



A • M • E • R • I • C • A • N  
A N T H R O P O L O G I C A L  
A S S O C I A T I O N

WILEY

---

"Uphill" and "Downhill" in Tzeltal

Author(s): Penelope Brown and Stephen C. Levinson

Source: *Journal of Linguistic Anthropology*, JUNE 1993, Vol. 3, No. 1 (JUNE 1993), pp. 46-74

Published by: Wiley on behalf of American Anthropological Association

Stable URL: <https://www.jstor.org/stable/43102869>

#### REFERENCES

Linked references are available on JSTOR for this article:

[https://www.jstor.org/stable/43102869?seq=1&cid=pdf-reference#references\\_tab\\_contents](https://www.jstor.org/stable/43102869?seq=1&cid=pdf-reference#references_tab_contents)

You may need to log in to JSTOR to access the linked references.

---

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact [support@jstor.org](mailto:support@jstor.org).

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at <https://about.jstor.org/terms>



JSTOR

American Anthropological Association and Wiley are collaborating with JSTOR to digitize, preserve and extend access to *Journal of Linguistic Anthropology*

---

■ **Penelope Brown and Stephen C. Levinson**

COGNITIVE ANTHROPOLOGY RESEARCH GROUP,  
MAX PLANCK INSTITUTE FOR PSYCHOLINGUISTICS

## **“Uphill” and “Downhill” in Tzeltal**

---

*In the face of the prevailing assumption among cognitive scientists that human spatial cognition is essentially egocentric, with objects located in reference to the orientation of ego's own body (hence left/right, up/down, and front/back oppositions), the Mayan language Tzeltal provides a telling counter-example. This article examines a set of conceptual oppositions in Tzeltal, uphill/downhill/across, that provides an absolute system of coordinates with respect to which the location of objects and their trajectories on both micro and macro scales are routinely described.*

---

### **Relative versus Absolute Coordinates in Theories of Human Spatial Conception**

This article reports on a set of conceptual oppositions—uphill, downhill, and across—that underlie distinctions in a number of grammatical or lexical subfields in the Mayan language Tzeltal.<sup>1</sup> The importance of the phenomenon inheres in its general significance for theories about human spatial conception, rather than its systemic importance per se for Tzeltal or Mayan languages, so it is essential to outline the leading ideas about the nature of naïve human spatial conception.

The familiar European languages have predisposed philosophers, linguists, and psychologists to think of spatial conception and description in a very specific way. Briefly, the idea is that, given the nature of human psychology and terrestrial ecology, we are predisposed to see space from an egocentric, anthropomorphic point of view. From this point of view, the spatial coordinates radiate out from ego, the individual located in space

---

*Journal of Linguistic Anthropology* 3(1):46–74. Copyright © 1993, American Anthropological Association.

who provides as speaker the deictic central reference point in discourse. The human frame provides a natural structure over these coordinates, with the symmetry of left and right sides, but the asymmetry of back (hidden) and front (visible), and distinct radii of distance (such as graspable/non-graspable, interactive distance/noninteractive distance, visible/nonvisible). The Piagetian child struggles to push the frame outward over the environment, learning slowly about the constancies of the world beyond its vision. Only the post-Newtonian scientist has escaped this anchored world, where space is ego-centered, and has learnt to think of space in absolute terms with an arbitrary displaced *origo* (point of reference) from which radiate fixed coordinates. So goes the picture, a picture fundamental to much work on spatial conception in cognitive science (see Clark 1973; Miller and Johnson-Laird 1976; Lyons 1977:690ff. for eloquent expositions).

Since coming into contact with an Australian group that proves with simple elegance that the egocentric spatial system is not the only natural linguistic system (Haviland 1979, 1986; Levinson 1986), it has been clear to at least some of us that the predominant cognitive science view is just plain wrong. Humans have the cognitive capacity to decenter spatial description almost entirely in everyday life in just the way that Newton explicitly pioneered as a scientific specialism. The Australian Guugu Yimidhirr speakers do so through a system of cardinal edges, reference to which replaces all (or nearly all) the relative spatial reference encoded in, for example, the English prepositional phrases "to the left of," "to the right of," "in front," "behind," and "across from." The English speaker's space is centered, and the relative positions of objects to one another and to the speaker are coded in corresponding locutions. In Guugu Yimidhirr, objects and vectors are to the north, south, east, or west, either absolutely or relative to other reference points, which may or may not be ego. Such a system replaces a system of *relative* spatial description with a system of *absolute* angles.

To see the difference clearly, think of all of us on a revolving stage. As the stage goes round, if we were using a relative system of description for the entities on the stage, the descriptions would not change; but all the descriptions would be constantly changing if we were using an absolute system. For example, imagine that, on our revolving stage, there is a table set for a tea party—I am sitting facing the Queen at the head of the table, with my friend the Mad Hatter at my left, and Alice opposite him. When the table swings around, nothing changes in the English description of orientations; Alice is still opposite the Mad Hatter (and so at my right), the Queen still in front of me, and so on. But every spatial discrimination changes in the Guugu Yimidhirr description, for the Queen is no longer to the north, and the Mad Hatter is no longer to the west of me. Such, crudely, are the enormous differences between a relative and an absolute conception of space (to use Miller and Johnson-Laird's [1976] terms). The two systems constitute fundamentally different strategies of spatial conception, focusing either on local configurations regardless of orientation, or on orientations within a larger frame—a landscape, as it were. One can easily see that they might be adapted to rather different purposes and preoccupations: for

example, Alice would have a hard time giving satisfactory instructions for setting the table in Guugu Yimidhirr; she couldn't say, "Place the knife to the sitter's right, with the glass above it, and the fork to the left." No general instruction would do the job; she would have to say that on the northern edge of the table, each knife should be to the west of the paired fork, but on the southern edge, each fork should be to the west and the knife to the east. But then, no self-respecting Guugu Yimidhirr speaker would ever propose such an egocentric custom for the disposition of objects in the first place. And Alice would find the relativistic spatial descriptions of English of little use when trying to find her way around the wilds of Cape York.

The interest we have in absolute systems of spatial description stems in part from its contrast with the familiar European languages, and in part from the presumption in cognitive science theory that human cognitive capacities are naturally predisposed to relative systems of spatial conception. According to these preconceptions, natural languages always build their spatial descriptions primarily on relative notions, because our perceptual system is so designed.<sup>2</sup>

Ordinary languages are designed to deal with relativistic space; with space relative to objects that occupy it. Relativistic space provides three orthogonal coordinates, just as Newtonian space does, but *no fixed units of angle or distance* are involved, nor is there any need for coordinates to extend without limit in any direction. [Miller and Johnson-Laird 1976:380; italics added]

The perceptual space to be characterized by a theory of perception must be relative in character. [Miller and Johnson-Laird 1976:57–58]

The degree to which language's spatial schema abstract away from physical characteristics is even greater than suggested so far. . . . Also a schema abstracts away from any specificity as to shape (curvature) or magnitude . . . hence also *from any specificity as to angles*. [Talmy 1983:262; italics added]

Guugu Yimidhirr makes extensive use of an absolute system, almost to the exclusion of a relative system (Haviland 1992; Levinson 1992c). But in this article we report on the finding that Tzeltal, a Mayan language spoken in Chiapas, Mexico, makes some, much more limited but nevertheless interesting, use of an absolute system too. In the literature on Amerindian, Austronesian, Papuan, and Australian languages there are many reports of the use of expressions that may be similar to the ones here investigated, so the phenomenon may be very general indeed.<sup>3</sup>

The Tzeltal expressions that are used in an absolute sense include especially the terms *ta alan* and *ta ajk'ol*, which one would naturally, but perhaps misleadingly, gloss as 'downhill' and 'uphill'.<sup>4</sup> Other related terms fit around these to form a complex of expressions that refer to motion and location on inclined planes. Before describing the structure of these expressions and their usage, it is essential to provide some background facts about the ecology and the nature of its exploitation.

### Ecological and Sociogeographical Background and the Absolute Use of 'Uphill'/'Downhill'

In this article we describe the usage of these expressions in the Tzeltal of the inhabitants of Majosik' paraje of the municipio Tenejapa, located in the Chiapas Highlands not much more than 50 miles from the Guatemalan border. Tenejapa is only one of at least 21 Tzeltal-speaking municipios in the region, but it's at the center of one of five main dialect areas (Berlin, Breedlove, and Raven 1974:7ff. after Hopkins and Kaufman). The *municipio*, or county, has an indigenous population estimated in 1974 to be around 10,000 (perhaps 15,000 or more now), of whom perhaps less than 30 percent speak Spanish to any degree (though increased schooling is rapidly increasing this figure). It is a rugged, mountainous area with elevations ranging between 900 meters (2,925 feet) in the northeast to 2,800 meters (9,100 feet) in the south, and a massive rainfall of perhaps 1,500 millimeters (Hunn 1977:5). Most travel is still by foot, over an extensive set of trails, the most important of which run north-south following the prevailing ridges and valleys.<sup>5</sup>

Majosik' paraje is in turn only one of 21 parajes, located at the northern extreme of Tenejapa. The *paraje* consists of a large high cirque in the south together with the western slopes of a long ridge running about four miles downhill from a high point in the south to a river in the north, which bounds the Tzeltal-speaking world.<sup>6</sup> The shift in altitude from the southern end (approximately 1,700 meters or 5,500 feet) to the northern end (approximately 950 meters or 3,000 feet) has dramatic ecological effects—from mountainous pine forest to tropical conditions (or, in native terms, from *sikil k'inal* 'cold country' to *k'ixin k'inal* 'hot country'). The fragmented land tenure system allows most families to exploit the different ecologies, with distinct crops in lowland fields and upland fields, reached by following the ridge or valley that runs down from the south to the north.

Most ridges in the surrounding area run parallel. The high, cold, ceremonial center of Tenejapa (approximately 2,000 meters or 6,500 feet) lies clearly uphill and due south of Majosik'. Thirty kilometers to the southwest beyond that, but still in high country at a similar altitude, lies the market town of San Cristóbal, still the furthest limit of travel for most inhabitants of the remoter parajes because of the absence of roads and the precipiteness of the terrain.

One of the central uses of the notions of uphill/downhill we are about to introduce refers to this overall inclination of the whole territory from highland south to lowland north, so one refers naturally to *lum* (Tenejapa center, which lies to the south of most of the parajes) as *ta ajk'ol*, 'to uphill', and the northern river (*tanate'*) marking the end of Tzeltal-speaking territory as *ta alan*, 'to downhill'. Given this overall inclination, and the use of the phrases 'uphill' and 'downhill' to mark relative positions on it, there is no contradiction in pointing out a cave that lies far to the north and saying in effect "look at the cave to downhill," even if the cave is in a ridge at a higher altitude than the place of speaking.<sup>7</sup> That is, although there may be local deviations from the overall inclination, the terms can still be utilized

to pick out positions on that overall inclined plane running downward to the north.

Less obviously, perhaps, this same dimension can then be applied at a microlevel, on the flat. If two bottles sit at either end of a north-south oriented table, one can be described quite naturally as 'to downhill' of the other, although the table is horizontal. Here the overall lie of the territory provides a *fixed angle* (of orientation, in the horizontal plane) that can be used to describe the directional relation of things that are not actually inclined with respect to one another.

Given the overall inclination of the land, and indeed the local difficulty of finding any level sites for houses or coffee-drying patios,<sup>8</sup> there is some reason to think that the horizontal plane, with its orthogonal vertical, is not the conceptual background to at least this aspect of spatial description in Tenejapa. This is highly conjectural, but if it were so, it would again run contrary to much speculation in the cognitive sciences, where it has been presumed that the vertical dimension given by our bipedalism provides one coordinate and an orthogonal horizontal plane the other two, which together are the three coordinates of spatial conception. ("Space has one vertical coordinate, two horizontal. . . . It is probably gravity that makes the vertical dimension unique" [Miller and Johnson-Laird 1976:397]. "In this [commonsense] view . . . the earth is immobile; its surface—the ground—extends to infinity in all directions and keeps overall, despite bumps and hollows, within an horizontal plane" [Herskovits 1986:27].) Instead it is possible that in this rugged terrain, Tenejapans find something more like a 45-degree inclined plane to be conceptually central. It is perhaps telling that the Tzeltal 'uphill' and 'downhill', which presume some such a prototypical inclined plane, can be extended to both the horizontal *and* the vertical dimensions: that is, one can talk, as we have seen, of two objects on a horizontal plane as uphill and downhill of one another, but also one may say that things over one's head are uphill and things beneath one are downhill. If the presupposed inclined plane ran at an angle of 45 degrees, then these two different uses would deviate no more than 45 degrees either side of the prototypical plane. Otherwise the usage is—to say the least—confusing.<sup>9</sup>

The use of 'uphill'/'downhill' expressions to locate entities on an idealized south/north inclined plane constitutes an absolute mode of spatial description; the terms label angles—fixed without reference to the orientation of ego or another human body and idealized away from local geography—with which one can describe relative positions. They are used in this way routinely to describe the locations of things, either with respect to each other or with respect to protagonists or speakers, on both a large scale (locations in the landscape) and on a small scale (locations within, for example, arm's reach).

The question naturally arises whether these terms are then just disguised cardinal point descriptions meaning in effect north and south. The ancient Mayans were thought to have had a system of cardinal edges, along with a developed system of celestial, ritual, and symbolic associations (see Becquelin 1990 for review). Some ethnographic descriptions of the neigh-



boring Tzotzil-speaking communities suggest that such a system still exists (e.g., Morris and Foxx 1987). However, recent reanalysis of the four relevant ancient Mayan hieroglyphs suggests that the system was not, or not primarily, a division of the horizontal plane into four major quadrants; instead, the four glyphs may represent primarily east, west, nadir, and zenith (see Stross 1991). The nadir and zenith glyphs were also associated with south and north respectively, which is the exact reverse of the present Tenejapan system.<sup>10</sup> The glyphs are normally paired east-west, zenith-nadir, and suggest a noncyclic, dual-axis system (Stross 1991:102). This reanalysis of the ancient system fits the present Tzeltal system well (allowing for the 180-degree rotation of the north-south [up-down] axis), and suggests that for Mayans, a quadrant system was never a central concept.

In any case, there are many reasons to think that the Tzeltal terms are not part of any quadrant system.

1. Informants who speak Spanish deny any correspondence between *alan* 'downhill' or *ajk'ol* 'uphill' and the Spanish *norte* or *sur*.
2. Informants make no reference to heavenly bodies when discussing the system; for example, they cannot even identify the North Star, which has no Tzeltal name (this in contrast to the ancient Mayan merchants, to whom the Pole Star "Ek" was a god guiding their wanderings).<sup>11</sup>
3. When asked: "How do you know where 'uphill' is?" informants stressed the topography, the mountains on the horizon, salient cliff-faces, and the like. (When pressed hard and asked about the relation to sunrise, one informant did say: "when my back is to where the sun rises, 'uphill' [south] is here [gesturing with left hand], 'downhill' is here [gesturing with right hand]".<sup>12</sup>
4. There is no full quadrant system, because the two directions either side of 'uphill'/'downhill', in effect east and west, are identically labeled as *ta jejch* 'the traverse' (described below). (This parallels the absence in Tzeltal of a distinction between *region to my left* and *region to my right*; see Brown and Levinson 1992; Levinson and Brown 1992.) East and west can be designated as *slok'ib k'aal* 'the coming out of the sun' and *smalib k'aal* 'the spilling of the sun', but these terms are not understood to label the orthogonal to 'uphill'/'downhill'.
5. In Tenejapa, there appears to be little ritual attention to cardinal orientations: houses and house-shrines can have any orientation, as can women's and men's seating ends of houses; people may sleep in any direction;<sup>13</sup> and so on. Nash (1970:293) remarks of the Tzeltal-speaking community of Amatenango that the only observable orientation in ritual was the insistence of burial with head to the east.<sup>14</sup>

Nevertheless, although cardinal-point notions are not employed in everyday life, informants display a keen sense of absolute orientation and direction. For example, from inside a house their gestures to distant locations appear to be very precise, distinguishing perhaps 10 to 15 degrees of arc. Gestures also appear to exactly model in absolute orientation the changes of direction in a path; thus, in route descriptions, the curves in trails

are indicated in precise conformity to the orientation of the curves on the ground.<sup>15</sup> Our own loose gestures to places and directions, made in the English-speaking way with at best rough orientation, gave rise to puzzlement, confusion, and correction.

Our informants claim to have an absolute sense of direction and orientation, and to keep this sense when transported far afield. A handful of anecdotes are perhaps relevant here. We called the bluff of our principal informant, who claimed to know day and night, awake or asleep, mountain or plain, where *batz'il alan* 'true downhill' always lay (a direction he indicated with precision recurrently). We blindfolded him, and spun him around over 20 times in a darkened house. Still blindfolded and dizzy, he pointed in the agreed direction! More methodically, we designed a task where an informant had to guide another blindfolded informant around a perfectly flat open space (a coffee-drying patio) by verbal instruction. English-speakers solve such a task by specifying rotations to the left or right ("turn a little bit to the right, go forward," and so on); our Tzeltal-speakers solve it by specifying rotations to the 'uphill' or 'downhill' direction, assuming (correctly) that the blindfold is no significant hindrance.<sup>16</sup> Another anecdote: we brought a woman into the local market town for medical treatment; she had rarely been there, and certainly never in the house we stayed in. In the night, she asked her husband which tap was the hot water tap in the bathroom by saying *ja' bal in ta ajk'ol-i* 'Is it this one uphillward?'. In general, when informants are in alien surroundings, they use the 'uphill' / 'downhill' terms with cardinal precision.<sup>17</sup>

Such confident absolute orientation reminded us of the Guugu Yimidhirr speakers of Cape York, who clearly do operate with a developed inbuilt sense of absolute orientation (Haviland 1986; Levinson 1992c). But yet another anecdote indicates that the Tzeltal sense of orientation is probably somewhat less secure, being at least partially based on observable features of the familiar landscape. One day the son of our hosts had an in-law visiting from the next door valley (Oxeb Witz, which falls away to the east as well as the north). We seized the opportunity to test his sense of direction from an unfamiliar location. When asked for the locations of Tenejapa center and San Cristóbal, he gave answers skewed by 25 degrees or more; he claimed 'downhill' was further east than our folk will allow. This suggests that familiarity with a particular territory may, at least for some individuals, be essential to exact use of the alignment.

A final ethnographic note is relevant in general to what follows. We claim below that there is a certain implicit geometry involved in the complex uses of 'uphill' / 'downhill' terms, and it may be relevant that Tenejapans, despite being slash-and-burn agriculturalists, operate a system of land tenure and land utilization that requires a certain geometric reasoning. Parcels are divided precisely among heirs; fields are laid out in rectangles (at least where the terrain permits) and their areas estimated accordingly, divisions being marked by the planting of specific species of trees.<sup>18</sup> There are planting norms, governing the spacing of different kinds of seeds, that also are expressed in geometric fashion, presumably allowing the calculation of area yields. It is noteworthy that this geometry of tillage also is conceived



of as on the inclined plane; the labor of planting and weeding is quantified in terms of the number of 'uphills' (the unit *moel* 'an ascension' is three uphill traverses of a corn field). Given this kind of conceptual background, we found that our informants could draw maps of their terrain (although this was a novel exercise) that, although not to scale, seemed to capture the correct orientation of features.

So far, we have introduced the absolute usage of the 'uphill'/'downhill' terms. But the whole system is greatly complicated by a number of other uses of the same oppositions or lexemes ('uphill' versus 'downhill', local versus main inclination). For example, a local inclination, say a bank on which one is working, can have 'uphill' ascribed to it according to its steepest angle, regardless of the north-south alignment. This usage is equally basic (perhaps even more so; see below). In addition to that, there are other, almost certainly more derivative, uses. To understand the full complex, it is necessary to have a great deal more information about the grammar and semantics of the terms involved, which we now attempt to provide.

### The Grammar of 'Uphill' and 'Downhill' in Tzeltal

There is a three-way opposition—'uphill', 'downhill', and 'traverse' (*across*)—which is expressed across four main subsystems. The first subsystem is the set of abstract nominals—'uphill', 'downhill', and 'traverse'—which appear in locative descriptions with the general-purpose preposition *ta*. The second main subsystem comprises the motion verbs 'to ascend', 'to descend', and 'to go across'. A third important subsystem is the set of derived adverbial directionals, 'ascending', 'descending', and 'traversing'. A fourth subsystem, not fully described here, is a set of specific nominals designating, for example, the 'uphill boundary (of a field or enclosure)' or the 'traverse side (of field or plane surface)'. (For more details on all of these, see P. Brown 1991).

Let us introduce the terms from the first three subsystems, organized under the conceptual oppositions:

*ajk'ol*. This noun is glossed here as 'uphill'. In Majosik' paraje of Tenejapa, this corresponds in one (the absolute) use to a precise fixed angle, roughly south (skewed slightly east of true south). Used more loosely, it may designate a quadrant about this point. Sometimes, with local distances, the positional adjective *kajal* 'on top of, superadjacent' is used as an alternate for *ajk'ol*. (It is interesting to compare Laughlin's (1975) entry for Tzotzil *?ak'ol*, n1b, 'above, over, upper, east'; thus, *?ak'oltik* 'Tenejapa', *j'ak'oltik* 'person who lives to the east, or Tenejapan'<sup>19</sup>). *Ajk'ol* normally occurs in the prepositional phrase *ta ajk'ol*, where *ta* is the sole general-purpose preposition in Tzeltal (glossing as 'to', 'from', 'at', 'in', 'on', or other as appropriate).

There is a corresponding common intransitive verb, *mo* 'to ascend, move uphill', from which is derived the much-used directional (a special kind of adverbial) *moel*, which can modify, especially, verbs of motion. These verbal

elements can describe literal (including vertical) ascent, or equally, movement in a southerly direction.<sup>20</sup>

*alan*. This noun is glossed here as 'downhill'. In Majosik' this corresponds in the absolute use roughly to north; there is a skewing, apparently precise, to a fixed angle approximately 15 degrees west of north as defined by the north star. (Laughlin [1975] has the corresponding Tzotzil term as *?olon*, n1b, glossing as 'beneath, before, west', not north.<sup>21</sup>) A quadrant around the focal point also may be so designated. Again, the term occurs nearly always in the phrase *ta alan* 'to/at the downhill'. Sometimes, with small distances, *y-anil* 'its underneath' is used as an alternate for *alan*.

The corresponding motion verb is *ko* 'to move downhill', with the derived very common directional adverb *koel* accompanying many motion verbs. Both of these can also specify motion northward.

*fejch*. This noun is glossable as 'the traverse, crosswise to the fall of the land'. The focal designation can be thought of as orthogonal to a line from *ajk'ol* to *alan*, but the wider designation is something like a quadrant either side of the 'uphill'/'downhill' quadrants; thus, on the absolute use of those terms, it corresponds indifferently to one side (say east) or the other (say west) of a north-south line. It occurs primarily in a prepositional phrase with *ta* (and probably also in most of the syntactic frames to be described below for *alan* and *ajk'ol*).<sup>22</sup> The corresponding motion verb is the intransitive *jelaw* 'to cross over, across the lie of the land', with derived directional *jelawel*.<sup>23</sup>

These central terms are used in the following syntactic frames. We take the opportunity to introduce the notion of a *relatum*, which is the reference point *from which* something can be said to lie 'uphill' or 'downhill'. The relatum may be implicit or it may be given by an explicit phrase, as indicated in the examples below.<sup>24</sup>

1. *ay ta ajk'ol te limite*  
EXIST PREP 'uphill' the bottle (= Figure)  
'The bottle is to the uphill (i.e., south)'

Here the nominal 'uphill'/'downhill' term appears in a prepositional phrase modifying the predicate, the locative existential, which in some ways can be treated as the vacuous positional predicate.<sup>25</sup> The relatum is here implicit, and would often be presumed to be deictic (i.e., 'uphill from the place of speaking').

2. *waxal ta ajk'ol te limite*  
POSITIONAL PREP 'uphill' the bottle  
'The bottle stands erect to the uphill/south'

Here the existential is replaced with a positional predicate adjective, one of a large set sensitive to shape and position of subject. The relatum is again implicit, might often be presumed to be deictic, but could easily equally be shifted to the narrative center (i.e., the position of some protagonist in a story).

3. *te lapis ay ta ajk'ol [yu'un te limite]*  
the pencil EXIST PREP 'uphill' 3E-RELN the bottle  
Figure Relatum  
'The pencil is uphill of the bottle'

Here the relatum is explicit and nondeictic; it is expressed in the bracketed phrase using the possessed vacuous relational noun *y-u'un*, the whole prepositional phrase then glossing "'uphill" with respect to the bottle'.<sup>26</sup> Using the same construction, one can make explicit a deictic relatum as follows:

4. *ay ta ajk'ol [a'w-u'un/k-u'un] te lapis*  
EXIST PREP 'uphill' of-you/of-me the pencil  
Relatum Figure  
'The pencil is uphill from you/from me'

Here the relational noun *-u'un* is prefixed with second (*a'w-*) or first (*k-*) person prefixes, to express the meaning '(uphill) with respect to you/to me'.

There is an alternative way to make the relatum explicit, as follows:

5. *ay [ta y-ajk'ol limite] te lapis*  
EXIST PREP 3E-'uphill' bottle the pencil  
Relatum Figure  
'The pencil is at the bottle's uphill'

Here the 'uphill' term is itself possessed by the relatum, so the whole prepositional phrase (marked by square brackets) glosses: 'at it's uphill, the bottle's' or 'at the uphill of the bottle'. In this construction, it doesn't seem possible to have a deictic relatum; that is, the possessing prefix cannot be first or second person (hence no *\*k-ajk'ol* 'at my uphill').

A final construction, which has only restricted uses, employs a nominalizing suffix on the end of the possessed 'uphill' term, as follows:<sup>27</sup>

6. *ay ta y-ajk'ol-al*  
EXIST PREP 3E-'uphill'-NOM  
'It is over his head/above him'

This seems to restrict the interpretation to the vertical dimension.

There are a number of facts about co-occurrence and alternation that may be important. The most obvious of these is that these expressions co-occur felicitously with deictics, motion verbs, and directionals, illustrated as follows:

Cooccurrence with deictics:

7. *li'/tey/lum ay ta ajk'ol*  
here/there/yonder EXIST PREP 'uphill'  
'It's here/there/yonder uphill'

Cooccurrence/alternation with the corresponding motion verb:

8. *ya x-mo-otik bel ta ajk'ol*  
 ICP ASP-ascend-1PLI DIRgo PREP 'uphill'  
 'We are going away uphill' (i.e., south)
9. a. *ya x-benon koel*  
 ICP ASP-walk-1A DIRdescend  
 'I am walking descending' (i.e., north)  
 b. *ya x-benon ta alan*  
 ICP ASP-walk-1A PREP 'downhill'  
 'I am walking downhill' (i.e., north)
10. *nit-a koel tey ta alan-e*  
 pull-IMP DIRdescend there PREP downhill-CL  
 'Pull (the rope) down toward downhill'
11. a. *jich koel ya x-ba-at ini (pointing north)*  
 thus DIRdescend ICP ASP-go-2A here  
 'Thus you go down this way' (to the north)  
 b. *jich ta alan ya x-ba-at ini (pointing north)*  
 thus PREP 'downhill' ICP ASP-go-2A here  
 'Thus you go down this way (to the north)'<sup>28</sup>

The directionals *koel* 'descending' and *moel* 'ascending' can be used to describe a static trajectory uphill or downhill,<sup>29</sup> as in:

12. *koel ya x-k'aboj bel li' ta alan-i*  
 DIRdescend ICP ASP-look+at DIRgo here PREP 'downhill'-DEIC  
 '(The cow) is looking downward away toward downhill  
 just here' (i.e., it is aligned and gazing northward)

### The Corresponding Semantics

We will treat the 'uphill' / 'downhill' prepositional phrases *ta ajk'ol/alan* as the central elements of this complex. They have a number of very different uses or "senses" that have to be carefully distinguished. As we have seen, one central use is the absolute one, where these terms involve angles defined as if by cardinal direction. We review this first, because it is the simplest, and then go on in the next section to outline the set of further uses. To facilitate description, we employ the following terms (borrowed from Miller and Johnson-Laird 1976, and, in the case of 'figure' and 'ground', from Talmy 1983):

**figure (or referent):** The object whose location is in question.

**relatum:** The point from which the angle of the figure is computed.

**search-domain:** The region, determined by the angle and the relatum, in which the figure is to be found.

**ground:** The object or landmark in relation to which the figure's location is specified.

### Absolute Uses of Ta Alan/Ajk'ol

The prepositional phrase in these cases delineates a *quadrant* or segment of a circle, of something less than 90 degrees of arc, whose origo is constituted by the *relatum*, the whole quadrant (of indefinitely large circumference) constituting the *search domain* for the referent or figure.

In these absolute uses, informants designate a point on the horizon as *batz'il alan* 'true, actual downhill', corresponding to a point roughly 15 degrees west of north. A quadrant of 90 degrees can then be constructed so that it is bisected by a line from this northern point to the origo of the quadrant; *mutatis mutandis* for southern-oriented *ajk'ol*. The prepositional phrases (*ta ajk'ol/ta alan*) then signify that the figure can be found somewhere in the delineated quadrant. Figure 1 should help to make this clear.

Note that the semantics of *ta jeich* are then derivative—once *ta alan/ta ajk'ol* are determined, *ta jeich* describes a search space neither *ta alan* nor *ta ajk'ol*; in effect to one side or the other of the *alan/ajk'ol* line (and segments) to which it is orthogonal. In short, *ta jeich* denotes indifferently the east or west quadrants.

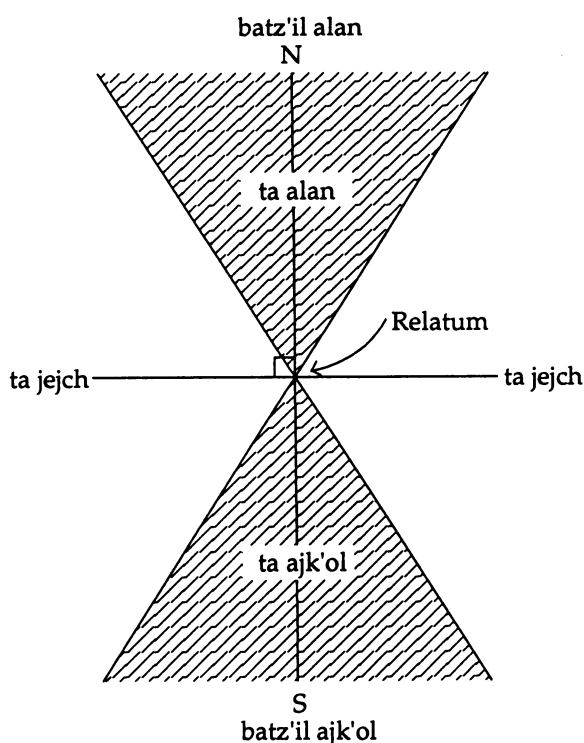


Figure 1

The nature of the *relatum* in these uses may be variously given, either explicitly or implicitly, as noted in the prior section. Because this is a feature that can vary across the different uses, it will now be useful to review all the different uses of the terms together.

### *The Different Uses of Alan/Ajk'ol*

The uses of the prepositional phrases *ta alan/ta ajk'ol* vary on a number of independent or semi-independent dimensions.<sup>30</sup> The first is the nature of the *relatum*, which may be deictic or nondeictic. Where the *relatum* is deictic, the center is normally the speaker (or speaker and addressee combined), the phrases thus glossing as 'uphill'/'downhill' from *here* (place of speaker), but the center can also be the addressee ('uphill'/'downhill' from you). Where the *relatum* is nondeictic, it may be explicitly indicated as in the constructions above, or it may be implicit, for example, given by the place of a protagonist in a story ('he went uphill', i.e., uphill from where he was previously).

Another dimension of variation is the question of how the relevant *angle* ('uphill', 'downhill', or 'traverse') is determined. There appear to be three distinct modes of usage here. The first is the absolute mode of determination described in the prior section, where the angle is fixed by an arbitrary but constant point to the south (for *ajk'ol*) and to the north (for *alan*), the two quadrants *ta jejch* being determined by having them bisected by the orthogonal to the north-south line. As we have noted, this usage may run contrary to the actual local inclination of the land (although it is in line with the overall general trend of slope in the landscape), and it may happily be used to describe a situation where referent and *relatum* are both on the flat.

A second, quite distinct method of determination is where the angle is given by the actual inclination of a local plane (i.e., a plane on which both referent and *relatum* lie). For example, suppose people are working on a slope that runs locally from (high) east to (low) west; then it is quite natural in such circumstances to refer to things *ta ajk'ol* meaning 'uphill, to the east'. In this case the usage is still absolute in the sense that the angle is given by factors outside the orientation of participants; but the angle denoted may vary on occasions of use, depending on the lie of the land. To determine the angle in any given case, one finds the line of steepest (most vertical) inclination on the local relevant landscape, and lets this line bisect a (say) 90 degree quadrant drawn (up the hill, in the case of *ajk'ol*) from the *relatum*. The meaning of the prepositional phrase *ta ajk'ol* is then that the referent can be found in the search-space so defined. Because an actual local slope has a bounded top and bottom, the search space in this case is not indefinite in area. (See Figure 2 for diagrammatic exposition.) This usage allows both a deictic usage ('up the hill from me here') and a nondeictic usage ('up the hill from the tree'), where the *relatum* may be explicit or implicit as in the syntactic frames given above.

The third kind of usage is by far the most complicated. In this usage, the angle is deictically determined by the body orientation of the speaker, although the primary *relatum* is here not deictic! Informally, what is involved in this usage is that an imaginary line (call it the *sight line*) is drawn at right angles from the shoulders of the person acting as deictic center



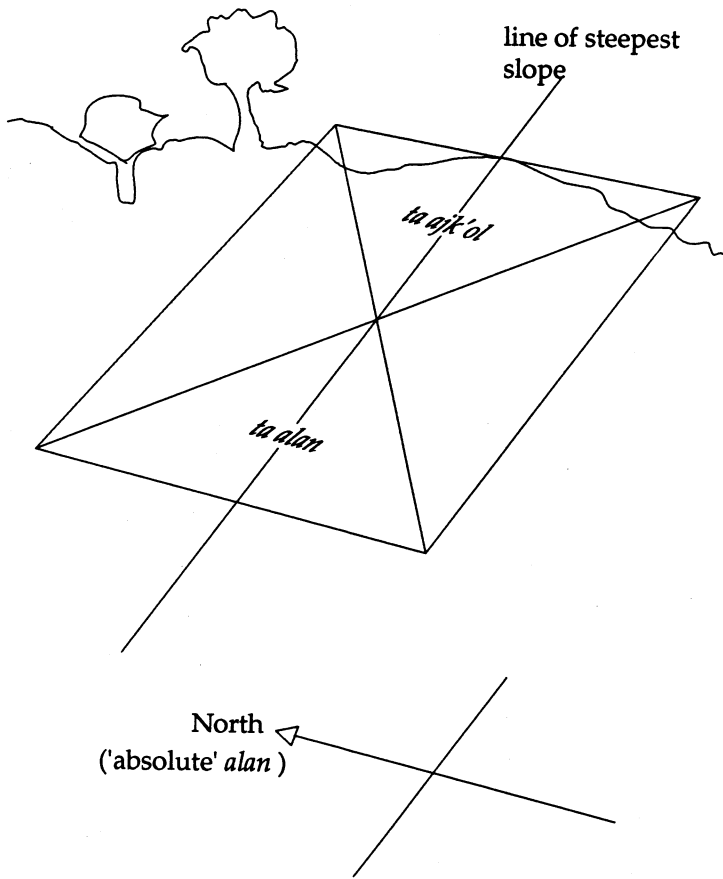


Figure 2  
Use of *alan/ajk'ol* on a locally inclined plane.

(speaker or addressee), straight ahead in front of him or her. One then constructs a quadrant so that it is bisected by this line, with the center at the speaker's chest (see Figure 3). An imaginary radius of two or at most three yards delimits the search-domain so constructed. The search-domain is further delimited by the fact that objects within a foot or less of the deictic center (speaker or addressee) would be described using a preempting descriptive system drawn from body-part terms (see P. Brown 1991, Levinson 1992b) instead of 'uphill'/'downhill' terms. The referent or figure must be found within this search-domain, but it must also lie on a line drawn from the relatum so that the line lies parallel to the sight line just described (again, see Figure 3). The general effect, speaking very loosely, is that *ta ajk'ol* on this usage asserts that the referent can be found in front of the speaker (sometimes the hearer) and 'in front of' the relatum (where 'in front of' is here given by the angle

determined by 'in front of' the speaker). What 'uphill' means here is then 'further away from the speaker than the relatum', while *ta alan* 'downhill' then means 'closer to the speaker than the relatum'.<sup>31</sup> From this description it is clear that the terms here require two salient objects in the field of vision, because they here encode an implicit comparative notion of distance from the speaker.

Schematically, what is involved is sketched in the following procedural steps and illustrated in Figure 3.

13. How to use deictic angle *ta alan/ta ajk'ol* in Tzeltal

- a) Draw line X-Y through Ego's shoulders.
- b) Draw the orthogonal line A-B extending out from Ego's front.
- c) Construct a quadrant Z with (say) radius 2 meters such that A-B bisects it.
- d) Construct the inner quadrant W with radius (say) 30 centimeters.
- e) Now we can say bottle F (the figure) is *ta ajk'ol* 'uphill' just in case
  - (1) the line drawn from the relatum or ground (here bottle G) to F (the line C-D) is parallel to A-B;
  - (2) both G and F fall within quadrant Z, but not within W (for in that case, the bottles would be *ta jtz'eel* 'at my side')
  - (3) bottle F would not be *ta alan* 'downhill' on the absolute usage (i.e., the line A-B or C-D does not point north).
- f) Likewise, if bottle G is to be referred to (i.e., is figure), G is *ta alan* 'downhill' just in case what is now the relatum or ground, bottle F, falls on a line C-D parallel to A-B, and all the other conditions (*mutatis mutandis*) are met.

*Note:* There are two implicit relata on this usage: ego, whose body angle establishes the angle A-B; another object (e.g., G) used to establish the line C-D.

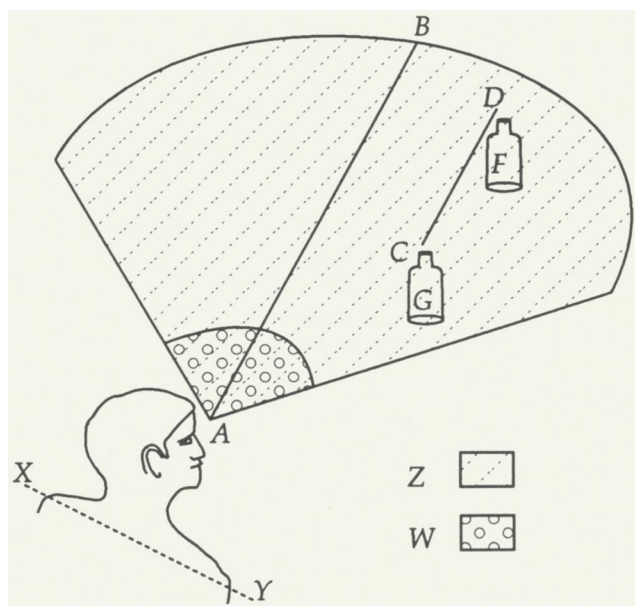


Figure 3  
Deictic angle *alan/ajk'ol*.

This last kind of usage is quite different from the prior two. It is relative in nature, somewhat like "in front of me" is in English. Suppose two bottles are on the table in front of the speaker, and the closer one can be said to be 'downhill, closer to speaker' and the further 'uphill, away from speaker'. If the speaker now goes right around to the other side of the table, the designation is reversed—what was 'downhill, closer' is now 'uphill, further' and what was 'uphill, further' is now 'downhill, closer'. Unlike Guugu Yimidhirr absolute cardinal point terms, this Tzeltal use of the 'uphill'/'downhill' terms could happily be used by Alice to instruct the Mad Hatter how to set the table (dessert forks 'uphill' of dessert spoons).

It should be noted that whereas with the absolute uses (with angle determined by overall inclination or local inclination), there are corresponding uses of *ta jejch* (to designate the two quadrants either side of the *alan/ajk'ol* line), with the deictic-angle usage of *alan/ajk'ol*, there is normally no corresponding use of *ta jejch* 'the traverse'.<sup>32</sup> This is presumably because the line between referent and relatum may already lie to one side or the other of the sight line. (So the Mad Hatter won't set the table completely correctly after all, confusing left and right, as Tzeltal makes no such distinction for the purposes of general spatial description.)

How can one account for this third, apparently divergent, usage? The explanation is straightforward. Because we stand five or more feet above the horizontal plane, two objects C and D on the ground, aligned so that C is closer to us in front of D, will project onto our retinas in such a way that C is below D. Alternatively put, D appears to be above C in the visual field. Hence it is natural to describe C as 'downhill' and D as 'uphill', relative to the point of viewing.<sup>33</sup> This effect is enhanced when the objects are close to us, especially if we have to tip our heads downward to see them; hence, perhaps, the proximity restriction in the Tzeltal 'deictic' usage.<sup>34</sup>

There remain two further distinct uses of *ta alan/ajk'ol*. One of the uses allows the terms to designate either end of the vertical dimension (as mentioned above), so that *ta ajk'ol* can designate a search area for the referent vertically above the relatum, and *ta alan* vertically below (although the latter use is normally preempted by *ta y-anil* 'at its underneath'). The relatum need not be deictic; one can use *ta ajk'ol* to talk about the bird above the tree, and so on. Indeed, for good maize plants with more than one ear of corn, using syntactic frame 5 above, one talks of *y-ajk'ol tz'al* 'upper ear of corn' and *y-alan tz'al* 'lower ear of corn on normal stalk having two ears' (Berlin, Breedlove, and Raven 1974:77).

There are clear indications that this use is not conceived of as primary. First, in elicitation informants were reluctant to use these terms in the vertical dimension, preferring, for example, the positional adjectives *kajal* 'above' and *toyol* 'tall, high, above'. Second, although the directionals *moel* 'upward' and *koel* 'downward' were often used in this vertical dimension, we noted only rare usages of *ta alan/ajk'ol* in this way; to designate vertical orientation *ajk'ol* is typically possessed and suffixed with a derivational -*VI* affix, as illustrated in syntactic frame 6, *y-ajk'ol-al*. The possessed form of 'downhill', *y-alan*, does not seem to take the -*VI* suffix and in fact is normally

preempted by *y-anil*. These facts contrast with the Tzotzil use of the corresponding cognates.

The final use of the terms is as *quasi*-proper names for places. As mentioned, family land holdings are typically fragmented, and if possible, families will own land distributed across the different ecological zones given by altitude. Ideally, then, each family will have fields 'uphill' in *sikil k'inäl* 'cold country' and 'downhill' in *k'ixin k'inäl* 'hot country'. It then comes about that if a family member announces that he or she is going *ta alan* 'downhill', the phrase can be taken to denote the lowland field area, and similarly for the 'uphill' term. On this usage, it seems plausible that *alan* is acting as a referring noun, and the phrase expresses a goal in the linguistic sense, whereas on the previous usages the phrase is adverbial and merely indicates an often indefinite search-domain in which the referent (denoted by the subject of the sentence) can be found. On the other hand, it might be argued that the phrase has one of its normal absolute meanings ('downhill, by local inclination, or to the north') on these occasions, and merely conversationally implicates the stereotypical goal location in that direction.<sup>35</sup> If the former analysis were correct, one would expect that it might be possible to say *ta alan* meaning 'to my lowland fields' even when they were actually uphill of one's current location (or at least *ta jejch*). On the latter analysis this would be impossible.

Unfortunately we do not have the data to decide, but we believe that a *quasi*-proper-name usage is not improbable. There is also firmer evidence for a different but similar *quasi*-proper-name usage: there is a ceremonial distinction between *alan k'inäl* and *ajk'ol k'inäl*, each political and religious function having paired *kaptanetik* 'religious officials' from uphill and downhill parajes, and there being (at least in former times) a division of the ceremonial center into two barrios or sections so named (Berlin, Breedlove, and Raven 1974:20; Rostas 1986:142f; compare also the endogamous moieties of Bachajon, called *alan* and *ajk'ol* —Aurore Becquelin [personal communication, 1990]—or the similar division of Amatenango described by Nash 1970.) On these grounds we shall assume that a *quasi* proper name usage exists and needs to be distinguished.

We summarize all the different usages in Table 1.

### Further Remarks on Usage

It should now be clear that the phrases *ta ajk'ol* and *ta alan* have an extensive range of rather different uses, quite sufficient to drive the ethnographer to distraction. But how, one wonders, do native Tzeltal-speaking recipients distinguish between the very different propositions that might be expressed by a single sentence? Consider for example the theoretically possible readings of some simple sentence like the following:

14. *ay ta ajk'ol te machit-e*  
 EXIST PREP 'uphill' ART machete-CL  
 'The machete is uphill'

**Table 1**  
**The different uses of *alan/ajk'ol*.**

- 
1. According to Nature of Relatum
    - a. Deictic relatum (reference point):  
'uphill/downhill from *here* (place of speaker)'
    - b. Nondeictic relatum:  
'uphill/downhill from the point X'  
where X may be given implicitly by narrative center or pragmatic inference, or may be explicit as in syntactic frames 3 and 4
  2. Distinct Determinants of Angle
    - a. Absolute (fixed angle, south or north)  
'to the north-south of relatum'  
(NB: Relatum can be deictic or nondeictic)
    - b. Local *real* inclination  
'in the direction of the salient local falling/rising inclination' (relatum deictic or nondeictic)
    - c. Deictic angle  
'in the quadrant—of limited extent—extending from my front whose bisecting line is at right angles to the line through my shoulders' (only used if figure is within reach, or close, but not so close as to be *ta jtz'eel* 'at my side')  
(Relatum must be nondeictic)  
(No corresponding use of *ta jejch*)
  3. Vertical Dimension  
By extension, *ta ajk'ol* can mean 'above the relatum' and *ta alan* can mean 'below the relatum'; the relatum can be either deictic or nondeictic. Intuitively, the horizontal and the vertical are the marked uses of *alan/ajk'ol*, which seem to presume a prevailing 45 degree sloping world.
  4. Place Name Use  
Land-holdings are fragmented; most families hold fields in hot-country (north, *ta alan*) and colder country (south, *ta ajk'ol*). *Ta alan* can then mean 'our hot-country fields', *ta ajk'ol* 'our cold-country fields'. Angle and relatum irrelevant, but one family's *alan* may be *ajk'ol* 'uphill, south' of another family's *ajk'ol*.
- 

There are probably corresponding uses for *ta jejch* except where noted.

- a. The machete is south of here (absolute, deictic relatum).
- b. The machete is south of there (absolute, nondeictic relatum).
- c. The machete is up the slope from here (local incline, deictic relatum).
- d. The machete is up the slope from there (local incline, nondeictic relatum).
- e. The machete is further in front of me than the other thing (speaker-deictic angle, nondeictic relatum).
- f. The machete is further in front of you than the other thing (addressee-deictic angle, nondeictic relatum).

- g. The machete is above you (vertical, deictic relatum).
- h. The machete is above something (vertical, nondeictic relatum).
- i. The machete is in our cold country fields (place-name usage, deictic relatum).

There would seem to be at least nine possible readings, each with quite different truth-conditions. Of course, on any particular occasion of use, ancillary knowledge will rule out many or most of these (e.g., reading e and reading f require the machete to be in the visual field of speaker or hearer respectively, while reading h requires some structure like a shelf across a rafter). However, there is enough ambiguity to require some further principles of resolution.

These principles seem to be a series of preemptive readings.<sup>36</sup> It is quite clear for example, that the deictic-angle interpretation is not intended by speakers to override an absolute reading. This became clear when we asked an informant to describe, for example, the relative locations of a yellow rope and a white rope placed toward the middle of a table. The informant was moved progressively around the table, and with this kind of restricted ground (the table), the informant chose to use deictic-angle *ta ajk'ol* / *ta alan* as long as these descriptions did not contradict the absolute meanings of those phrases. But when placed in a position where, by the deictic angle usage, he would have had to say 'the yellow rope is uphill' (further in front of me than the white rope) but, by the absolute usage, he would have had to say 'the yellow rope is downhill' (to the north of me), he invariably used the latter. In a systematic way, informants would not let the deictic-angle use contradict the absolute use, but were happy to use it unless it did so.

If the table was now tilted so that a local inclination came into play, the same kind of priority was assigned to the local-inclination interpretation over the deictic-angle interpretation; thus, if the table was tilted away from the speaker so that the yellow rope was further down the slope than the white rope, the deictic-angle interpretation *ta ajk'ol* 'uphill' could not be used to describe it. Instead it was plain 'downhill'.

What about the relative priority of local-inclination and absolute (cardinal edge) interpretations? On a flat table, the rope to the north was *ta alan*, but when this northern edge of the table was tilted up, informants preferred *ta ajk'ol* 'uphill'; thus, the local inclination can override the cardinal edge, absolute orientation usage. This was clear also from observing natural interaction; for example, during the construction of a large chicken run on a steep east-west slope, *ta alan* and *ta ajk'ol* were frequently employed to indicate the direction in which a post should be moved in its hole, or the direction in which wire should be stretched. There was never any doubt that the terms indicated the direction of the local slope, except that occasionally informants referred to the vertical dimension when the sense was clear from the activity in progress (e.g., pulling chicken wire downward to nail it to a post).

We can set up the following ordered set of usages:

15. local inclination    cardinal absolute    deictic angle



This ordering does not necessarily express a preference over interpretations; it merely states that when two readings would be inconsistent, the one to the left applies; thus, when a deictic-angle interpretation of 'uphill' was *consistent* with a cardinal-absolute one, it was quite clear that the deictic-angle one could still be intended. For example, when the yellow rope was both to the south of the white one and further away from the speaker, it could be felicitously said to be *ta ajk'ol* meaning 'relatively far from the speaker compared to the white one' (a comparative notion missing from the absolute usage), this being clear from changes in description caused by moving the white rope.

This ordering of interpretations is interesting in that it shows that reference to positions on an inclined plane is still the central usage. There are other disambiguating factors involved, no doubt; for example, the deictic-angle usage is applicable only to objects within a few yards of the speaker, while when involved in agricultural or building operations on a real slope, the practical significance of the actual inclination may override the absolute usage.

Occasionally, the different usages of expressions with primary reference to an inclined plane conflict in a single utterance. Consider for example the following, said by an informant when we (but not the informant) got disoriented in the local market town, where there are steep hills:

16. *ya x-ch'ay-otik koel li' ta ajk'ol*  
 ICP ASP-fall-1AplI DIRdescend here PREP uphill  
 'We're dropping downward here toward uphill'  
 (i.e., we're descending (this hill) toward the south)

Such an utterance is not contradictory only because the verb 'fall' and the directional adverb (*koel* 'descending') could naturally be taken to describe our actual steep descent, while the prepositional phrase could be taken to denote the absolute direction ('uphill', i.e., south) in which we were heading.

Finally, we should note that we have concentrated on the terms *alan/ajk'ol*. But no account of the full complex of Tzeltal 'uphill'/'downhill' terms will be complete without extensive analysis of the motion verbs *mo* 'go up' and *ko* 'go down', the derivative adverb-like directionals *moel* 'ascending' and *koel* 'descending', and indeed many other expressions (like *s-ba* 'its top' or 'its uphill edge', *y-ejtal* 'its downhill edge', *kajal* 'above') mentioned above. It seems that any Tzeltal expression whose semantics makes necessary reference to the vertical axis is also likely to have an interpretation in terms of the absolute angle given by the overall fall of the terrain. But the conditions under which such absolute interpretations are natural have special restrictions in each case. Further exploration must be left for future research.

## Conclusions

The Tzeltal use of absolute spatial descriptions needs to be understood in the context of the general nature of spatial description in that language,

and indeed other Mayan languages. We have tried to give that overall picture in companion papers (Brown 1991, 1992; Brown and Levinson 1990, 1992; Levinson and Brown 1992; see also Levinson 1992b, 1993; de León 1992a,b). Here it must suffice to say that the Mayan languages may provide yet another model for spatial description, one that is equally alien to the cognitive science presumption about what is natural. At least in the case of Tzeltal, there appears to be a preference to avoid egocentric locative descriptions and describe objects according to their *disposition* in space. This disposition is specified largely in terms of the shape and orientation of the object itself, with a tendency to give relatively undetailed information about its location relative to other objects. Where this relative information is encoded, it is often in terms of the system of absolute angles we have described. The strategy makes sense if we conceive of spatial description as existing primarily to satisfy the needs of reference. Adapting an adage of John Lyons, we may say that there are three primary modes of reference: (1) ostension (demonstrative deixis: "the man over there"), (2) spatial description ("the man who lives next door"), and (3) intrinsic description ("the man who has a hunchback").

Guugu Yimidhirr, with its absolute north-south-east-west system, would seem to emphasize mode 2 because most referring acts come with spatial coordinates. English would seem to use a broader mix of all three. But Tzeltal, it seems, emphasizes mode 3 by developing such a rich vocabulary of descriptors that unique reference can be efficiently achieved even within a field of view of near identical objects. This allows Tzeltal speakers to minimize the use of relational descriptions, and when employing such relational descriptions of one object vis-à-vis another, to minimize the use of deictic relata. In line with this, Tzeltal speakers do not use expressions glossing 'to the left of' or 'to the right of',<sup>37</sup> and expressions glossing 'in front of' and 'behind' have highly restricted uses, while vertical 'up' and 'down' appear to be derivative concepts (see Brown 1991, Brown and Levinson 1990 for this background).<sup>38</sup> It is as part of this tendency to *decenter* spatial description away from an egocentric reference point that the absolute system of spatial reference here reported seems to make best sense.<sup>39</sup>

The Tzeltal 'uphill'/'downhill'/'traverse' oppositions, reflected as they are across a number of lexical subsystems, help to explain how Tzeltal can manage without notions like *left of*, *right of*, *in front of*, and so on. Instead of projecting, on the basis of the speaker's left, for example, a region leftward of a tree (as in "the machete is left of that tree," Tzeltal employs fixed angles (as in "the machete is uphill [i.e., south] of that tree"). Comparative work currently in progress<sup>40</sup> shows that spatial use of left/right (and even front/back) oppositions is by no means universal, and is perhaps inversely correlated with systems of the sort here described, which utilize fixed or absolute angles.

The Tzeltal system of oppositions also raises interesting questions about the underlying conceptualization of space. As spelt out in the introduction, the received opinion in the cognitive sciences is that naïve human spatial conception uses relative angles based on human prototypes such as *left* and *right*. Clearly, this view must now be rejected. The presumption was based

on the apparent unlikelihood of a population that keeps track of abstract fixed angles. The cognitive preconditions of such a system are indeed that persons must have an inner compass, as it were, always aware of where abstract 'uphill' lies regardless of the local inclination, and that children must acquire such a compass fairly early in order to understand locative references. However improbable, this is clearly the case for Tzeltal speakers, and they are not alone. Current work among 13 societies in different parts of the world has revealed no less than four where an uphill/downhill system analogous to that of the Tzeltal is routinely used to describe locations on both the micro and macro scales: in addition to the closely related Mayan language Tzotzil, there is Kota (south India), Belhare (Nepal), and Yupno (Papua New Guinea).<sup>41</sup> For members of small-scale societies occupying a mountainous terrain, this is apparently a perfectly natural solution to the problem of spatial reference. We hope that the accumulating evidence of non-egocentered systems of spatial orientation will stimulate other researchers to attend to this aspect of how people think about and describe spatial relations in different languages and cultures.

### Notes

1. This article develops an original version that was presented orally by Levinson to the workshop "Spatial Conceptualization in Mayan Language and Culture," Berlin, September 10–20, 1990. We are thankful for many comments from participants in the workshop, including Aurore Becquelin, Michael Dürr, Suzanne Gaskins, Bill Hanks, John Haviland, Lourdes de León, John Lucy, and Norman McQuown. We are also indebted to Haviland and de León for subsequent comments on a draft. The paper is based mainly on extensive elicitation conducted by us in the field and filmed in August 1990. Usage was also checked against some naturally occurring data, observed, tape-recorded, or filmed. A second field trip (summer 1991) and a third (by P. Brown, December 1991 to January 1992) allowed the analysis to be checked with other informants and against many kinds of situated use.

2. For a more balanced account in this direction, see Levelt (1989:49ff.), who describes a matrix of possibilities where spatial coordinate systems are speakercentric or nonspeakercentric, and the relatum is or is not the speaker. Then he notes that the third cell, nonspeakercentered coordinate system with speaker as relatum is unfilled, because "it is unusual, if not entirely impossible, for a speaker to use himself as relatum in an intrinsic co-ordinate system." The data in this article show quite clearly that it is possible to utilize an externally based coordinate system, related, for example, to intrinsic properties of the immediate environment, together with deictic relata. Levelt himself goes on to note that *geographic reference* is an important exception.

3. Unfortunately, most of these descriptions provide hardly any semantic detail. But there are some nice exceptions (see, for example, Mosel 1982 and especially Heeschen 1982). Heeschen's account of Papuan deictic systems suggests that the theme *uphill* versus *downhill* versus *across* (here detailed for Tzeltal) may be general in Papuan languages. It is also a striking feature in Austronesian languages. For further references see Levinson 1992a.

4. Why not just gloss these terms (as perhaps for the cognates in Zinacantan Tzotzil) as 'down' and 'up' (Haviland, personal communication)? The reason is that in Tzeltal, the uses on the vertical dimension are perhaps the most marginal uses of

the terms, being preempted by other terms like *s-ba* 'it's top' or *toyol* 'high up' (see below). Even in the Tzotzil of the neighboring Chamulas, the association of the cognate terms with cardinal directions and overall inclination of the territory is fundamental:

Chamulas believe that the world is an inclined island, which is higher in the east than in the west . . . Economic activity, travel, social organization, and topography, therefore, support the prevailing belief that the earth-island is generally high in the east and low in the west. This view is reflected in the Tzotzil words that are sometimes used to designate these directions: *ta 'ak'ol* ('above' or 'up') means east; *ta 'olon* ('below' or 'down') means west. [Gossen 1974:21; see also p. 35]

5. The map SPP "Oxchuc" E15D52 shows these north-south trails clearly.

6. This description includes the old territory of the Pinka Karmen, now effectively incorporated in the paraje (cf., e.g., the maps in Berlin, Breedlove, and Raven 1974:11; Hunn 1977:8).

7. We take this to be evidence that 'downhill' is the relevant fundamental meaning, not, for example, 'down'. The base from which the cliff with its cave rises was clearly downhill from the place of reference, even if the cave was 'up'. The English *above* and *below* also allow a base-oriented usage of this kind, so that "the house is above the office block" can be true even if the office block towers over the house, provided that we conceptualize *above* as 'uphill' (see Herskovits 1986:66).

8. In recent years, basketball with large monetary prizes has become an immensely popular form of expressing local rivalries. This has required enormous public effort in the leveling of appropriate sites. Soccer captured local imagination too, but the size of the field makes leveling totally impractical.

9. There is clear evidence, we hasten to add, for the importance of the vertical dimension elsewhere in the semantics of Tzeltal (in the positional roots and relational nouns, for example; see P. Brown 1991). The question here is whether the prototype extensions of the 'uphill'/'downhill' terms are vertical, or on an inclined plane as we tentatively suggest. One should note that even in English, the interpretations of *up* and *down* can be relativized to the horizontal (Shepard and Hurwitz 1985). One potential difficulty with the use of an inclined plane (tippable to the horizontal or vertical as required) as conceptual prototype, John Haviland points out (personal communication), is that this would then leave two vacant quadrants (if I were facing uphill, one of these would be behind me, from the vertical upward through my head to the horizontal drawn from my heel; the other would be in front of me, from the horizontal drawn from my toes down to the vertical beneath my feet). But mental rotation of the 45 degree-inclined plane would still allow the use of the same conceptual apparatus to describe, say, a bird behind my head. In practice, for most but not all usages, the plane is conceived of as absolutely anchored along a north-south line, and one would use other (more truly vertical) terms to describe the bird's location.

10. There may be an important clue here for those in search of the geographic navel of the culture of the glyph carvers: they should look for a locus where the terrain is mountainous, and falls steeply and consistently to the south. The southern slopes of the Guatemalan highlands look promising.

11. There may be ritual experts who have greater knowledge of the heavens than our informants, who had terms only for the Pleiades and the three stars in Orion's belt. The term *ek'* now means just 'star' in Tzeltal, with planets undifferentiated, except that Venus is called *muk'ul ek'* 'big star'.

12. C. Brown (1983:136) notes that many languages equate left with north, right with south, assuming an east-facing canonical posture. Dürr (1990) points out that where Mayan languages such as Quiche make the association, it is normally in

reverse. In Tzeltal, given the absence of general use of the left-right distinction, there is no linguistic association at all.

13. In fact informants say it is bad to sleep with your head 'downhill', (toward the north) because one is then sleeping *kojkoltza* 'upside down'. However, they hasten to add, some people disregard this prescription and sleep any old way.

14. This is the reverse direction, as she notes, from that used in Tzotzil-speaking territory. Tzotzil speakers of Zinacantan, who bury their dead with heads to the west, are careful not to sleep in that orientation (Haviland, personal communication); Tenejapans traditionally buried their dead crouched upright. In Tzotzil territory, the four sides of the world, as in the classic Maya cardinal edges, are still apparently conceptually central (Gossen 1974:31); in Tenejapa one has the impression that the three-pointed figure, which characterizes the supports for all the main instruments for food preparation, is more of a dominant ritual theme.

15. These remarks are based on the following kinds of data: (1) direct observation, (2) filmed natural interactions, and (3) filmed role-played route directions. John Haviland has found a similar iconically-oriented use of gesture in stories for Tzotzil speakers from Zinacantan.

16. Saying, for example:

(a) *walk'un-a moel a'-ba tey a mene*  
turn-IMP DIRascend 2E-REFL there DEIC that  
'Turn upward there' (i.e., southward)

(b) *ben-an moel cha'-tejk'-uk moel*  
walk-IMP DIRascend two-NC+step-SUBJ DIRascend  
'Walk two steps uphill' (i.e., south)

Of course, there are many auditory cues (including the direction from which the instructions are being given) that may help to orient the blindfolded informant in this context.

The Tzeltal transcription is based on a practical orthography with the following conventions (where they differ from the IPA): *j* represents /h/, *ch* represents /c/, *x* represents /j/, *tz* represents /ts/, and ' represents either phonation with glottalic air stream mechanism or a glottal stop. In Tenejapa Tzeltal, *w* is normally pronounced *v*, and *b* is invariably glottalized. Abbreviations for morpheme-by-morpheme glosses are as follows: 1,2,3 E indicates first-, second-, and third-person ergative prefixes (these mark both subjects of transitive verbs and noun possession); 1,2,3 A indicates the corresponding absolutive suffixes; 1PLE stands for first-person plural exclusive; 1PLI first-person plural inclusive; PL second- or third-person plural; ASP neutral aspect; BEN benefactive; CMP completive aspect; ICP incompletive aspect; ART article; AUX auxiliary verb; CJ conjunction; CL clitic; DEIC deictic element; DEM demonstrative; DIM diminutive; DIR directional; EXIST existential predicate; IMP imperative; NAME personal or place name; NC numeral classifier; NEG negative particle; PREP preposition; Q question particle; QUOT evidential clitic; REFL reflexive; REL relational noun; STAT stative (perfect) aspect; and SUBJ subjunctive.

17. For example, when directing us toward a store one block south in the local market town, one Tenejapan described the location in the following way:



ja' niwan li' ta ajk'ol  
 it+is perhaps here PREP uphill  
 'It may be that it's here, uphill' (i.e., to the south)

18. The traditional boundary trees are *tim*, *Yucca elephantipes* (Berlin, Breedlove, and Raven 1974:420), and a deciduous tree we cannot identify. Recently, boundary stones have been coming into use; but unlike the trees, they can be easily moved, and thus spawn quarrels. Boundary trees are planted at the corners (*chikin* 'ears') of plots, as well as occasionally on a long edge (they are also planted along paraje borders). Incidentally, the edges of a field are named according to their 'uphill'/'downhill' orientation, but here these notions correspond primarily to the local inclination of the land: *s-ba* 'its top' labels the uphill edge, *y-ejtal* 'its edge, of large expanse' the downhill edge, with the ascending sides called *s-ti'il* 'its lips or edge'.

19. The difference in cardinal point association is explained by the different location of the Tzotzil center of Zinacantan. Zinacantan lies on the western edge of the Central Highlands plateau. Westward lies a dramatic drop down toward the coastal plain; eastward lies the highest point in the Central Highlands (Tzontewitz, 2,900 meters). Hence "uphill" and "downhill" in Zinacantan Tzotzil are associated by the general line of the land with east and west respectively. Ulrich Köhler (personal communication) tells us that within San Pedro Chenalho, the Tzotzil municipio bordering Tenejapa to the north, these associations are variable according to the local terrain.

20. It is also possible to use the verbal noun *moel* in the expression *ta moel* 'to upward' as it were, as equivalent to *ta ajk'ol*. Another near synonym is *ta kajal* 'to/at above', from the positional root *kaj-* 'on top of'.

21. Laughlin 1975 also records temporal uses of this spatial expression, e.g., *ta yolon k'in* 'before the fiesta', but no corresponding use of *ak'ol*. The same applies in Tzeltal: one says *ta yanil k'in* 'before the fiesta', but not *\*ta yajk'ol k'in* 'after the fiesta'. Thus time runs uphill in Tzotzil and Tzeltal, and being linear never backwards downhill! Incidentally one has the feeling that Tzeltal *alan* is the unmarked, more basic term of the opposition, and perhaps this is so for Tzotzil *olon*, hence the greater number of semantic extensions. But Gossen (1974:35f) claims that for the Tzotzil-speaking Chamulans 'up' (*ak'ol*) is primary.

22. Laughlin 1975 gives a rather different gloss 'on the other side' for the Tzotzil cognate *hech*. This sense also arises in Tzeltal, as in *ta jejch uk'um* 'the far side of the river (from us)'. The interpretation is perhaps pragmatically induced. In any case, without the nominal complement (e.g., *uk'um*), *ta jejch* refers equally to either side of a bounded entity.

23. The association of absolute directions with 'up'- and 'down'-oriented terms extends beyond the expressions mentioned above. For example, relational nouns *s-ba* 'its top', *y-ejtal* 'its side bottom edge', and *s-tz'eel* 'its side edge' have usages (when applied to fields or other bounded areas) with respect to both inclined planes and absolute orientations. However, we leave these other expressions aside here.

24. These examples are drawn from our videotaped elicitation sessions, where informants were being asked to describe the location of objects (like the omnipresent Pepsi bottle or pencil) in relation to each other, to locate objects in response to verbal directions on a flat cement patio while blindfolded, or to role-play giving route directions to a stranger. Example 10 comes from a naturally occurring event where a chicken house was being constructed. In everyday interaction, these sorts of instructions and descriptions are frequent and routine whenever the location or trajectory of people or objects is at issue, as a casual inspection of our large corpus of Tzeltal natural conversation has indicated.



25. Like other Mayan languages, Tzeltal has a class of roots called *positionals* that are (in theory) isolable on morphological and semantic grounds (in practice the class is not so clear); they have a stative locative meaning and usually describe very exactly the disposition of the subject. The existential *ay* has similar stative locative meaning but assumes no special disposition of the subject. Its usage is restricted because by asserting existence, it tends to presuppose an indefinite subject. See P. Brown 1991 and 1992 for details.

26. Another example:

A: *te joko?*

(where is) the flashlight?

B: *ja' ajk'ol ay y-u'un te matz'*  
it is uphill EXIST 3E-REL the corn-dough

'It's uphill (i.e., south) in relation to the corn-dough

27. The suffix *-al* derives noun stems from noun roots, sometimes with no apparent change of meaning (as in *ajk'ub* 'night', *ajk'ubal* 'night'), sometimes with a clear change of meaning (*k'ajk'* 'fire', *k'ajk'al* 'day, sun, anger'). See Kaufman 1971:77.

28. Example 11a actually occurred in direction-giving; 11b would be equivalent.

29. See Haviland 1991 for detailed investigation of the parallel motion verbs and directionals in Tzotzil, and de León 1991, 1992a, for their static trajectory uses in Tzotzil.

30. There are probably corresponding uses for *ta jejch* except where noted, but we have relatively few data here.

31. Heeschen (1982:102) reports a similar deictic use of 'uphill'/'downhill' terms for the Papuan language Eipo; although in this case, it is the 'downhill' term that is used on the flat to indicate the far end of something. In general, the Tzeltal system is natural in equating 'up' with 'further from me', as this follows the raising of the gaze from near to far objects (as noted by Shepard and Hurwitz 1985). For detailed examples of this deictic usage of 'uphill'/'downhill' see P. Brown 1991; for its theoretical importance for the relation between language and vision see Levinson 1992b.

32. We have one example. Given a photograph (Matz' series no. 23) of a wedge-shaped piece of corn dough where the wedge lies across the photograph (thick end to left, thin end to right), one informant described the shape thus: *muk' jejch, ch'in jejch* 'thick end (one) side, thin end (other) side'.

33. Natural in one sense. On the view that visual processing is modular, this conceptual conflation of a three-dimensional spatial model and a two-dimensional retinal projection is anything but natural. See Levinson 1992b for theoretical comment.

34. For an interesting review of the cognitive bases for the extension of an 'up' orientation to horizontal circumstances, see Shepard and Hurwitz 1985:166ff. They note, for example, that in American Sign Language, more distant locations are indicated by signing higher. In the same way, Guugu Yimidhirr gestures of direction indicate distance by degrees of arm raising (Levinson 1986).

35. Thanks to John Haviland for suggesting this.

36. These remarks were stimulated by a response of John Lucy to the oral presentation of this article.

37. For the evidence in regard to Tenejapan Tzeltal, see Brown and Levinson 1992; Levinson and Brown 1992. There are, however, reasons to think there may be dialect variation on this very feature (John Haviland [personal communication] tells us there is, for example, in Tzotzil).

38. It is interesting to compare the universalizing generalizations of, for example, Lyons 1977, who assumes (not without good reasons) that the vertical dimension is primary, the front-back secondary, and the left-right tertiary in a fundamentally egocentric human spatial conceptualization. In Tzeltal, the vertical dimension seems derived from a system applicable to inclined planes, the front-back system is underdeveloped, and the left-right one more or less nonexistent; thus, the dimensions are ordered as Lyons predicts, but their general secondary importance is not as predicted.

39. This is not to say that Tzeltal lacks deictics altogether—there are of course the expectable deictic demonstratives and adverbs with a proximal/distal distinction ('this/that', 'here/there/way over yonder'), and more subtle distinctions available with 'terminal deictics' possibly analogous to some of those described for Yucatec Maya by Hanks (1990). (P. Brown [1991:6–13] gives an overview of these deictics in Tzeltal). Deictic anchoring is also an important feature in some intransitive verbs of motion. There are many other ways in which utterances are anchored spatially and temporally in the speech act situation. But the point here is that, with the exception of deictic adverbs and demonstratives, the locational systems are either markedly nondeictic or neutral between deictic and nondeictic relata. The uphill/downhill system in Tzeltal equally readily allows deictic or nondeictic relata; no priority is given to ego's position or perspective. And two other core sets of resources for describing locations—the body part system and the system of dispositional adjectives—provide object-centered rather than ego-centered relata (although there are marginal deictic uses of certain body part terms, as there are marginal deictic uses of the uphill/downhill dimension, as we described above).

40. This work by members of the Cognitive Anthropology Research Group at the Max Planck Institute for Psycholinguistics, Nijmegen, is aimed at describing spatial language and spatial conceptualization in non-Western languages and cultures.

41. This claim is based on as yet unpublished fieldwork results by Eric Pederson (Kota), Balthazar Bickel (Belhare), and Jürg Wassman (Yupno), sponsored by the Cognitive Anthropology Research Group, MPI, Nijmegen, 1991–92. The Tzotzil evidence can be found in de León 1992a.

### References Cited

- Becquelin, Pierre  
 1990 Les quatres directions du monde Maya. In *Vingt études sus le mexique et la Guatemala: réuni à la mémoire de Nicole Percheron*. Alain Breton, J. P. Berthe, and S. Leevin, eds. Toulouse: Press Universitaire du Miriel, pp. 35–46.
- Berlin, Brent, Breedlove, Dennis E., and Raven, Peter H.  
 1974 *Principles of Tzeltal Plant Classification*. New York: Academic Press.
- Brown, C. H.  
 1983 Where Do Cardinal Direction Terms Come From? *Anthropological Linguistics* 25(2):121–161.
- Brown, Penelope  
 1991 *Spatial Conceptualization in Tzeltal*. Working Paper No. 6. Nijmegen, Netherlands: Cognitive Anthropology Research Group, Max Planck Institute for Psycholinguistics.
- 1992 The INs and ONs of Tzeltal Locative Expressions: The Semantics of Static Descriptions of Location. Paper delivered at the Workshop on Spatial Conceptualization in Mayan Languages, Nijmegen, February 10–14, 1992. To appear in *Space in Mayan Languages*, Special Issue of *Linguistics*. John B. Haviland and Stephen C. Levinson, eds.

- Brown, Penelope, and Levinson, Stephen C.  
 1990 "Recentring" in Mayan Spatial Description: The Tzeltal Case. Working paper. Berlin: Max Planck Project Group for Cognitive Anthropology.  
 1992 "Left" and "Right" in Tenejapa: Investigating a Linguistic and Conceptual Gap. In *Space in Mesoamerican Languages*, Special Issue of *Zeitschrift für Phonetik, Sprachwissenschaft und Kommunikationsforschung*. Lourdes de León and Stephen C. Levinson, eds. Pp. 590–611. Berlin: Akademie Verlag.
- Clark, Herbert  
 1973 Space, Time, Semantics and the Child. In *Cognitive Development and the Acquisition of Language*. T. E. Moore, ed. Pp. 28–64. New York: Academic Press.
- Dürr, Michael  
 1990 Reference to Space in Colonial Quiché. *Función* 1990.
- Gossen, Gary H.  
 1974 *Chamulas in the World of the Sun*. Cambridge, MA: Harvard University Press.
- Hanks, William.  
 1990 *Referential Practice: Language and Lived Space in a Maya Community*. Chicago: University of Chicago Press.
- Haviland, John B.  
 1979 Guugu Yimidhirr. In *Handbook of Australian Languages*, I. R. M. W. Dixon and B. Blake, eds. Pp. 27–182. Canberra: Australian National University Press.  
 1986 Complex Referential Gestures in Guugu Yimidhirr. Manuscript.  
 1991 The Grammaticalization of Motion (and Time) in Tzotzil. Working Paper No. 2. Nijmegen, Netherlands: Cognitive Anthropology Research Group, Max Planck Institute for Psycholinguistics.  
 1992 Anchoring, Iconicity and Orientation in Guugu Yimidhirr Pointing Gestures. Working Paper No. 8. Nijmegen, Netherlands: Cognitive Anthropology Research Group, Max Planck Institute for Psycholinguistics.
- Heeschen, Volker  
 1982 Some Systems of Spatial Deixis in Papuan Languages. In *Here and There: Cross-Linguistic Studies on Deixis and Demonstration*. Jürgen Weissenborn and Wolfgang Klein, eds. Pp. 81–110. Amsterdam: John Benjamins.
- Herskovits, Annette  
 1986 *Language and Spatial Cognition*. Cambridge: Cambridge University Press.
- Hunn, Eugene S.  
 1977 *Tzeltal Folk Zoology*. New York: Academic Press.
- Kaufman, Terrence  
 1971 *Tzeltal Phonology and Morphology*. Berkeley: University of California Press.
- Laughlin, Robert  
 1975 *The Great Tzotzil Dictionary of San Lorenzo Zinacantan*. Washington, DC: Smithsonian Institution Press.
- de León, Lourdes  
 1991 Space Games in Tzotzil: Creating a Context for Spatial Reference. Working Paper No. 4. Nijmegen, Netherlands: Cognitive Anthropology Research Group, Max Planck Institute for Psycholinguistics.  
 1992a Locative Body Parts and Geographic Anchoring in Tzotzil Acquisition. Paper presented at the April 1992 Stanford Child Language Conference, Stanford, CA.  
 1992b Body Parts and Location in Tzotzil: Ongoing Grammaticalization. Working Paper No. 16. Nijmegen, Netherlands: Cognitive Anthropology Research Group, Max Planck Institute for Psycholinguistics.

- Levelt, Willem J. M.  
1989 *Speaking: From Intention to Articulation*. Cambridge, MIT Press.
- Levinson, Stephen C.  
1986 *The Semantics/Pragmatics/Kinesics of Space in Guugu Yimidhirr*. Paper presented at the University of Bamberg, Bamberg, Germany.  
1992a *Primer for the Field Investigation of Spatial Description and Conception*. *Pragmatics* 2(1):5–47.  
1992b *Vision, Shape and Linguistic Description: Tzeltal Body-Part Terminology and Object Description*. Working Paper No. 12. Nijmegen, Netherlands: Cognitive Anthropology Research Group, Max Planck Institute for Psycholinguistics.  
1992c *Language and Cognition: Cognitive Consequences of Spatial Description in Guugu Yimidhirr*. Working Paper No. 13. Nijmegen, Netherlands: Cognitive Anthropology Research Group, Max Planck Institute for Psycholinguistics.  
1993 *Relativity in Spatial Conception and Description*. In *Rethinking Linguistic Relativity*. John J. Gumperz and Stephen C. Levinson, eds. Cambridge: Cambridge University Press.
- Levinson, Stephen, and Brown, Penelope  
1992 *Immanuel Kant among the Tenejapans*. Working Paper No. 11. Nijmegen, Netherlands: Cognitive Anthropology Research Group, Max Planck Institute for Psycholinguistics. In press: *Ethos*.
- Lyons, John  
1977 *Semantics*, 1 and 2. Cambridge: Cambridge University Press.
- Miller, George, and Johnson-Laird, Philip  
1976 *Language and Perception*. Cambridge, MA: Harvard University Press.
- Morris, W. F., and Foxx, J. J.  
1987 *Living Maya*. New York: Abrams.
- Mosel, Ulrich  
1982 *Local Deixis in Tolai*. In *Here and There: Cross-Linguistic Studies on Deixis and Demonstration*. Jürgen Weissenborn and Wolfgang Klein, eds. Pp. 111–132. Amsterdam: John Benjamins.
- Nash, June  
1970 *In the Eyes of the Ancestors*. New Haven: Yale University Press.
- Rostas, Susanna  
1986 *From Ethos to Identity: Religious Practice as Resistance to Change in a Tzeltal Community, Tenejapa, Chiapas, Mexico*. Ph.D. dissertation, University of Sussex.
- Shepard, R. N., and Hurwitz, S.  
1985 *Upward Direction and Mental Rotation*. In *Visual Cognition*. Steven Pinker, ed. Pp. 161–93. MIT Press.
- Stross, Brian  
1991 *Classic Maya Directional Glyphs*. *Journal of Linguistic Anthropology* 1(1):97–114.
- Talmy, Leonard  
1983 *How Language Structures Space*. In *Spatial Orientation: Theory, Research and Application*. Herbert L. Pick and Linda P. Acredolo, eds. Pp. 225–320. New York: Plenum Press.