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**Interacting Semantic Systems: Mixtec
Expressions of Location**

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0. Introduction: This paper concerns the interaction of two semantically related classes of lexical items in the Chalcatongo dialect of Mixtec, an Otomanguan language spoken in the state of Oaxaca, Mexico. The two systems that we will discuss are the verbs of location and the set of body part terms (hereafter, BPTs) which express locative relationships. We will describe their interaction with reference to the following considerations: first, what kinds of semantic information are coded in each of the two systems and how the semantics coded by one system differs from that of the other; and second, how these different lexicalization patterns combine to produce a highly-elaborated expression of the locative relationship. Because each system uses semantic parameters different from those encoded in English verbs and prepositions, we will briefly contrast the two languages with respect to the issues mentioned above.

1. Mixtec

1.1. Verbs of Location: Our claim that the Mixtec verbs of location encode different semantic parameters than those encoded by the BPTs might be taken as implying that the semantic parameters employed are uniform across each system. This is not the case, however. In fact, the set of verbs of location includes forms ranging from a generic "be located," to many forms which entail being in a particular location, but whose primary denotation is much more highly elaborated (for example, the stative "be locked in").<1> We have limited ourselves in the present study to formally intransitive verbs, including forms which code posture of Figure or a particular spatial relation between Figure and Ground.<2> One factor which does constrain the set we are concerned with is that they all either require or strongly tend to collocate with locative expressions containing BPTs.

The term "Figure" will be used to refer to that entity of which location is being predicated; in our Mixtec examples this will always be expressed linguistically by the subject which is clausemate of the locative expression containing a BPT. The term "Ground" will always refer to the entity relative to which the Figure is located, expressed by a noun-noun sequence which includes a BPT.<3> Actually, the Ground is sometimes referred to by a simple noun without a BPT, but we exclude such cases from consideration here after a preliminary conclusion that this possibility is restricted by independent principles, i.e. constraints both on the nature of the spatial relationship and on the type of entity identified as Ground. We will also not be considering abstractions in such expressions as in place of.

The verbs of location that we will be considering are given in (1), with provisional glosses (some of which will be modified later).<4>

1. Generic

- (a) híʒaa(R-Sg) / kúʒaa(P-Sg) /
káisikú(R-P1) / kúsikú(P-P1) - 'be located (generic)'

Posture

- (b) híndii(R) / kúndii(P) - 'be standing'
(c) ndúkoo(R) / ndukòò(P) - 'be sitting'
(d) hítuu(R) / kutuu(P) - 'be lying'

Position

- (e) híndee(R) / kundee(P) - 'be in'
(f) híndee(R) / kusndee(P) - 'be on (top of)'
(g) kándee(R) / kundee(P) - 'be in, hidden from view'

As (1) shows, the verbs encode a diverse range of details relevant to spatial relationships, for example, posture of the Figure (1b-d), position of the Figure relative to the Ground (1e-g), and whether the Figure is visible (1g). The members of this set cannot be described paradigmatically or taxonomically, since there is no lexicalized opposition between, e.g., "be located, hidden from view," and "be located, visible," or "be on (top of)" and "be underneath." This lack of paradigmatic opposition, however, is not unexpected in such a broad category (see Talmy 1985b).

1.2. Body Part Terms: BPTs in Mixtec often appear as the first element in a noun-noun sequence with the second noun indicating the entity of which the BPT denotes the Subregion, as in (2):

- 2a. ʒini ndá?á - Finger b. s:k̄ k̄t̄ - Horse's back
 head hand animal+back horse

Regular analogical principles allow the BPTs to be used to identify subparts of inanimate objects. In identifying such subparts, the noun-noun sequences can serve either as nuclear terms of their clauses (as in (3)), or in locative expressions (as in (4) and (5)):

3. nda?a ʒúnu tá?nu
 arm tree break
 The tree's branch is breaking
4. híʒaa-re ʒini ʒuku
 be+located-3SgM head mountain
 He is at the top of the mountain
5. hikà wáã híʒaa nuù mesa
 basket the be+located face table
 The basket is on the table

In example (4) the configuration of the human body is imposed on the mountain such that its top area is referred to as its "head". In (5), the top of the table is referred to by nuù 'face.' This term has the widest, or most general use of all the BPTs. Among other uses which we will describe below, nuù can be used to refer either to the front or to the top surface of a box-like object, such as a table.

When BPTs are used in locative expressions, there is no other explicit marking to indicate that the sequence is being used to refer to the location of a state or event, nor to constrain the possible nature of the spatial relationship, nor to mark complement or adjunct status of the locative. We have argued elsewhere (Brugman 1983) that BPTs are neither semantically nor syntactically interpretable as prepositions.

Only a subset of the whole list of BPTs can appear in locative expressions. The rest can be used only as nuclear terms, describing a Subregion of either an animate or inanimate Ground. The terms which we know to be used in locative expressions appear in (6).

- | | |
|----------------------------|---------------------------|
| 6. (a) šini - 'head' | (e) nda?a - 'hand/arm' |
| (b) ha?a - 'foot/leg' | (f) žata - 'back [human]' |
| (c) siki - 'back [animal]' | (g) čii - 'belly' |
| (d) ini - 'stomach' | (h) nuù - 'face' |

BPTs are also used to refer to areas near to but outside of the boundaries of the named subpart of the object. Examples (7) and (8) illustrate this use:

7. ni-ndečé šš saà šini žúnu
 Cp-fly one bird head tree
 A bird flew over the tree
8. ni-ndečé šš saà žata žúnu
 Cp-fly one bird back tree
 A bird flew behind the tree

In (7) the area over the tree is coded with the word for "head", while in (8) the area behind the tree is coded as žata 'back'. We will call this the Adjacent Space use of a BPT, and define it as requiring that there be no contact between the Figure and Ground.

When the BPTs are used in locative expressions, there may be ambiguity between the Subpart and the Adjacent Space readings. We will show that part of the work of disambiguation is done by the verbs with which the BPTs collocate. However, there are also lexical conventions according to which some BPTs have only one of the two possible readings. Two exceptional cases we have noted are nda?a 'hand', for which an Adjacent Space reading is not available, and žata 'back', for which a Subpart reading is not available. Thus, while šini in (7) can be used to refer to a space in the air adjacent to the tree's "head," thus rendering the English translation 'over,' nda?a can never be used in this way, to

refer to an adjacent space in the air over a branch of the tree. A sentence corresponding to (7), in which nda?a replaced ḡini, could only mean 'the bird flew to the branch of the tree,' not 'the bird flew around, through, over, or under the branches of the tree.'

Conversely, ḡata cannot be used to refer to the upright back surface of an object in a locative expression. It may only have the Adjacent Space interpretation. A sentence like (8), then, can only mean "A bird flew behind the tree," never "*A bird flew to the back (branches) of the tree."

It was mentioned earlier that nuù 'face' deviates somewhat from the other BPTs in that it is used to denote locations on a Ground which are not precisely analogical to a corresponding subregion on a human or animal body. The use mentioned earlier was that of nuù referring either to the front or top surface of a box-like object. There is also another unexpected facet of the use of nuù, as exemplified in (9) - (12), below:

9. saà ndéčé s*ki itú
bird fly animal+back cornfield
The bird is flying over the cornfield
10. saà ndéčé nuù itú
bird fly face cornfield
The bird is flying among the corn in the cornfield
11. ni-kāžáa ini ndúčá
Cp-drown stomach water
Someone drowned in the water
12. sučá-ró nuù nduča
swim(P)-2Sg face water
You will swim in the water

At first glance, it is unclear whether nuù in (10) and (12) is being used with a Subregion or an Adjacent Space reading. While the action is not being performed in a three-dimensional area away from the Ground (hence, requiring an Adjacent Space reading), the Ground is also not, strictly speaking, two-dimensional (requiring a Subregion reading). Rather, the action is being performed through some medium in each case; the corn in the cornfield in (10), and the water in (12). We claim that this is, in fact, a Subregion use, by virtue of the fact that there is a salient two-dimensional surface in these examples. This surface is allowed to have a small amount of "depth" only because that depth is a small fraction of the total depth dimension. Also note that there is contact between the Figure and Ground in these cases, which is definitional to the Subregion use of BPTs. Accordingly, we will call this the "Shallow Subregion" use of nuù.

1.3. The Interaction of the Two Systems: The two classes of lexical items under discussion code interacting aspects of the more general domain "location." In a sentence containing both, verb choice may restrict the reference of the BPT (i.e. selecting for either Subregion or Adjacent Space use, within the constraints

on possible reading noted above for particular BPTs), while choice of a particular BPT may construct and define the space which licenses verb choice. We will first give some relatively simple examples with posture verbs, and then proceed to the more complicated cases.

1.3.1. Posture Verbs

Examples (13) - (17) illustrate typical sentences containing both a verb of location and a BPT. (13) - (15) are examples of Subregion uses, while (16) and (17) are Adjacent Space uses.

13. híʒaa nuù ndà?a-ri
be+located face hand-1Sg
It is in my hand (chalk on open hand, lying or balanced upright)
14. hítuu nuù ndà?a-ri
be+lying face hand-1Sg
It is lying on my hand (chalk lying on open hand)
15. hítuu ini ndà?a-ri
be+lying stomach hand-1Sg
It is lying in my hand (chalk in closed fist)
16. rù?ù hindii-ri nuù María
I stand-1Sg face María
I am standing in front of María
17. ndukoo ha?a žunu
sit foot tree
He is sitting at the foot of the tree

Such cases give one a feel for the ways in which members of each lexical class are used, but pose no real surprises for the analysis. We will now proceed with more interesting cases, in which the BPTs interact with the verbs describing relative position of Figure and Ground.

1.3.2. Position verbs

Híndee: The following examples illustrate híndee 'to be in', in collocation with various BPTs:

18. kafée wáá híndee ini kaha
coffee that be+in stomach box
The coffee is in the box
19. halúli-ro híndee čii mesa žá?a
child-2Sg be+in belly table that
Your child is under that table
20. kítí-ré kundee nuù corral-rí šíá
animal-3SgM be+in(P) face corral-1Sg tomorrow
His animals will be in my corral tomorrow

In (18), híndee and ini 'stomach' collocate predictably. It is not surprising that the inside of a box would be referred to with the term for "stomach," and that something in this space would be located with the verb meaning "to be located in".

However, this is not the only possible BPT in a sentence with híndee. Consider example (19). The Subpart reading of ǎi 'belly', in ǎi mesa, would describe the underside of the table top. But the Adjacent Space reading, which is the relevant one here, refers to the three-dimensional space beneath that underside, bounded on four sides by the edges of the table top. It is this bounded space that the child is in in example (19).

(20) is somewhat more complicated. As mentioned before, nuù, 'face', is unusual among the BPTs in that it can code several Subregions. Apparently nuù has become so abstract that it can now refer to any two-dimensional surface, whether it is vertically or horizontally oriented.<5> We see this in (21), in which nuù codes the inside bottom surface of the "molcajete" (the mortar of a mortar and pestle):

21. sá?á-rí nducá?á nuù molcajete
make(P)-1Sg salsa face molcajete
I'm going to make salsa in the molcajete

This latter use of nuù, coding an inside bottom surface, is the same reading as that in example (20). Given this fact, however, we are forced to reconsider our understanding of the meaning of híndee. If it means "to be in", in the intuitive, three-dimensional sense, then its collocation with the planar surface reading of nuù is contradictory. Example (20) is evidence that this is not the most accurate translation for híndee. A more precise gloss would be "to be within the boundaries of," a definition which is neutral with respect to dimensionality of the ground. We hypothesize that híndee only requires that the Figure be within some bounded space, and that the BPT it collocates with fill in information about the shape of the Ground.

Thus, the appearance of ini in examples such as (18) is not redundant. Rather, it codes one possible shape of the Ground for which the Figure is in a híndee relationship. Because ini refers to the three-dimensional interior of the Ground (that is, the box in (18)), the requirement of boundedness is explicitly met.

Note also that (20) is acceptable with ini in place of nuù:

22. kítí-ré kundee ini corral-rí sǎ
animal-3SgM be+in(P) stomach corral-1Sg tomorrow
His animals will be in my corral tomorrow

The two sentences describe the same situation. Given the physical shape of a corral, which is a broad horizontal surface bounded by a low fence, the Ground is construable either as a three-dimensional container (expressed with ini), or as a saliently planar area (coded with nuù). kundee (the Potential of híndee)

just expresses containment, rather than giving any information about the shape of the Ground. Thus, it can collocate with either BPT, as long as the shape of the Ground is compatible with each construal. In this case the distinction expressed by the difference between ini and nuù could be described as "pragmatic" rather than "semantic," in the strict sense that the distinction codes the speaker's perspective on the situation rather than on the actual state of the world.

Kándeé: Like híndeé, kándeé 'be in, hidden from view' collocates most frequently in our corpus with ini 'stomach'. This reflects the normal real-world situation, in which the Figure is hidden from view because the Ground is an enclosed three-dimensional container. Hiddenness, being more specific a feature than mere containment, entails "being within the boundaries" of the Ground. We claim that the dimensionality of the Ground is left unspecified with kándeé just as it is with híndeé. Consider the following examples:

23. kándeé ʔí ñazĩũ ini be?e wáá
 be+hidden one person stomach house that
 There is a stranger in the house
24. ndihá-rí kándeé čii tĩkaí
 shoe-1Sg be+hidden belly blanket
 My shoes are under this blanket
25. kándeé bina ñú?ni nuù ndu?a wáá
 be+hidden now now face plain that
 He is on the plains right now

(23) illustrates the expected case of kándeé's collocation with ini, in which the object is hidden within a three-dimensional Ground: the house. (24), in which kándeé collocates with čii, describes shoes hidden under a saliently two-dimensional object, a blanket. This sentence contains a Subregion use of the BPT, as evidenced by the fact that the blanket and the shoe are in contact. In (25), there are two possible explanations for the use of kándeé. Either the subject is hidden by virtue of the fact that he is far away and out of sight, or he is hidden by the grass (or corn or whatever) growing on the plain. (The latter would be an example of what we have referred to as the "Shallow Subregion" use of nuù). In either case, however, nuù codes a two-dimensional surface, illustrating our point that kándeé is unspecified for dimensionality. Thus we claim that three-dimensional containment represents only the pragmatically most usual case for the use of kándeé, rather than reflecting a lexical requirement of this verb.

Hísndeé: Having established that the nuù of (20) denotes a two-dimensional surface, one might speculate that a sentence like (26) would be acceptable either with hízaa 'be located (generic)' or hísndeé 'be on (top of),' or that the verb kundeé (in (20))

could be replaced by kusndee (the Potential of hísndee), as in (27):

- 26a. bílu wāā hižaa nuù žuu
b. *bílu wāā hísndee nuù žuu
cat that be+located face mat
The cat is on the mat
27. *kĩtĩ-ré kusndee nuù corral-rí žĩá
animal-3SgM be+on(P) face corral-1Sg tomorrow
His animals will be in my corral tomorrow

However, (26b) and (27) are unacceptable. Hísndee requires more than just the spatial relation of English on; it requires that the Figure be located on a Ground with a raised surface. The gloss of hísndee, then, must be modified to read "be on a raised two-dimensional surface."

Sĩkĩ 'animal back' has a Subregion reading which exactly fills the semantic requirements of hísndee. That is, it represents a horizontal surface which is raised. Therefore, it is not surprising that hísndee collocates almost exclusively with sĩkĩ. (28) is a typical example:

28. hísndee sũkĩ mesá wāā
be+on animal+back table that
It is on that table

What is curious is that hísndee does not normally cooccur with nuù, despite the fact that nuù, as noted above, can refer to the kind of two-dimensional raised surface that hísndee requires (for example, the table top, as in example (5)). In fact, one consultant explicitly stated that hísndee may never cooccur with nuù. Our data show, however, that there is no lexical constraint against this cooccurrence per se, as evidenced by the following example, produced by the same consultant:

29. sú?unu-ro hísndée nuù žúnu wāā
clothes-2Sg be+on face tree that
Your clothes are on that tree

This sentence describes a situation in which clothes are spread over the branches of a tree, for drying. The example suggests the following: we know that nuù is a much less semantically elaborate term than sũkĩ, since the former is unspecified for elevation, while the latter marks elevation positively. We suggest that in the unmarked use of hísndee, nuù is blocked by sũkĩ, even when nuù would otherwise be truth-conditionally equivalent. This is the principle behind the putative prohibition stated by the consultant. However, (29) is grammatical because the top surface approximated by the tree's branches does not fit the requirements for sũkĩ, which requires fairly precise horizontalness and planarity, and appears, based on

independent evidence, to require that the longest dimension of the three-dimensional object be the horizontal plane. It does, however, fit the requirements of nuù, defining a roughly two-dimensional and semi-horizontal surface, and location on that surface fits the requirements of hísndee. (29) describes a rare real-world case, then, in which a raised nuù is not also a síkí, and so blocking does not apply.

We can find further evidence for the semantic description of hísndee hypothesized here by looking at the following contrasting examples:<6>

30. *ʒusndée kačini-ró šini poste
 put hat-2Sg head post
 Put your hat on the post
31. sú?unu-ro hísndée šini žúnu wãã
 clothes-2Sg be+on head tree that
 Your clothes are on that tree

The consultant explained the ungrammaticality of (30) as being due to the fact that hísndee cannot collocate with šini, much as he claimed that it cannot collocate with nuù, either. However, the consultant later gave example (31) as grammatical. Notice that (31) differs from (29) only in the BPT, and describes the same real-world situation. From this we conclude that what is unacceptable about (30) is that the šini, or 'head', of the post is not saliently two-dimensional; that is, that its top surface is too small with respect to its height to fulfill the requirements of hísndee.<7> Recall that síkí is appropriate of a subregion just in case at least one of its horizontal dimensions is salient relative to its height. Based on these examples, we can conclude that hísndee requires the Ground to possess a saliently two-dimensional and raised surface. This will typically be a síkí, but when such a surface exists which cannot be described by síkí, hísndee can be used with other BPTs nonetheless.

2. A Brief Comparison of Mixtec with English

Several differences between English and Mixtec emerge from our consideration of the Mixtec data. One which is immediately obvious is that the nature of the relationship between Figure and Ground, when lexicalized at all, appears in verbs in Mixtec and in prepositions in English. This is evident from the English glosses of the Mixtec position verbs, e.g. hísndee 'be on (top of).' English has a fairly large set of spatial prepositions which usually encode the feature of contact between Figure and Ground, and sometimes also code the orientation or shape of the relevant subpart of the Ground. What they do not consistently do is code the overall shape of the Ground, which, as we have seen, Mixtec does in some detail with both the position verbs and the BPTs. For instance, English on codes contact with an external planar

surface, but is neutral with respect to whether that surface is elevated or whether it is horizontally or vertically oriented:

- 32a. The chair is on the rug
- b. The chair is on the platform
- 33. The picture is on the wall

Similarly, above expresses lack of contact and a relationship of altitude of the Figure with respect to the Ground, but entails no particular shape properties of the Ground:

- 34. The bowl I want is above the refrigerator
- 35. The helicopter was above the tree/trees/lake

Another highly elaborated area of the English lexicon is posture predicates. Like Mixtec, English has stative verbs like sit, stand, and lie, and in fact several more which Mixtec does not have. In addition, English has participial adjectives encoding a postural state as the result of some action performed upon the Figure. The English set (i.e. including verbs and participials) is much larger than the Mixtec, and so more information is lexicalized about the physical properties of the Figure. This information in turn can restrict the possible interpretations of a cooccurring preposition, as illustrated by the following:

- 36a. The cloth was spread over the bed
- b. The cloth was hung over the bed

(36b) has a reading in which the cloth is, e.g., hanging on a wall, and it is this spatial relation which would be coded in Mixtec, rather than the relationship which the cloth holds to the bed.

In contrast with the closest Mixtec correlate, English does not lexically differentiate kinds of in. This English preposition is rather like the Mixtec verb hindee in not requiring three-dimensional enclosure in all cases, as the following contrasting pairs illustrate:

- 37a. The coffee is in the can
- b. The fish is in the water
- 38a. He was standing in the batter's box
- b. The car is parked in its usual space

However, as we have seen, this distinction can be made in Mixtec, by the use of the various BPTs to hindee.

Another difference between hindee and in is that, while any bounded planar region can be the Ground for in, it is not the case that just any region can be chosen as its object:

- 39. *The cat is in the mat

With the intended reading (synonymous with the gloss of (26)), on is grammatically required, preempting in in such cases. Thus, while there is a local resemblance in the possible relations coded by hindee and in, they do not have the same conditions of application, as a consequence of the differences in the systems in which they are members.

One final difference between the two languages is that, in contrast to the Mixtec example (19), English cannot overtly express in one clause both the containment relation and the exact location of the Figure with respect to the Ground. This can only be done indirectly, by using, e.g., contained, hidden, or a posture verb such as crouching. The simple English sentence does not entail containment. That is, 'the boy is under the table' might be used even if his legs were protruding - a situation which would not be described using hindee in Mixtec.

3. Other Considerations

For the purposes of this paper, we have had to oversimplify the kinds of real-world properties which might be involved in these lexicalization patterns. One consideration which we have omitted up to this point involves the physical properties of the Figure. The posture verbs, for example (see (14)-(19)), indicate that the salient dimensionality of the Figure as well as that of the Ground can determine the kinds of spatial relations which obtain.

Another consideration is whether the Figure is singular, mass, or plural, as shown in (40):

40. ñazĩũ wãã ká-ndukòò nùù mesa
 people those Pl-sit face table
 The people are sitting around the table

Here, nùù is a relation distributed over each of the units of the plural Figure. That is, each person is sitting adjacent to a distinct, vertically oriented planar surface of the table.

There are English cases which demonstrate the same point. For example, the shape of the Figure in (41) and (42), below, entails other physical properties of the Figure, such that (41) can mean that the gum is in contact with the underside of the chair, while (42) cannot.

41. I found a wad of gum under my chair
 42. I found a stick of gum under my chair

Obviously this minimal pair partakes of more than pure grammatical knowledge, yet the semantic properties of the lexical items employed (in particular, under) must be compatible with this world knowledge in order for the pair to contrast.

4. Conclusion

While we certainly have not done justice to the systems of either language in this short paper, one notable generalization which emerges has to do with what kinds of information each language lexicalizes, and in which lexical category. The Mixtec systems lexicalize a great deal of information about the shape of the Ground, largely by means of the BPTs and to a lesser extent through the positional verbs. They lexicalize relatively little about the exact relationship borne by the Figure to the Ground, and, with the exception of a small number of posture verbs, lexicalize relatively little about the shape of the Figure.

In English, however, much less is lexicalized about the shape of the Ground, while a great deal is expressed about the relations between the Figure and the Ground. In addition, by virtue of the exploitation of participles as statives, a reasonable amount is often expressed about the shape of the Figure. Both languages tolerate a great deal of ambiguity, largely because real-world context will disambiguate the offending elements.

In addition to these typological points, there is also a methodological moral to this story. Since each of us had previously worked on one of these Mixtec systems in isolation, it was only by virtue of our collaboration that we have achieved this level of understanding of the data. We have found that one simply cannot discover nor adequately describe a single semantic system without very careful attention to other semantic classes with which it cooccurs.

Notes

1. There are, of course, verbs of motion (see Macaulay 1985) which also entail stative locations (at the point before and/or after motion takes place). These verbs also interact with locative BPTs in interesting ways, but they will not be discussed here.

2. There are also a few verbs of location which code the semantic parameter "permanence of location," but since they do not appear to interact with the BPTs in any way significantly different from the verbs we discuss, we have omitted them from consideration in the present paper.

3. This is a special case constrained by our corpus. However, when Ground interacts with a verb of motion, we take it to be a generalization over stative location, source, path, and goal, after Talmy 1985a.

4. Re our abbreviations and diacritics: Mixtec is a tone language, and the dialect under discussion has three tones; high (´), mid (unmarked), and low (`). Every Mixtec verb has (at least) two aspectual stems, the Realized and the Potential. These are marked with "R" and "P" in the examples below, although in subsequent examples the Realized form will be unmarked in the gloss. There is also an inflectionally marked aspect, Completive,

which is represented by "Cp" in the examples. Other abbreviations should be self-explanatory.

5. In some cases we must distinguish between two-dimensional and planar: "two-dimensional" means only that the subpart has no salient or discernible thickness (but can e.g. be curved), while "planar" is a special case of "two-dimensional," a flat and non-thick surface.

6. If this is in fact the crucial difference between šini in (30) and (31), it counterexemplifies the claim made in Brugman 1983 that a šini must be a "tip".

7. šusndée is a causative form of hísndee.

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