N. P. SUDHARSHANA

ENCODING ‘SUPPORT’ AND ‘CONTAINMENT’ RELATIONS IN KANNADA*

ABSTRACT: The ‘support’ and ‘containment’ scenes which are encoded by the prepositions on and in in English are encoded by five different spatial terms in Kannada, a Dravidian language spoken in South India. Using a framework based on geometric, functional and qualitative physics attributes (Feist & Gentner 2003; Feist 2004, 2008 among others), I offer an explanation for the distribution of two spatial nominals (mēle, ojage), verbs of spatial location, and two cases (genitive and locative). The uses of the two spatial nominals are largely governed by geometric factors (in particular, relative vertical height and inclusion) whereas those of the other spatial terms are largely governed by functional factors (such as functional relatedness) and qualitative physics (such as whether the Ground controls the Figure’s movement), except for the locative case, where pragmatic factors are also crucial.

KEYWORDS: Kannada, spatial relations, spatial nominals, verbs, locative case, geometry, functional relations, qualitative physics

0. CROSSLINGUISTIC LEXICAL ENCODING OF STATIC SPATIAL RELATIONS

In the domain of space, static relations between Figure and Ground objects (such as support, containment, occlusion, etc.) are universal; yet, languages may vary in how they morpho-syntactically encode such relations. In some cases, these relations are restructured into different language-specific categories. For instance, the English prepositions on and in distinguish between ‘support’ (e.g., a cup on the table) and ‘containment’ (e.g., an apple in the bowl) whereas the Korean verbs

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classify corresponding scenes as ‘tight-fit’ (e.g., a cap on the pen, a drawer in the desk) and ‘loose-fit’ (e.g., a pen on the table, an apple in the bowl) (Choi & Bowerman 1991). Even when broad categories are similar, similar scenes may be categorised differently among languages. For instance, both English and Japanese have categories of ‘support’ and ‘containment’ which are encoded by prepositions in English and spatial nominals in Japanese. However, a Figure impaled by the Ground (e.g., an apple on the skewer) is considered an instance of ‘Support’ in English (and is encoded by the preposition on) but not in Japanese (where it is encoded by a verb). Another instance of variation arises when similar scenes may be classified under the same category, but languages differ in the fineness of the distinctions they make. For instance, in both English and Dutch a Figure supported by the Ground is an instance of ‘support,’ but in Dutch ‘support without attachment’ (e.g., a cup on the table) is different from ‘support with attachment’ (e.g., a clock on the wall).

0.1 Encoding ‘support’ and ‘containment’ in Kannada
Kannada is a Dravidian language spoken mainly in South India. It is an agglutinating type language with SOV word order. Kannada has a set of nouns which denote a particular region adjacent to the ground entity (e.g., mēle ‘on/above’, oļage ‘inside’). These spatial nominals follow

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1 Studies have explored the interface between non-linguistic cognition and language, particularly in the domain of space. Sridhar (1989, 1999) in an early, 10-language experimental study, examined how non-linguistic cognitive principles affect sentence production. The findings showed that the way speakers describe states and actions is determined “in a major way by the fundamental principles of human perception and cognition” (Sridhar 1999: 223). For instance, when describing scenes, speakers prefer to mention figures before grounds, sources before recipients, and actions before states. While describing visual arrays, speakers move from top to bottom and from front to back. Nevertheless, such effects of perceptual variables are mediated through structural constraints such as word order. On the other hand, some researchers argue that language-specific categories may influence non-linguistic cognition. For instance, after studying whether English-speaking children can make distinctions between ‘tight-fit’ and ‘loose-fit,’ categories which are present in Korean but not in English, Choi (2006:228) claims, “As children acquire the spatial semantics of the ambient language, the language-specific system in turn influences their spatial cognition: children’s nonlinguistic sensitivity for the semantically relevant categories is well maintained, whereas their sensitivity to other categories gets much weaker”.

the Ground object in the clause, inflected for genitive case, and function as postpositions. Kannada also has a locative case marker –alli which attaches to the Ground. The phonological variants of the case include –yalli (e.g., maneyalli ‘house.loc’), –nalli (e.g., kālinalli ‘leg.loc’) and -dalli (e.g., tōtadalli ‘garden.loc’).2

As noted earlier, English has the two broad categories of ‘support’ and ‘containment’ which are encoded by the prepositions on and in respectively. The distribution of these two prepositions can be clearly explained with the ‘similarity gradient’ proposed by Bowerman and her colleagues (Bowerman & Pederson 1992b, Bowerman & Choi 2001). At one end of the gradient lie configurations in which a Figure is supported from below by a Ground (e.g., a cup on a table); at the other end lie configurations in which a Figure is completely included within a Ground (e.g., a pear in an otherwise empty bowl). In between lie configurations bearing similarities to both endpoints, arranged according to whether they are more similar to support from below or to complete inclusion:

In English, the scenes (a-e) are encoded by the preposition on while the scene (f) is encoded by the preposition in. How are these encoded in

\[\text{Figure 1. Similarity gradient}\]

(Bowerman & Choi 2001: 485)

2 In this paper the spatial nominals mêle and oţage are glossed as on/above and inside respectively and the locative case as AT. However, it must be noted that such English glosses for spatial terms from other languages most often give “no indication of semantic differences at the lexical level” (Stringer 2005: 75) and such morpheme and lexeme translation is “only in terms of degrees of approximation” (Stringer 2005: 81). See Stringer (2007) for a detailed discussion on issues in glossing.
Kannada? In Kannada, the two ends of the gradient are encoded by the two spatial nominals *mēle* ‘on/above’ and *oḷage* ‘inside’ respectively (as in 1a-b).

(1)

a. mējina *mēle* lōṭa  
   table.gen on cup  
   ‘a cup on the table’

b. baṭṭalina *oḷage* haṅṅu  
   bowl.gen inside fruit  
   ‘the fruit inside the bowl’

However, there is a significant variation in encoding the intermediate scenes. The scenes in (b) and (c) are encoded by a resultative construction, the scene in (d) by the genitive or dative case, and that in (e) by the locative case, as 2a-d (respectively) illustrate.3

(2)

a. kālige paṭṭi hākide  
   leg.dat bandage put.pst.  
   ‘the leg has a bandage put on it’ (lit. ‘a bandage is put to the leg’)

b. gōḍege  fōṭo nāṭu hākide  
   wall.dat photo hang.pst.ppl put.pst  
   ‘a photo hangs on the wall’ (lit. ‘a photo is hung-put to wall’)

c. bāgilina/ bāgilige hiḍi  
   door.gen/ door.dat handle  
   ‘the door has a handle’ (lit. ‘the door’s handle’)

3 Constructions which treat the current state of Figure objects (attachment, piercing, tying, etc.) as “the end result of a prior action (glossing, perhaps, as ‘figure has been VERBED’)” (Levinson & Wilkins 2006: 518) are referred to as ‘resultative constructions’ in this paper.
d. marada rembeyalli sēbu
tree.gen branch.loc apple
‘an apple on the tree’ (lit. ‘branch of the tree-AT apple’)

1. EXPLAINING THE MEANING OF SPATIAL TERMS

Previous studies have offered broad accounts of the locative case and spatial nominals without detailing their semantic specifications or uses. Pederson (2006) claims that the locative case is used for ‘pragmatically inferencing’ situations whereas the spatial nominals are ‘semantically specifying.’ The locative case is “the most common way of indicating a locative relationship” which “does not specify nor deny a more exact nature of the relationship between figure and ground (‘in contact,’ ‘figure vertically superior,’ etc.)” (Pederson 2006: 404). The spatial nominals, on the other hand, indicate more specific relationship. Therefore, a canonical relationship such as a fish swimming in the water would be encoded with the locative case whereas a spatial scene with more specific relationship between Figure and Ground objects such as a dead fish floating on water would be encoded with the spatial nominal (here mēle).

Regarding the spatial nominals, mēle ‘on/above’ encodes both contact (e.g., mējina mēle lōja ‘cup on the table’) and vertical superior relations (e.g., maneya mēle vimāna ‘airplane over the house’) unlike its English translational equivalent on (cf: *a cup on the table but a plane over the house*). The other spatial nominal olage ‘inside’ encodes the interior location of the Figure (e.g., jēbina olage kāsu ‘money inside the pocket’) (Sridhar 1997).

However, one still needs to answer the following questions: In which situations is the default locative case used, and in which situations cannot it be used, and a specific spatial nominal required (for instance, mēji-na mēle pustaka ‘books on a table’ but *mējinalli pustaka ‘table-AT books’)? Why are scenes of attachment (e.g., a stamp on a letter) or impalement (e.g., an apple on skewer) not encoded by spatial nominals? Which factors determine the use of resultative constructions and the genitive case?
1.1 Attributes of spatial terms: geometric, functional and qualitative physics

In a series of studies (Feist & Gentner 2003; Feist 2004, 2008 among others), Feist and his colleagues examined factors influencing people’s use of spatial prepositions. They propose that the spatial prepositions are usually governed by three types of factors: geometry, function and qualitative physics. Geometry includes difference in vertical position, contact, inclusion and relative sizes of Figure and Ground. Function includes functional relatedness of the Figure and the Ground while qualitative physics includes support by the Ground, animacy and the ability of the Ground to constrain the location of the Figure. In a crosslinguistic study of spatial terms from seventeen languages, Feist (2004) classifies spatial terms as generalised and specific. For the specific spatial terms, he identifies four attributes from the list mentioned above, viz., difference in vertical position, contact, inclusion (all geometric attributes) and support by Ground (subsumed under qualitative physics), as important. Table 1 presents a coding of some spatial terms for these four attributes.

<table>
<thead>
<tr>
<th>Spatial terms</th>
<th>Difference in vertical position</th>
<th>Contact</th>
<th>Inclusion</th>
<th>Support by Ground</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>ue</em> (Japanese)</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>nad</em> (Russian)</td>
<td>+</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>ṭīpar</em> (Hindi)</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><em>pā</em> (Swedish)</td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
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<tr>
<td><em>sur</em> (French)</td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
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<tr>
<td><em>auf</em> (German)</td>
<td>+</td>
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<tr>
<td><em>an</em> (German)</td>
<td>+</td>
<td></td>
<td></td>
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<tr>
<td><em>u</em> (Croatian)</td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
</tbody>
</table>

**Table 1: Coding spatial terms for universal attributes**

(Adapted from Feist 2004)
In the table a ‘+’ sign indicates that the attribute has to be necessarily present; a ‘-’ sign indicates that the attribute has to be necessarily absent; and a blank column indicates that the attribute may or may not be present and it is not consequetial. Thus, for the Hindi postposition अपर ‘above’ the feature ‘Difference in vertical position’ has to be true while ‘contact’ is unspecified. However, for its French counterpart sur ‘on’ both ‘Contact’ and ‘Support by Ground’ must be true but ‘Difference in vertical position’ is irrelevant. For the Croatian preposition u ‘in’, inclusion is a necessary feature while the remaining three are irrelevant. Feist (2004) observes that it is difficult to account for generalised spatial terms such as Japanese に or Indonesian di. He proposes that the meaning of such terms may be a result of an interplay between semantic and pragmatic elements of meaning.4

In the subsequent sections, I analyse the spatial terms in Kannada using the framework proposed by Feist and his colleagues (Feist & Gentner 2003; Feist 2004, 2008 among others) and offer an explanation for their distribution.

2. ATTRIBUTES OF KANNADA SPATIAL TERMS

2.1 Data

The first task in an attempt to list the attributes of Kannada spatial terms (two spatial nominals, two cases and resultative constructions) was to identify the complete range of scenes each of the spatial terms encodes. In order to do so, native speaker responses on the Topological Relations Picture Series (TRPS) (Bowerman & Pederson 1992a) from an earlier study (Sudharshana 2010) were analysed. The TRPS consists of 40 pictures depicting ‘support’ (as encoded by the English preposition on) and 14 pictures showing ‘containment’ relation (as encoded by the English preposition in) among others. The pictures vary along geometric features

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4 Feist (2004) originally encodes the Hindi postposition अपर ‘on/ above’ as ‘-’ for ‘contact’. However, the postposition can be used in +contact situations (with a case inflected Ground object): cf. मेज़ के अपर किताब ‘a book on the table’, and therefore it is coded as ‘unspecified’ i.e. with no sign for ‘contact’.
of Figure and Ground (e.g., ±three-dimensional; ±solid; ±horizontal orientation), functional features (e.g., ± freely movable; ±marks on surface; ±negative spaces) and nature of relation between Figure and Ground (e.g., attachment, adhesion, close contact). The participants were asked to describe the location of Figure with respect to Ground and their choice of spatial term(s) for each picture was recorded. In this paper, I present only the responses from adult control group and do not report differences across age groups.

2.2 Analysis

<table>
<thead>
<tr>
<th>Spatial term</th>
<th>Spatial scenes</th>
</tr>
</thead>
</table>
| mēle         | • A point-like freely movable smaller Figure supported by a bigger horizontal/vertical Ground (e.g. a cup on table, insects on wall)  
• A bigger yet freely movable Figure supported by a horizontal Ground (e.g. tablecloth on table)  
• Figure located at a vertically superior position to Ground without contact (e.g. a cloud over mountain)  
• Figure attached to a horizontal/vertical Ground (e.g. a hat on head, a photo on wall) |
| Resultative Constructions | • Figure attached to Ground (e.g., a bandage on leg)  
• Figure impaled by Ground (e.g., paper pieces on spike) |
| Genitive case | • Figure attached to Ground (e.g., a handle on door) |
| Locative case | • Ornaments (e.g., a ring on finger)  
• A smaller Figure partially contained in a Ground (e.g., an apple on plate)  
• A smaller Figure fully contained in a Ground (e.g., an apple in bowl)  
• Figure located in a larger Ground region (e.g., a spider on ceiling) |
| oḻage        | • A smaller Figure fully contained in a three-dimensional Ground (e.g., a book in the bag) |

Table 2: Pictures encoded with Kannada spatial terms
The analysis showed that, including some overlaps, 9 pictures were encoded with the spatial nominal *mēle* ‘on/above’, 15 scenes with resultative constructions, 21 with the locative case, 5 with the spatial nominal *olage* ‘inside’ and only one picture with the genitive case. Table 2 presents descriptions with their specifications under each of the spatial terms.

When these pictures are coded for the four attributes identified by Feist (2004), one can observe that difference in vertical position seems to be the necessary attribute for *mēle* ‘on/above’ whereas contact seems to be irrelevant (e.g., *beṭṭada mēle mōda* ‘cloud over mountain’). For *olage* ‘inside’ the necessary attribute seems to be inclusion. However, the four attributes do not seem to account for the uses of resultative constructions, and the locative and genitive cases. As a result, it was decided to code the spatial scenes under each spatial term for the entire range of attributes under three broad domains identified by Feist and his colleagues (Feist & Gentner 2003; Feist 2004, 2008 among others). The attributes, mentioned earlier in Section 1.1 above, are listed here again: (i) Geometry — difference in vertical position, contact, inclusion and relative size; (ii) Function — functional relatedness of Figure and Ground; and (iii) Qualitative physics — support by Ground, animacy and the ability of Ground to constrain the location of Figure.

Once the spatial scenes encoded by each spatial term, as mentioned in Table 2, were coded, it emerged that for Kannada spatial terms animacy and the relative size of Figure and Ground were found to be irrelevant. For instance, *mēle* ‘on/above’ can be used with both animate and inanimate Ground objects: cf. *gōḍeya mēle iruve* ‘ant on wall,’ *angai mēle iruve* ‘an ant on the palm’. It can also be used when Figure is
bigger than Ground: cf. mējina mēle baṭṭe ‘tablecloth on table.’ Therefore, the spatial terms were coded for the remaining six factors: difference in vertical position, contact, inclusion (all geometric), functional relatedness of Figure and Ground (function), and support by Ground and the ability of Ground to constrain the location of Figure (both qualitative physics). The coding, using the conventions in Feist’s (2004) study, is presented in Table 3.

2.3 Attributes of Kannada spatial terms

We can see from Table 3 that the spatial nominal mēle ‘on/above’ requires the Figure to be placed vertically higher than the Ground. As a result, Figure may or may not be supported by the Ground (e.g. mējina mēle lōṭa ‘a cup on the table’, beṭṭaḍa mēle mōḍa ‘cloud over the hill’) unlike the English preposition on, where ‘support’ is a necessary attribute (cf: a cup on table but a cloud over mountain). Another necessary attribute for mēle ‘on/above’ is that Ground should not be controlling Figure’s location. Because of this, all instances of attachment are encoded by resultative constructions.

<table>
<thead>
<tr>
<th>Spatial term</th>
<th>Difference in vertical position</th>
<th>Contact</th>
<th>Inclusion</th>
<th>Functional relatedness</th>
<th>Support</th>
<th>Ground constrains Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>mēle</td>
<td>+</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td>-</td>
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<tr>
<td>Resultative constructions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Genitive case</td>
<td></td>
<td></td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Locative case</td>
<td>+</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>oḷage</td>
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<td>+</td>
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</tbody>
</table>

Table 3: Coding of Kannada spatial terms
As mentioned above, when Figure is attached to Ground and as a result Ground is controlling Figure’s movement resultative constructions are used. Three types of attachment were identified: (i) Figure is attached to (nearly) vertical surface (e.g., gōde gē photo is (hung) on the wall); (ii) Figure is attached by projecting, piercing part of Ground (e.g., rādige sēbu chuchhide ‘apple is (stuck) onto the rod’); and (iii) Figure is attached strongly to Ground by means of tying, adhesion, etc. (e.g., kōlige balunu kaṭṭide ‘the balloon is (tied) on the stick’) (see Levinson 2006 for more details on types of attachment). It must be noted here that, as pointed out by a reviewer, the first type of attachment scene can be expressed with the spatial nominal mēle ‘on/above’ (e.g., gōde mēle gē ‘photo on the wall’). However, “the tighter the attachment, or the more the Figure is an intrinsic part of the Ground” (Levinson & Wilkins 2006b: 515), as in the remaining two types of attachment, mēle ‘on/above’ is not preferred. Another attribute of resultative constructions, which is a consequence of the first one, is that Figure is necessarily supported by Ground.

Some cases of attachment where the Figure is seen as an intrinsic part of the Ground, mostly because they are functionally related, are encoded with the genitive case (e.g., chīlada hiḍi ‘strap on the bag’). Thus, it is the functional relatedness that sets the genitive case apart from the resultative constructions.

The use of oḷage ‘inside’ appears to be governed by the geometric attribute ‘inclusion’. In other words, the spatial nominal has “stronger implication of complete containment” (Levinson 2006: 170). Ground may be a three dimensional object (e.g., chīlada oḷage pustaka ‘books inside the bag’) or, as pointed out by a reviewer, a two-dimensional object (e.g., vruttada oḷage makkaḷu ‘children inside the circle’). However, when the Figure is partially included in the Ground, oḷage ‘inside’ is not preferred (e.g., *bāyiya oḷage sigarēṭu ‘cigarette inside the mouth’).

Regarding the locative case, in the data set it was used in a number of situations: (i) smaller objects in a container (e.g. taṭṭeyalli haṇṇu ‘plate-
AT fruits’); (ii) ornaments/footwear (e.g., kāḷallī shū ‘leg-AT shoe’); (iii) fruits/leaves on a tree (e.g., maradallī haṇṇu ‘tree-AT fruits’); (iv) designs/pictures/stains on objects (e.g., gōḍe yallī biruku ‘wall-AT crack’); and (v) people/animals/plants in habitats (e.g., beṭṭāda ilījārinallī mara ‘hillside-AT tree’). In all of these, ‘contact between Figure and Ground’ is a necessary attribute. In addition, in all these situations Figure and Ground are in ‘a canonical or stereotypical relation’ (Levinson & Wilkins 2006a: 16). Thus, the use of locative case is largely governed by ‘systematic pragmatic factors’ (Levinson & Wilkins 2006a: 16).5

These two attributes viz., contact and canonical relation, help explain why the locative case cannot be used in certain situations. For instance, when a freely movable Figure is located vertically higher than the Ground (where ‘contact’ is not implied), mēle ‘on/above’ is used and not the locative case (e.g., mējina mēle but *mējīnallī lōṭa ‘table-AT cup’). Similarly, when Figure is strongly attached to Ground (that is Figure and Ground are together not naturally but by means of adhesion, attachment, piercing, etc.) resultative construction is used (e.g., kōlige balūnu kaṭṭide ‘balloon is tied to the stick’ but *kōḷallī balūnu ‘stick-AT balloon’).

2.4 Placing Kannada spatial terms in the crosslinguistic continuum
Recall here that Bowerman and her colleagues (Bowerman & Pederson 1992b, Bowerman & Choi 2001) propose a ‘similarity gradient’ to explain the distribution of spatial terms crosslinguistically. On the basis of the necessary attributes identified above, Kannada spatial terms can be arranged in the continuum as shown in Figure 2.

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5 One must note here that some of the instances encoded by the locative case can also be encoded by other spatial terms. For instance, smaller objects in a container (as in (i) above) can also be encoded with oṭage ‘inside’: cf. buṭṭīyallī/buṭṭīya oṭage hāvu ‘flowers in a basket’ whereas ornaments/footwear (as in (ii) above) (e.g. beraṭījega ungrā hākide ‘a ring on the finger’ lit. ‘A ring is put on the finger’) and designs/pictures/stains on objects (as in (iv) above) (e.g., gōḍe biruku biṭṭide ‘a crack on wall’ lit. ‘The wall has cracked’) can also be encoded with resultative constructions.
Figure 2. Similarity gradient of Kannada spatial terms

The spatial nominals *mēle* ‘on/above’ and *oḷage* ‘inside’ form the two ends of this continuum just as the English prepositions *on* and *in* do. However, unlike the preposition *on*, the spatial nominal *mēle* ‘on/above’ does not encode scenes in between; instead, they are encoded by three different spatial terms based on functional and qualitative physics attributes. The geometric attribute ‘contact’ governs the locative case but it alone does not determine the use of the locative case; rather, it is largely determined by pragmatic factors. Yet, as discussed above, it is more likely to overlap with the spatial nominal *oḷage* ‘inside’ rather than with *mēle* ‘on/above.’
3. CONCLUSION

In this paper I analysed encoding of ‘support’ and ‘containment’ relations in Kannada and showed that the range of scenes covered by the English prepositions on and in are, in fact, covered by five different spatial terms in Kannada. Using the framework developed by Feist and his colleagues (Feist & Gentner 2003; Feist 2004, 2008), I tried to list the necessary attributes of these spatial terms and account for their uses. The coding of spatial scenes associated with each spatial term for six attributes showed that while geometric factors play crucial role for spatial nominals, functional factors and qualitative physics determine the uses of other spatial terms. Further studies are definitely required to throw more light on these spatial terms, particularly the locative case and the pragmatic factors which determine its uses. Also, crosslinguistic studies in encoding of static relations would help explain syntactic and semantic properties of comparable spatial terms across languages.

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