (i.e., a sports game)  
c. on tap (i.e., beer is available)  
d. on sleep (as in an alarm clock on a particular mode)  
e. on pause (as in a DVD player)  
f. on sale  
g. on loan  
h. on alert  
i. on best behaviour  
j. on look-out  
k. on the move  
l. on the wane  
m. on the run

Figure 8 depicts the parameter that underpins this lexical concept.
9 The state senses of at

This section briefly examines the ‘state’ lexical concepts of at.

9.1 The prototypical lexical concept for at: [co-location]

The lexical concept which licenses spatial uses of at affords the most general expression of localisation in space in English, expressing the relation between a TR and a point of space that it is contiguous or proximal with. This lexical concept I gloss as [CO-LOCATION]. Consequently, it is one of the most polysemous of all English prepositions. Indeed, this lexical concept for at forms a contrast set (Tyler and Evans 2003) with the ‘place’ identifying lexical concepts associated with other prepositions. The [CO-LOCATION] lexical concept encodes the Co-location parameter, designating a highly abstract spatial relation between a TR and a place, when the relation is not more precisely expressed by ‘spatial’ lexical concepts associated with the following prepositional forms: near, by, on, in, over, under, all of which, at times, can be encoded by at.

Perhaps the most salient functional category associated with at constitutes what I will refer to as that of Practical Association. That is, a functional consequence of being co-located with a particular LM is that the TR has some practical association with the reference object. This is evidenced in the examples in (6) discussed earlier (e.g., at the desk/bus-stop), and is particularly evident with examples such as the following:

(47) a. at school
   b. at sea

In these examples, the activity associated with the school buildings or being out on the sea is extremely salient.
9.2 The ‘state’ lexical concepts for \textit{at}

There are three distinct lexical concepts associated with \textit{at} that might be described as relating to ‘states’. These are illustrated below:

State (or condition) of existence

(48) at rest/peace/ease/liberty

(e.g., \textit{He stood at ease}, or \textit{He is at peace} [=dead])

States relating to mutual relations

(49) at war/variance/strife/one/dagger’s drawn/loggerheads

(e.g., \textit{The EU is at war with the US over the imposition of steel tariffs})

States relating to external circumstances

(50) at peril/risk/hazard/expense/an advantage/a disadvantage

(e.g., \textit{The company is at risk of going under})

The ‘state’ lexical concepts for \textit{at} appear to be motivated by the functional consequence of close-proximity between two point-like entities giving rise to the formation of a parameter: Practical Association.

In the case of the \textit{[state of existence]} lexical concept, the practical association resulting from the co-location is the state of existence which holds. That is, there is a practical association which holds between a given entity and its state of existence.

The second lexical concept I gloss as \textit{[state of mutual relations]}, as evidenced by (49). This lexical concept arises due to a salient practical association resulting from co-location of two entities involving mutual relations. For instance, while warfare often involves combatants who must be proximal to one another, the state of being ‘at war’ need not, as evidenced by the so-called ‘phoney war’ which held during 1939 when the United Kingdom, France and Germany were officially ‘at war’, and yet no troops engaged. Thus, the use of \textit{at} to designate a state of mutual relations, independent of spatio-geometric co-location, is due to the parameter of Practical Association being invoked as part of the linguistic content encoded by this lexical concept. Put another way, this lexical concept encodes a state of a particular kind, rather than the ‘spatial’ notion of proximity.

Finally, states pertaining to external circumstances may relate to evaluations concerning circumstances associated with mutual relations. This is instantiated by the lexical concept which I gloss as \textit{[states of external circumstances]}, as evidenced by the examples in (50). The relationship between the parameter of Practical Association and the ‘state’ lexical concepts is diagrammed in Figure 9.
10 Conclusion: *in* vs. *in* vs. *at*

Having presented an analysis of i) distinct ‘state’ lexical concepts for *in*, *on* and *at*, and ii) how these encode distinct parameters which relate to functional categories arising from spatial scenes involving spatio-geometric relationships, I now return to one of the observations with which I began this study. I observed that each of the ‘state’ lexical concepts associated with *in*, *on* and *at*, as exemplified in (1)-(3), is minimally distinct in that it is associated with distinct semantic arguments. Consequently the lexical concepts exemplified in these examples relate to states of distinct kinds. The analysis presented here has supported this initial assessment, and elaborated on it in three ways.

Firstly, the perspective offered here, particularly with respect to the construct of the lexical concept, allows us to establish in a reasonably precise way the nature of the distinction between the ‘state’ lexical concepts associated with *in*, *on* and *at*. That is, given that lexical concepts are form-specific and moreover have distinct lexical profiles – for instance they collocate with distinct kinds of semantic arguments – we are able to establish that the ‘state’ lexical concepts (within and between) prepositional forms are distinct.

Secondly, by taking seriously the functional nature of spatial relations, and the formation of parameters: highly abstract knowledge structures specialised for being directly encoded ‘in’ language, this allows us to understand the sorts of functional motivations, and thus distinctions, between the ‘state’ lexical concepts among different forms.

Thirdly, prepositions, particularly *in* and *at* have more than one so-called ‘state’ lexical concept associated with them. We have seen that the prototypical spatial lexical concept associated with a given preposition is associated with a number of parameters, including parameters derived from what I referred to as functional cognitive categories.
Providing an LCCM analysis gives us a way of establishing the sorts of distinctions that exist between the ‘state’ lexical concepts associated with the same form. That is, we have a means of understanding how these lexical concepts are distinct (based on a distinction in parameters encoded) despite their conceptual similarity. We also have a means of empirically verifying hypotheses as to distinctions in the underlying lexical concepts which are assumed to sanction instances of use. This followed due to an examination of semantic selectional tendencies, which relate to the theoretical construct of the lexical profile in LCCM Theory: distinct lexical concepts are held to have a unique lexical profile which forms part of the knowledge encoded by a given lexical concept.

Notes

1 This said, the framework developed in Tyler and Evans (2001, 2003) and Evans and Tyler (2004a, 200b) remains important. Principled Polysemy, as articulated in those publications, was and remains an important theoretical development in terms of what it brings to descriptive accounts of spatial semantics. In particular, it sought, for good reason, to address the sorts of methodological criticisms that had been levelled at the early pioneering work of Brugman and Lakoff (Brugman [1981] 1988; Brugman and Lakoff 1988; Lakoff 1987) in developing cognitive lexical semantics. While it doubtless requires modification (see Evans 2004a), it nevertheless provides a relatively robust set of methodologically constrained, and above all principled ‘decision principles’ (in Sandra’s 1998 terms) for identifying and distinguishing between senses-units, and for, a principled means of modelling lexical polysemy with respect to spatial relations. While important developments in the use of psycholinguistic testing (see Sandra and Rice 1998; Cuyckens et al. 1997) and corpus-based techniques (see Gries 2005) have added to the arsenal of cognitive lexical semanticists in this regard, empirical methods will always require a theoretical framework in order to motivate the sorts of questions that can be asked and to provide a lens for interpreting results, even though this may mean modifying the theoretical framework. Indeed, this perspective is in fact compatible with the desire to have more empirical methods in cognitive lexical semantics.


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