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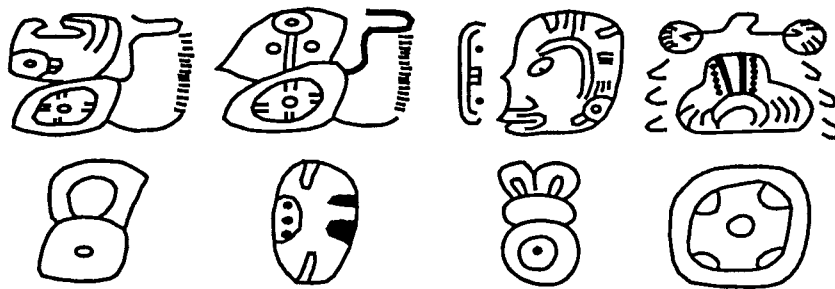
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MAPPING OPERATIONS IN SPATIAL DEIXIS AND THE TYPOLOGY OF REFERENCE FRAMES

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Mapping Operations in Spatial Deixis and the Typology of Reference Frames

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0. Introduction

This essay is concerned with the typology of systems of spatial reference and deixis such as LEFT/RIGHT/Front/BACK, UP/DOWN/ACROSS, NORTH/SOUTH/EAST/WEST, and HERE/THERE systems. Traditional typologies, from Bühler (1934) through Miller & Johnson-Laird (1976) and Levelt (1984) to Svorou (1994), operate with a major division of systems in 'egocentric' or 'relative' and 'topomnestic' or 'absolute' systems, with a potential extension to include 'intrinsic' systems. It is well known that words for spatial reference tend to be vague or even polysemous to a strong degree (see, for instance, Fillmore 1971, 1982, Hill 1982, Ehrich 1985, Herskovits 1986). An often discussed ambiguity is the difference between a viewer-based use of *left* in (1a) as against an 'intrinsic' use as in (1b). The difference is usually held to be due to different 'frames of reference' that the speakers adopts.

- (1) a. *John is sitting to the left of the tree.*
b. *John is sitting to the left of the prince.*

In (1a) the side where *left* is, is determined by the speaker's position, for if s/he goes to the other side of the tree and looks at the scene from behind, John will be now to the *right* of the tree. This is not necessarily true for (1b), which can apply to the situation irrespective of the speaker's current point of view. Although this kind of variation is well known, typologies and terminological frameworks continue to conflate distinctions between individual meaning units with distinctions between lexemic systems, i.e., the words in which meaning units are bundled up. This makes it difficult to compare spatial reference across languages and to assess claims about universal patterns.

The goal of the following is to lay apart individual meanings from the lexemic systems within which they are found. Ideally, semantically justified meanings are treated as distinct from pragmatic use effects in contextualisation. By traditional lexicological standards claiming a semantic unit requires that one show its combinatorial reflexes and systematic

nature. If there are no such reflexes, the putative meaning is probably a mere contextualisation (if not translation) effect. In the domain of spatial reference, various efforts have been made to provide a fair amount of detailed semantic analyses (among many others, Fillmore 1971, Hill 1982, Talmy 1983, Ehrich 1985, Vandeloise 1986, Herskovits 1986, Casad 1988, Brown & Levinson 1993, Levy 1994, Bickel 1994). To the degree that this information on linguistic 'fine structure' (Talmy 1983) is available, I shall concentrate on semantically justified meaning distinctions.

Traditionally, such meaning units in deixis are analysed as due to different frames of reference. It is not clear, however, how these frames are constituted. Are they grids that the speaker projects onto the world? Are they constructed by performing geometrical computations? Are they based on specific cognitive models or matrices? In this paper I propose an analysis of reference frames and their linguistic realization as the result of 'mapping operations', i.e. as operations that map co-ordinate systems from a specific conceptual entity (the 'anchor') onto the scene to be described. These operations are then compared across lexemic systems (to wit, words bundling up operations) and languages. In so doing I attempt to uncover cross-systemically and cross-linguistically recurrent operations. To the degree that this enterprise is successful, these operations can be assumed to constitute a universal, well-defined set from which speakers of a given language draw when building up their specific systems of spatial reference. Moreover, to the degree that the operations are semantically justified, we know how much of spatial mapping computation, geometry and geographic knowledge linguistic structure can be sensitive to.

In what follows, I first survey the parameters involved in deixis and formulate the central hypothesis which I want to explore in this paper: that the key parameter for a typology of spatial deixis is the nature of the 'anchor', i.e., the conceptual entity that determines the orientation of a coordinate system. Section 2 reviews what has been found in the analyses of UP/DOWN/ACROSS or 'environmental' systems in Tzeltal, a Mayan language spoken in Mexico (P. Brown 1991, Brown & Levinson 1993) and in Belhare, a Tibeto-Burman language of Nepal (Bickel 1994). In section 3, I compare the semantic operations isolated in these systems to 'anatomic' space systems, i.e. to systems consisting of LEFT/RIGHT and/or FRONT/BACK terms. This yields a preliminary inventory of cross-systemically and cross-linguistically recurrent operations and to a principled way of defining lexemic systems and of discerning their language-specific properties. Section 4 shows how this inventory also extends to 'geographic' (NORTH/SOUTH/EAST/WEST) space and to 'personal' (HERE/THERE) space in a range of languages. Section 5 summarizes the findings and offers some prospects on future research.

1. The parameters of deixis

One of the traditional terms most likely to be confusing is the term 'deictic' itself. It has been used in the literature for both speaker-based reference of the type in (2a) as well as to speaker-centred reference as in (2b).

- (2) a. *The well is to the left of the tree.* (i.e., from *my* point of view)
 b. *The well is to the left.* (i.e., to *my* left)

In order to avoid this confusion, I will not use the term in any of the two senses. Rather, I maintain the Bühlerian notion of deixis, which denotes any kind of situation or context-sensitive reference, including anaphora. With respect to examples like (2), I call **egomorphic** the speaker-based reference in (2a) and **ego-centric** the speaker-centred reference in (2b). This terminology will be motivated in the following sections. Before doing that, however, it is necessary to isolate the different notions or parameters that are involved in examples such as (2).¹

In an egomorphic use of English *left* or *right* we need to distinguish the **ground** object from which something, the **figure**, is said to be left or right and the deictic origin or **origo** that determines which side of the ground is left and which is right.² For instance, if I say, as in (2a) that *the well is to left of the tree*, it is me, as the origo, who determines where the left side of the tree is. Thus, if I am turning around the scene, the well is now to the right (or in front or in back) of the tree. Unlike in an egocentric expression as in (2b), where *the well is to the (i.e. my) left*, there is in addition to the origo (*I*) a ground object (*the tree*) from which the location of the figure (*the well*) is indicated.

Spatial deixis usually operates with **co-ordinate systems**, an example of which is represented in Figure 1 below (in Section 2). Whether the system consists of a single co-ordinate (for example, FRONT/BACK) or of two intersecting co-ordinates (FRONT/BACK and LEFT/RIGHT or UP/DOWN/ACROSS), there is a **zero-point** or centre of the system. A figure is located by indicating on which side or quadrant it is from the zero-point. In our two English examples in (2) the zero-point is in the ground object (...*the left of the tree*), which in turn can fall together with the origo (...*to my left*).

The notions or parameters of figure, ground, zero-point and origo are involved in any kind of deixis. The parameters are sufficient as long as we deal with the single use of a single lexemic system. The difference between a speaker-based use of *left* and *right* as in (1a) above (*John is sitting to the left of the tree*) and an object-based use as in (1b) (*John is sitting to the left of the prince*), reveals another parameter of deixis. What is at issue here is the 'frame of reference', as psychologists have called it (for a review, see Rock 1990). The hypothesis I want to entertain, is that different frames of reference are brought

about by different operations mapping co-ordinates from an **anchor** onto a scene. The anchor, or, as Talmy (1983) has it, the 'secondary reference object', is the particular physical, social or (socio-)geographic entity in our conceptualisation of the world in which a particular layout of co-ordinates is founded. The anchor is ego in (1a) and an intrinsically featured 'object' (*the prince*) in (1b). It is the knowledge and experience, i.e., a specific 'cognitive model' (Lakoff 1987) or 'cognitive matrix' (Langacker 1987) of the anchor that determines the operation that maps co-ordinates onto the world. These **mapping operations** project in (1a) and (1b) referential extensions of *left* on a scene in different ways. If the anchor is characterised by being one of the three grammatical persons the mapping is **personmorphic**³ (1a). Egomorphic and allomorphic are specific cases of personmorphic mapping. **Egomorphic** mapping is mapping with a first person anchor and **allomorphic** is mapping with an anchor other than first person. If the anchor is characterised by the intrinsic shape, function or motion of the ground (an object, an animal, a human), the mapping is **physiomorphic** (1b).

Differences like the one between personmorphic and physiomorphic mapping is what languages are recurrently sensitive to. This justifies taking the anchor as the fundamental parameter in a linguistic typology of spatial deixis. The difference between anchors is recurrently relevant for grammar and can hardly be reduced to pragmatic or generally cognitive structures (*pace* Carlson-Radvansky & Irwin 1993). For instance, if the English term *left* appears in the syntactic environment [*at N's* __], it is restricted to a physiomorphic use (3a) and is therefore incompatible with the speaker as the (personmorphic) anchor and an unfeatured object as the ground (3b). In other environments, such as [*to the* __ *of N*] in (2), the term is ambiguous, though.

- (3) a. *John is sitting at the prince's left.*
 b. **John is sitting at the tree's left.*

Such a distribution, which distinguishes the two readings by a privative opposition between two syntactic patterns, has been described also for German (Ehrich 1985), Hausa (Hill 1982), French (Vandelose 1986) and Greek (Svorou 1994: 214, note 11). As we will see later, also Belhare disambiguates the two meanings by syntactic devices. It seems that if linguistic structure is at all sensitive to differences in deictic use, then it is sensitive to the anchor parameter rather than to the other parameters involved in deixis (origo, figure, ground, etc.). This suggests the hypothesis that the following elaborations are devoted to: semantic differences in lexemic systems of spatial deixis, including word pairs like *left* and *right* and many others, are constituted by differences in mapping operations. The hypothesis is formulated more explicitly in (4).

- (4) If the grammar of any language is sensitive at all to differences in deictic use, it is sensitive to the difference between the nature or '**-morphic**' quality of the anchor that determines how and in which direction co-ordinates are mapped onto a scene. The anchor is a specific entity in the (partly culture-specific, partly universal) conceptual construction of the physical, social and geographic world.

In most cases, the concept of this entity is in turn defined in the framework of a cognitive matrix that specifies the kind of knowledge and background computation that is necessary in order to apply and understand the concept (e.g., the knowledge of a person's left and right sides underlying the comprehension of (3a)).

The hypothesis in (4) gives privilege to grammatical patterns over lexicalisation. The reason for doing so is that I want to investigate spatial deixis primarily as a linguistic phenomenon. A purely lexical pattern (say, the bare existence of the word *left*), however, does not tell us about the status of a meaning phenomenon. Specifically, it does not imply that a given phenomenon is entrenched in language and cannot be reduced to general spatial cognition. What lexicalisation tells us is the way in which meanings or uses are bundled up. By contrast, sensitivity to grammar allows assessment of the degree to which a given meaning unit is part of language as a system *sui generis* that cannot be completely reduced to general cognition.

To the extent that the hypothesis in (4) is empirically borne out, it justifies that the key parameter in a typology of spatial deixis is the anchor. To be sure, this is not entirely different from traditional approaches. Insofar as traditional typologies are concerned with differences as the one exemplified in (3), they start implicitly from a similar hypothesis as in (4). However, as I will try to point out throughout the paper, available typologies often mix the anchor parameter with other parameters, especially with the 'origo' or 'zero-point' parameter. This decreases their power in predicting what grammar can be sensitive to and make it difficult to assess the semantic structure of deixis in a given language (or at a given stage during a child's linguistic development). Since in some respects I depart considerably from one or the other of traditional typologies, it is useful to have a short survey at hand. Such a survey is included in Appendix A.

It is common practice in studies of spatial reference to start by discussing different uses of LEFT/RIGHT and/or FRONT/BACK systems of the type illustrated by examples (1) through (3). Apparently, there are some serious problems and a high degree of language variation in the system integration and the range of uses of LEFT/RIGHT and FRONT/BACK antonym pairs. I find it helpful, therefore, to approach the issue from an entirely different angle and to start the discussion by considering UP/DOWN/ACROSS or 'environmental space' systems.

2. Environmental space, mainly in Tzeltal and Belhare

Environmental space can be defined pre-theoretically as an UP/DOWN/ACROSS-system, or, more specifically, a group of words encoding at least notions of verticality and horizontality. Such systems have received detailed study in the Mayan language Tzeltal (Brown 1991, Brown & Levinson 1993) and the Tibeto-Burman language Belhare (Bickel 1994). In Tzeltal, the environmental space system is realised mainly by relational nouns and motion verbs, but extends also to derived adverbials and semantically more specific nominals for, say, the 'uphill boundary (of a field etc.)'. In all grammatical manifestations the same semantic features recur. Taking the motion verb roots as labels, the features can be named MO, KO and JELAW.⁴ The features gloss as 'up' or 'uphill', 'down' or 'downhill' and 'across' or 'on the traverse', respectively. As we shall see, this does not equal their semantic value, though. In Belhare, the category of environmental space is more deeply integrated into the grammar of the language. The semantic features TU 'up', MU 'down' and YU 'across' are not only present in demonstratives, motion verbs and relational nouns, but also in case desinences, interjections and Aktionsart derivation markers.⁵ This difference between Tzeltal and Belhare notwithstanding, the features in both languages are defined in a co-ordinate system of two axes (Figure 1).

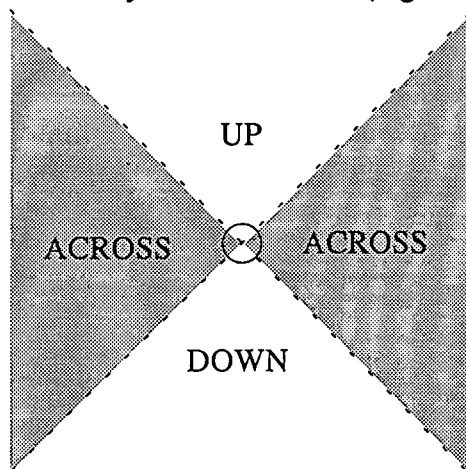


Figure 1: The co-ordinates in environmental space (with Tzeltal MO, KO, JELAW and Belhare TU, MU, YU for 'up', 'down', 'across', respectively)

In both languages, the features refer to quadrants extending from the zero-point of the system. Reference to any given quadrant implies the existence of the other three quadrants.⁶ This implication is a metasemantic or 'pragmatic' rule parallel to what defines the traditional category of person. 'Person' is justified as a grammatical category because any element of the category, for example, 'first person', implies the existence of all other elements. Therefore, if person is a valid category in any language, so is environmental space in Tzeltal and Belhare. Notice that the features refer to quadrants rather than to directions. Neither in Tzeltal nor in Belhare are there intermediate terms like, for instance, *south-west* as

in the English system of cardinal directions. This is the reason why the 'ACROSS'-feature is represented in Figure 1 by two quadrants rather than by a bi-directional line. In Tzeltal there is no further linguistic differentiation as to which 'ACROSS' side a term refers. In Belhare, the two sides are distinguished if demonstrative are used. Spatial demonstratives in this language combine reference to the quadrants in Figure 1 with the distinction of a proximal and a distal area. This forces the speaker to treat one of the

two ACROSS quadrants as proximal and the other as distal even if there is no physical difference in distance (see Bickel 1994, forthcoming).

The features that refer to the quadrants in Figure 1 are polysemous in both languages. Interestingly, they encompass the same range of uses which fall into five distinct types of mapping operations. They are summarised in Table 1. The crucial difference between the uses is the nature of the anchor and how the anchor is experienced and conceptualised. Let me discuss and illustrate them in turn.

| <i>Mapping operation</i> | <i>Anchor</i> |
|--------------------------|--|
| geomorphic: small-scale | region, defined by local hill inclination, as goal of a trajectory |
| geomorphic: large-scale | region, defined by global hill inclination, as goal of a trajectory |
| ecomorphic | structure of the environment (e.g., concept of verticality or of ecological house divisions) |
| personmorphic | first, second or third person |
| physiomorphic | ground object, with respect to its intrinsic orientation defined by shape, motion, or function |

Table: 1 Mapping operations and their anchors in environmental space

2.1 Geomorphic mapping

The two types of geomorphic mapping have in common that the anchor is defined in the (socio-)geographic environment. Independent of the nature and size of figure and ground, the figure is located by indicating the goal of a real or imagined trajectory running from the speaker (or origo in general) through the figure towards a specific region. In small-scale mapping, this region is defined locally whereas in large-scale mapping it is defined globally.

In **small-scale geomorphic** mapping the goal region is defined by the local hill inclination. The UP quadrant is where the hill ascends, DOWN is where it descends, and ACROSS is on the hill's traverse. Although this definition of the quadrants may ultimately be motivated by the perception of gravitational force, it cannot be reduced to the vertical dimension. This is shown by the fact that the mapping can and routinely does apply to spatial arrangements on the horizontal plane. It is most common in Belhare, for instance, to say something like (5) if you want the addressee to put a bottle on a different place on the flat ground inside a house.⁷

- (5) *cippa toto yuŋs-u!*
 a.bit UP:TRANSP put-IMP:3U
 'Put it a bit further uphill.'

As demonstrated by Brown & Levinson (1993) such use of UP, DOWN and ACROSS terms is equally characteristic of Tzeltal. In European languages small-scale geomorphic mapping is not so common. Yet an English sentence like (6) can be true even if the house is smaller than the apartment building but behind it on an uphill path (cf. Herskovits 1986: 66). The sentence does not necessarily suggest that the house is vertically above the apartment building, i.e., on top of it.

(6) *The house is above the apartment building.*

Such use of UP/DOWN terms does not seem to be possible, however, on a smaller scale, say, for locating items inside a room. In European languages this domain is usually pre-empted by the dominance of spatial reference in terms of FRONT/BACK/LEFT/RIGHT systems. Exceptions to this general tendency are documented for some Upper German dialects. Rowley (1980) notes that in the Tirolian dialect of Florutz/Fierozzo a hearth on the downriver side of the kitchen is referred to by *anó!* [away.from.origo-DOWN] 'down away' (p. 78).

On the horizontal plane the respective UP and DOWN quadrants in such examples are determined by the location of the goal point of an imagined trajectory. In (5) 'uphill' on the ground is there where a straight trajectory starting from the origo (the speaker) and extending beyond the bottle would reach a hill region of higher elevation than the speaker's current position. That it is indeed goal computation of this kind that determines the mapping in (6) is evidenced by what one might call **Haugen effects**. In his seminal study on Icelandic orientation, Haugen (1957) has shown that the specific meaning of cardinal direction terms is recurrently determined by the goal of one's path while travelling (i.e. by "ultimate orientation") rather than by the knowledge of abstract compass orientations (i.e. by "proximate orientation"). Thus, somebody might be said to go north while actually going west just because the person happens to be on a path that eventually ends up in the north. Such effects are well attested also for small-scale geomorphic mapping in Belhare and they are likely to be found also in Tzeltal (P. Brown, p.c.). In Bickel (1994), I report on a case where the UP quadrant in Belhare is not found by the goal of a trajectory line extending straight beyond the ground object, but by the goal of an actual path that the speaker intends to follow. This path follows first the traverse of the hill before ascending. Accordingly, what on other occasions is the ACROSS corner of a room is called the UP corner. Such Haugen effects are readily explained if small-scale geomorphic use of environmental space terms is analysed as goal computation on a trajectory. The effects are due to deviations from the straight line that the trajectory describes when extended beyond the ground object. More precisely, the goal point of the actual curved path overrides the goal point of an abstract straight path. This is best explained if we assume that the trajectory is part of the semantics, irrespective of whether it

is straight, or curved as in the case of Haugen effects. To make this more explicit, it helps to formulate the semantic structure in the framework of Conceptual Semantics (Jackendoff 1983, 1990). In small-scale geomorphic mapping, a function constituent [UP (x)], which stands for 'above x ', is modified by the anchor constituent [HILL TOP]. The modified constituent as a whole is the argument of a path constituent [TO (x)], yielding [TO([UP(x))]]. In other words, a term like *toto* 'further uphill' in (5) means 'on a path going UP from the current location, in such a way that the path going UP is taken in the sense of (i.e., 'modified to') 'towards the HILL TOP'.' (See Appendix B for further formalisation.)

Large-scale geomorphic mapping follows essentially the same logic as small-scale mapping. The difference is only that in the large-scale variant the goal of the trajectory is fixed once for all by the overall inclination of the terrain in the world of the speech community. In terms of the Conceptual Semantics formalism, the anchor constituent is filled by the global hill inclination. The environment of Belhare speakers in Nepal is characterised by the overall downward inclination of the rugged and steep southern slopes of the Himalayan range. On a large scale, then, the UP quadrant is on a trajectory directed towards the top of this range. Formally, the modifying constituent [HILL TOP] is replaced by [TOP OF HIMALAYA RANGE]. Given the geography of the Himalayas, Belhare UP translates as 'north'. In Tzeltal, the contingencies of geography produces an association of UP with 'south'. The Tzeltal world in Mexico is a mountainous area with an overall inclination falling from about 2,800 meters in the south to about 900 meters in the north. In both Belhare and Tzeltal, large-scale geomorphic mapping is anchored in the knowledge of the ultimate goal where a trajectory between the speaker and the figure would eventually end up. This is shown by the fact that the mapping not only extends to arrangements on the horizontal plain but that it can even contradict the inclinations of the local landscape. In example (7) from Tzeltal (Brown & Levinson 1993: 65), the relational noun *ajk'ol* 'up' designates a southern direction as the ultimate goal of the Path, whereas the adverb *koel* 'down' is used in small-scale geomorphic mapping determined by the immediate downward fall of the local trail.

- (7) *ya x-ch'ay-otik ko-el li' ta ajk'ol.*
 INCOMPL N.ASP-fall-1pi DOWN-ADV here LOC UP
 'We're dropping downward here toward uphill.'
 (i.e., 'we're descending [this hill] toward the south')

Also in Belhare the local inclination may be ignored and a neighbouring bazaar to the north may be said to lie *tuba* [UP-LOC] 'up', i.e. 'north', even if the place happens to be on a lower elevation than the speaker's current position. Whereas small-scale mapping is rare among European idioms, large-scale geomorphic use of UP (for 'north') and DOWN (for 'south') is more common.

The goal regions in large-scale mapping are geographic edges (e.g., the top of the Himalayan mountain range) that are outside of the routine world of the speech community and, therefore, not considered to be reachable under normal conditions beyond lore and myth. This is the only difference that separates such regions from place names. Both are unique areas that provide anchors from which to map co-ordinates. Place names are helpful means for giving spatial information and easily substitute for more generalised means such as environmental or anatomic (LEFT/RIGHT and/or FRONT/BACK) deixis (cf., for cases of particularly extensive use of region names, Neumann & Widlok 1994). This could give rise to what I would call **toponymically anchored geomorphic** mapping. Brown & Levinson (1993: 62) speculate that such a mapping occurs in Tzeltal. If it holds true, an expression like *ta alan* [LOC UP] 'up' could mean towards a place conventionally named *Alan K'inal* 'lowland field' even if the field happens to be uphill from the speaker's location. The data to decide on this possibility are lacking, though (*loc. cit.*). In Belhare, I have no evidence for the mapping type. Although environmental terms do occur in place names, e.g. *Mona Kopce* 'Lower Kopce' and *Tona Kopce* 'Upper Kopce', the co-ordinate system cannot be anchored in these places. Thus, you cannot say to go up (*tharɣma*) when you are actually traversing or descending the hill just because you are to reach *Tona Kopce* 'Upper Kopce'. A typology, however, should be prepared to integrate such a use in other languages. In the present framework, the operation can easily be derived from the general notion of geomorphic mapping.

2.2 Ecomorphic mapping

Whereas geomorphic mapping involves the notion of a path and the computation of the goal of this path, ecomorphic mapping relies on the concept of an unbounded direction in the environment. Most commonly, this direction is simply given by the vertical dimension. In neither Tzeltal nor Belhare is the mapping the most typical one. Far more common is geomorphic mapping in its large-scale (Tzeltal) or small-scale (Belhare) variant. In Tzeltal, ecomorphic mapping induces different syntactic behaviour of environmental terms (Brown & Levinson 1993: 55). Suffixation of a nominalizer on the possessed relational noun restricts its interpretation to the vertical dimension (8). In any other syntactic frame, the ecomorphic meaning of environmental space terms is one amongst several, and the expression is ambiguous.

- (8) *ay ta y-ajk'ol-al*
 EXIST LOC 3POSS-UP-NOML
 'It is over his head / above him.'

In Belhare, the ecomorphic meaning is syntactically distinguished from geomorphic uses in that only the latter allows inclusion of a locative marker before the ablative case ending in (9a). Without a locative, the expression is ambiguous (9b). (Obligation in Belhare is often expressed impersonally, similar to French *il faut*.)

- (9) a. *u-thaŋ-ma-et-nahuŋ yaŋ-ma khe-yu.*
 3POSS-UP-CIT-LOC-ABL carry.by.hand-CIT must-3NPT
 'You should carry it from where it starts going uphill.' (geomorphic meaning)
- b. *u-thaŋ-ma-huŋ yaŋ-ma khe-yu.*
 3POSS-UP-CIT-ABL carry.by.hand-CIT must-3NPT
 'You should carry it from where it starts going uphill.' (geomorphic meaning)
 'You should carry it in an upright (vertical) position.' (ecomorphic meaning)

As has been known since the emergence of Gestalt psychology verticality is a conceptual category that cannot be reduced to perceived gravitation (see Rock 1990, Levelt 1984, Friederici & Levelt 1990). It is a concept founded in the way we approach our environment and can follow not only the gravitational vector (as perceived by the vestibular system) but any perceptually dominant vector (e.g. the line in a drawing). The theory of Conceptual Semantics allows such psychological concepts, which are potentially defined in a specific cognitive matrix, to be the direct constituents of semantic representations. In terms Conceptual Semantics, therefore, ecomorphic mapping is simply mapping with [VERTICALITY] as the anchor concept modifying the place function [UP (*x*)]. However, unlike geomorphic mapping, ecomorphic use of UP, DOWN and ACROSS terms does not seem to show Haugen effects. Consequently, the place function is not located on a path constituent in semantic representation (cf. Appendix B). Incidentally, this holds also for all remaining mapping operations to be discussed.

While verticality is certainly the most common instantiation of the anchor in ecomorphic mapping, other directional features of the environment can substitute for verticality. This is not attested for Tzeltal or Belhare. In other languages, however, the fixed characteristics of a specific spatial surrounding, such as the interior of a house, can override the ecological dominance of the vertical axis. Such is the case in two Papuan languages of Irian Jaya discussed by Heeschen (1982). In Eipo and Yale, ecomorphic mapping can be anchored in what is perceived as an intrinsically given, ecological division of the interior in a hut: "everything above the level of the eyes, seen from the normal sitting position, is "up there", even if the speaker happens to stand and the object referred to is on the same level as the speaker's eyes." (*op. cit.* 102). Here, culturally given room divisions provide a 'world surrogate' that has a status similar to the tilted room psychologists use to show the conceptual autonomy of verticality from gravitation (Rock 1990). Anchored in such an

ecological concept, ecomorphic mapping presupposes a fairly elaborate cognitive matrix about room divisions in the two cultures. I am not sure whether such matrices are also presupposed by ecomorphic mapping anchored in verticality. The concept of verticality seems to be primitive and not relying on other knowledge.

2.3 Personmorphic mapping

Like ecomorphic mapping, also personmorphic mapping is not as common in Tzeltal and Belhare as geomorphic mapping. The operation is not based on an aspect of the environment but on the cognitive matrix of a perceptual experience. As pointed out by Levelt (1982) and Shepard & Hurwitz (1985), the fact that we normally perceive the world from a slightly elevated position has the consequence that our gaze shifts up and down in order to discern farther and closer objects on the ground in front of us. Personmorphic mapping of environmental space terms is motivated by this contingency of human perceptual geometry. Since the geometry only holds for objects relatively close to the viewer, personmorphic use of spatial terms is restricted in both Tzeltal and Belhare to a narrow zone in front of the speaker. Within the limits of this zone, a Tzeltal speaker may distinguish a bottle further away as *ta ajk'ol* [LOC UP] and a closer bottle as *ta alan* [LOC DOWN] (Brown & Levinson 1993: 60). Exactly the same is possible with the Belhare terms *toba* [UP:TRANSP-LOC] and *napmu* [PROX-DOWN], and a similar use of English *down* is observed in expression such as (10), cited by Shepard & Hurwitz (1985: 164).

(10) *Look who is coming down the street!*

Personmorphic mapping does not seem to have grammatical repercussions in Tzeltal or any other language I included in my (admittedly small) sample. Nevertheless, the mapping is in most languages well entrenched in semantic structure. This is evidenced by systematic correspondences that the mapping has in FRONT and BACK terms: UP corresponds extensionally to BACK, DOWN to FRONT (see Bickel 1994).

The perceptual geometry underlying personmorphic mapping is not a structure abstracted from the person that is actually speaking. It is anchored in the way a person apprehends his or her immediate surrounding. This person can be the speaker, and this 'egomorphic' case is certainly the most common. It also possible that the mapping is anchored in another instance of the three grammatical persons. In Belhare, for instance, it occurs occasionally that the mapping is anchored in the addressee. In the arrangement illustrated by Figure 2, the mapping is 'allomorphically' anchored in the addressee.

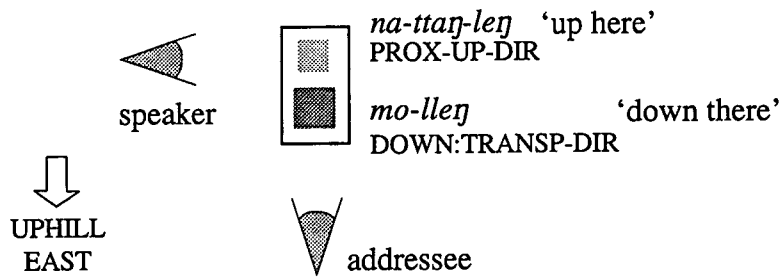


Figure 2: Allomorphic mapping in Belhare

In this situation, where I was eliciting spatial deixis with the help of small cards on which two differently coloured and sized squares were to be distinguished, the addressee sat to the east of the speaker and the hill went steeply up some two meters behind the addressee. Thus, there was clearly no geomorphic mapping involved in the use of *molleŋ* 'down there'. Notice that the speaker uses *nattaŋleŋ* 'up here' for the object closer to her and *molleŋ* 'down there' for the one further away. The expression *nattaŋleŋ* contains the morpheme *na-* indicating proximity to the deictic origo (cf. Bickel, forthcoming, for justification of this analysis). Since the expression refers to the square closer to the speaker, it is clear that the origo is not affected by the use of the terms in the situation depicted by Figure 2. The speaker remains the deictic origo throughout. It is only the anchor of the mapping operation and not also the origo of the demonstrative that is relegated to the addressee. Therefore, personmorphic mapping cannot be reduced to 'origo-morphic' mapping, although in most instances anchor and origo fall together. Personmorphic mapping can neither be reduced to a kind of 'anthropomorphic' mapping. The crucial property of personmorphic operations is not simply the condition that they are anchored in a human being. This condition can be satisfied by physiomorphic mapping, as we shall see below. What is more important is the social aspect of the *condition humaine*, viz. that we are 'persons', disposed to play a particular communicative role as speaker, addressee or third person (Bühler 1934: 79). In terms of the representational machinery of Conceptual Semantics, personmorphic mapping is defined by having person features, for instance [+SPEAKER, -ADDRESSEE] for first person, [-SPEAKER, -ADDRESSEE] for third person or [+SPEAKER, +ADDRESSEE] for a first person inclusive, as the conceptual filler of its anchor constituent. This is why the most prominent and cognitively most challenging effect of personmorphic mapping is its alternation between egomorphic and allomorphic mapping (for example in language acquisition, cf. *inter alia* Clark 1973, Tanz 1980, Danziger 1993). The proposed semantic definition of personmorphic mapping, however, should not lead us to disregard the fact that the operation relies on a specific cognitive matrix about persons, specifying how we usually perceive the world and how this affects our gaze movements.

This social aspect of personmorphic mapping has the effect that terms are dependent on the current location and orientation of the speaker. Obviously, this is why the mapping

would be called 'deictic', 'viewer-centred' or 'relative' in available typologies (for instance, Hill 1982, Levelt 1984, Carlson-Radvansky & Irwin 1993). One of the problems with such a terminology, however, is that also geomorphic and ecomorphic mapping can be 'deictic', 'viewer-centred' or 'relative' (cf. Brown & Levinson 1993, Bickel 1994, Levinson 1994). This is the case when the terms are used egocentrically, i.e. when the zero-point of the co-ordinate system is the speaker. This is implicitly the case in all examples from (5) through (9). If necessary, the zero-point can be made explicit. In Tzeltal, for instance, this is achieved by introducing the zero-point specifying NP with the possessed vacuous relational noun ('RELN') *-u'un*. (11a) is 'deictic' but geomorphic whereas (11b) is 'non-deictic' but geomorphic (Brown & Levinson 1993: 55).

- (11) a. *ay ta ajk'ol k-u'un te lapis.*
 EXIST LOC UP 1POSS-RELN ART pencil
 'The pencil is uphill from me.'
- b. *te lapis ay ta ajk'ol y-u'un te limite.*
 ART pencil EXIST LOC UP 3POSS-RELN ART bottle
 'The pencil is uphill of the bottle.'

The alternation between ego and a bottle as the zero-point of the co-ordinate system, has not much impact on the referential extension of *ajk'ol* 'up'. In contrast, the variation of what instantiates the anchor has far-reaching consequences on the reference of the word. If the anchor is not a geographic region but a person, the environmental space terms have different extensions. As noted above, personmorphic *ajk'ol* 'up' and *alan* 'down' in Tzeltal is restricted to a narrow zone in front of the speaker. Such a restriction does not occur in geomorphic or any other mapping type.

Personmorphic mapping associates UP with far away and DOWN with close. As noticed by Shepard & Hurwitz (1985), this seems to be not the only association. Along with personmorphic use of Tzeltal or Belhare environmental space and English expressions such as (10) (*Look who is coming down the street!*), there are apparent counterexamples. In Eipo and Yale, for instance, what is closer to the speaker is 'up' rather than 'down' in (Heeschen 1982: 102). Similarly, French etymology suggests that the distal demonstrative *là-bas* 'there' is related to *bas* 'down', although modern usage allows the term for horizontal distance and occasionally even for reference to points higher than the speaker. And in modern High German motion verbs are usually prefixed by *runter-* 'down' (e.g., *runtergehen* 'to go down') if the speaker wants to emphasise the completion of a long trajectory and wants to signal that the far endpoint of this trajectory should be reached.

It seems that we have to deal here with a different mapping operation, which is not spatial at all. In Bickel (1994) I refer to such cases as 'sociomorphic' mapping but '**aristomorphic**'

seems to be a less ambiguous label (since also personmorphic is 'socially' anchored). The crucial feature in the examples is the saliency and referential prominence of the deictic origin (cf. DeLancey 1981, Kuno 1987, Bickel, in press). This parallels the mapping logic that assigns in French UP to the capital Paris. Irrespective from which province we start, *on monte à Paris* 'one goes up to Paris'. A similar case can be observed in Belhare, where one refers to the local market place and district centre Dhankuṭā by *tu-* 'UP' expressions, irrespective of the actual direction or difference in height. Such usage is also similar to the case when we talk of social relations in terms of *higher* and *lower* status. In all these cases, UP terms refer to the most salient or important point of reference. 'Importance' is computed with reference to a large range of principles, from political and economic power to discourse empathy. The reason why it is UP rather than DOWN that is associated with importance is probably to be found in the frequent evaluation of upward trajectories as positive (Clark 1973). On an alternative account, the association is motivated by in the unmarkedness of the upward direction (cf. Shepard & Hurwitz 1985). General markedness theory associates referential prominence and saliency with unmarkedness and vice versa. The unmarkedness of UP is independently evidenced by neutralisation phenomena such as the fact that in English and many other languages we speak of John's height rather than his shortness. According to markedness theory, what becomes the neutral term is the unmarked one.

2.4 Physiomorphic mapping

The most rarely employed mapping operation in environmental space, and also the most restricted one, physiomorphic mapping. It is anchored in what is conceptualised as the intrinsic shape of object or person serving as ground. In the Conceptual Semantics framework, the anchor constituent is filled by the concept of the ground object. The concept is assumed to be highly detailed and specialised since it should provide information about what is thought of as the intrinsic upper and lower side of the object. Obviously, the concept relies on a specific cognitive matrix about the ground object. In both Tzeltal and Belhare, the nature of such matrices severely restricts the mapping. Physiomorphic mapping seems to be applicable only in cases where the figure is a part of the ground. If a maize plant has more than one ear of corn, for instance, the upper ear can be called *yajk'ol tz'al* [3POSS-UP ear] and the lower ear *yalan tz'al* [3POSS-DOWN ear]. Since this seems to be true even if the plant lies on the ground (P. Brown, p.c.), the UP and DOWN quadrants are determined in this case not by verticality but are conceived of as intrinsically given by the plant's form (but perhaps ultimately by its canonical orientation). This is similar to the fact that in Belhare your teeth are distinguished as the *tokha keṅchi* [UP:TRANSP-ART.ns tooth-ns] 'upper teeth', the *napmuha keṅchi* [PROX-DOWN-ART.ns tooth-ns] 'lower teeth' and that the *yokha keṅchi*

[ACR:TRANSP-ART.ns tooth-ns] are the *hamaluṛchi* 'molar teeth', irrespective of whether you are standing upright or lying on the bed. In English, physiomorphic mapping has been shown to be restricted in similar ways as in Belhare (Levelt 1984, Carlson-Radvansky & Irwin 1993). Although there is quite some idiolectal variation in this issue, physiomorphic mapping seems to generally require that the figure be enclosed by or at least adjacent to the ground object that determines the co-ordinate lay-out. Whereas a person on a bed has his *upper* teeth on the horizontal it is unnatural to say that a small table a bit away from the head of his bed is *up there* (Levelt 1984). A *table above somebody* can only suggest an elevational difference and would normally imply a strange if not dangerous situation. In English physiomorphic mapping, the figure must be perceptually adjacent to the ground object but it need not be part of it. As pointed out by Clark (1973: 44f) and Hill (1982: 29), we can say without oddity that there is a wasp above somebody's knee also if the person is lying supine and the leg is bent so that the wasp is vertically below the knee. In some cases physiomorphic mapping is syntactically distinguished from ecomorphic use. As Talmy (1983: 247) has observed, something *on the top of the TV* refers to the canonical upper side of the TV so that the location remains constant if the TV is tilted or put upside down. This is different with the article-less phrase *on top of the TV* which suggests a location that is vertically up.

Notice that it is perfectly possible that a human person is the anchor in physiomorphic mapping. Such is the case, for example, when an insect is crawling *up* the back of a person lying on the bed. This person can even provide the deictic origo as in (12).

(12) *I feel an insect crawling up [to me] on my back .*

This is why personmorphic mapping cannot be distinguished from physiomorphic mapping by a simple opposition of 'deictic' vs. 'non-deictic'. The operations can only be distinguished by specifying that the anchor of physiomorphic mapping needs to be the ground object whereas the anchor of personmorphic mapping is a human being (or its anthropomorphic counter-part) **in its a role as first, second or third person**. Physiomorphic mapping has also been identified in the literature as 'intrinsic' or 'inherent' use (e.g., Levelt 1984, Svorou 1994). It is difficult to see how such a notion can distinguish physiomorphic mapping from ecomorphic mapping. Both mappings and the resulting reference frames are based on the conceptualisation of an intrinsic featuredness in the world. It is not such featuredness *per se* that marks the crucial difference of the two mapping types. Again, what is crucial for physiomorphic mapping is that the anchor is (at least partly) **identical with the ground object**. This does not hold for ecomorphic mapping, even if anchored on ecological or architectural structure. In the Eipo and Yale examples, the ground is the speaker but the anchor is the ecologically defined upper and lower parts of the room. Also an extended

traditional typology (as advanced, for instance, by Carlson-Radvansky & Irwin 1993) with a notion 'extrinsic' as opposed to 'intrinsic' (to wit, physiomorphic), would not help much further. 'Extrinsic' would apply not only to ecomorphic but also to geomorphic mapping. This neglects the crucial difference between the two types. Whereas geomorphic mapping works irrespective of the elevation difference between figure and ground and even works on a horizontal plane, this is impossible with an ecomorphic operation. This mapping is bound to figure - ground relations on the vertical axis. The anchor can vary insofar as the division in UP and DOWN sides can be defined by different ecological aspects, in particular by a general concept of verticality or by architectural associations.

3. Comparison of operations across lexemic systems

After this review of mapping operations found in environmental space, I compare this set of operations to the meaning units prevailing in other lexemic systems of spatial deixis. In this Section, I focus on antonym pairs building on the notions LEFT/RIGHT and/or FRONT/BACK, which I will refer to as 'anatomic space' systems. The hypothesis is that the operations in anatomic and environmental space are essentially the same. Therefore, I shall postulate a range of basic operations, from which languages draw semantic units in their deictic systems. More specifically:

- (13) In any language, lexemic systems of environmental and anatomic space draw on the same restricted set of mapping operations.

These operations are distinguished from one another by the anchor determining the mapping of a co-ordinate system onto the world. To the degree that operations are semantic units, i.e., linguistically not further decomposable units with formal (combinatorial) or structural (categorical) reflexes in the language, the hypothesis in (13) also predicts what kind of anchors and their properties language structure can be sensitive to.

3.1 Operations in anatomic space, mainly in Belhare

Immediate support for this hypothesis comes from the observation that anatomic space, which can be defined pre-theoretically as a word groups involving LEFT/RIGHT and/or FRONT/ BACK terms, includes the same meaning difference between personmorphic and physiomorphic mapping as environmental space. In Belhare, for instance, anatomic space consists of the four nouns *cuptaŋ* 'right', *phɛŋsaŋ* 'left', *ʌgari* 'front' and *pɔchari* (or

eṅsua ‘back’, two of which (*ʌgari*, *pʌchari*) are borrowed from Nepali (*agāḍi*, *pachāḍi*), the Indo-Aryan *lingua franca* of Nepal. The terms have more or less the same range of use as their counterparts in English. Specifically, *cuptaṅ* ‘right’ and *pheṅsaṅ* ‘left’ can be used in both personmorphic and physiomorphic mapping. The FRONT and BACK terms are restricted to physiomorphic use, where they encode a sequence of elements.

Physiomorphic mapping is anchored in the concept of the ground object. The way in which this object is thought of (in a cognitive matrix) as having geometrical, functional or temporal structure, determines the co-ordinate layout. The terms, then, designate four regions projected off the object: a front, a back, a left, and a right side. This is done in accordance with the object’s cognitive matrix that specifies where the four sides are.

In contrast to many other languages including English, the use of Belhare *ʌgari* and *pʌchari* (or *eṅsua*) is unambiguous since the nouns do not also name body parts. As for *pheṅsaṅ* ‘left’ and *cuptaṅ* ‘right’, the region and body part meanings are formally distinguished in more or less the same way as in English. Used as body-part terms, *pheṅsaṅ* ‘left’ and *cuptaṅ* ‘right’ can be directly attributed to a head noun (14a). Functioning as region terms (14b), attribution requires inclusion of a locative marker (*-eC* ‘LOC’ or *-leṅ* ‘DIR’). Without a locative the head noun is invariably interpreted as a body part (14c).

- (14) a. *a-pheṅsaṅ muk*
 1POSS-LEFT hand
 ‘my left hand’
- b. *a-pheṅsaṅṅ-ek-kha murha*
 1POSS-LEFT-LOC-GEN stool
 ‘the stool to my left’
- c. **a-pheṅsaṅ(-ṅaha) murha*
 1POSS-LEFT(-GEN) stool
 *‘my left stool’

Notice that this syntactic pattern difference does not simply follow from the semantics of locative case marking. An anatomic space noun can, like any inherently spatial term, happily appear without case. Example (15) illustrates *cuptaṅ* ‘right’ and *pheṅsaṅ* ‘left’ in physiomorphic use without case marking. The scene occurred during a marriage. The bride’s uncle corrects the way in which bride and groom are sitting on a courtyard. According to the traditional rule, the groom must stay to the bride’s right and the bride to the groom’s left:

- (15) *lakhe! beula cuptaŋ, beuli pheŋsaŋ!... beula na-pmu!*
 INTERJ groom RIGHT bride LEFT groom PROX-DOWN
 'Wait a minute! The groom to the right, the bride to the left!...The groom down here!'

Incidentally, notice that the speaker clarifies his command by adding an environmental space term (in small scale geomorphic mapping). This is not untypical for Belhare and reflects the dominance of environmental over anatomic space in this language.

Physiomorphic mapping can also be transposed to an object that has no intrinsically given or functionally assigned front; back, left and right sides. There are two ways in which physiomorphic anatomic space can be transposed, which are, following Hill (1982), the alignment and the confronting strategy. In the confronting strategy the speaker assigns a front to the side that happens to face him, whereas in the alignment strategy the assigned front faces away from the speaker. The other quadrants are found by clockwise rotation. Belhare exclusively uses the alignment strategy. At first sight this looks similar to what has been called 'deictic' use of *left* and *right* in English. Although in our introductory example (1a) (*John is sitting to the left of the tree*), the left is syntactically coded as belonging to the tree, it is the speaker's current location that determines which side is left: if you turn around the scene and look at it from the opposite side, John will be to the right. A parallel use of Belhare *cuptaŋ* and *pheŋsaŋ* is well attested. However, this use represents **personmorphic** mapping and is not the same as **transposing physiomorphic** mapping onto an object without an intrinsically given left and right side. This distinction, which is not grammaticalized in English (and does not exist in the literature⁸), has both referential and grammatical effects in Belhare. Consider the following examples which refer to the scene sketched in Figure 3:

- (16) a. *siŋ taŋ-ŋaha u-cuptaŋ-leŋ khim yuŋŋa.*
 wood plant-GEN 3POSS-RIGHT-DIR house is
 'There is a house to the (personmorphic) right of the tree.'
- b. *siŋ taŋŋ-et-nahuŋ cuptaŋ-leŋ khim yuŋŋa.*
 wood plant-LOC-ABL RIGHT-DIR house is
 'There is a house to the (physiomorphic) right of the tree.'

Personmorphic mapping divides the visual field into two halves with the division line (solid line in Figure 3) running through the ground object,⁹ i.e. the tree in our example. The lateral extensions are bounded only by the limits of the visual field and, crucially, depth perception is completely ignored. As a result, not only house β but also house α can be said (in both Belhare and English) to be 'to the right of the tree' (16a). Notice that, if you would go to the tree, house α would turn out to be *ŋke agarileŋ* [our(incl.) FRONT-DIR] 'in our front' rather than to our right! If we apply personmorphic mapping in Belhare, we must stick to the appropriate syntax pattern and use a genitive construction as in (16a). In addition to this

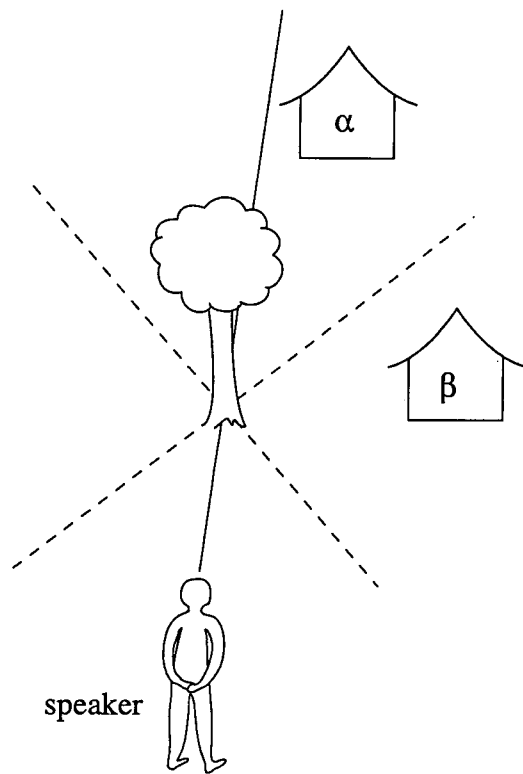


Figure 3: Personmorphic vs. transposed physiomorphic mapping in Belhare

mapping, Belhare has also grammaticalized a way to encode transposed physiomorphic mapping (16b). In this case, the co-ordinates (dashed lines in Figure 3) are centred on the ground object, which is encoded by an ablative noun phrase. If the transposition operates, as it does in Belhare, under an alignment strategy, this has the effect that physiomorphic LEFT and RIGHT overlap with personmorphic LEFT and RIGHT to a certain degree. With a confronting strategy, as attested for instance in Tamil (cf. Pederson (1994) and endnote 8), transposed physiomorphic LEFT/RIGHT (i.e., *to the right of the tree*, as if the tree were a human being facing us) is on the opposite side from personmorphic LEFT/ RIGHT (i.e., *to the right of the tree from my point of view*). The referential extensions are clearly distinct also under the alignment strategy, in spite of the overlap. Whereas

personmorphic mapping imposes a binary division of the visual field, physiomorphic mapping projects a full-fledged co-ordinate system consisting of both the LEFT/RIGHT axis and the FRONT/BACK axis. This holds for the non-transposed mappings in (14) or (15) as well as for the transposed mapping in (16b). It has the effect that in Figure 3 the expression *cuptarŋeŋ* 'to the right' in (16b) can only refer to the house β . Sentence (16b) would not be appropriate if the house were α , and, thus, in front, rather than to the physiomorphic right of the tree. In transposition, physiomorphic mapping is not different from other cases: four mutually exclusive quadrants are projected off the ground object. What is particular about cases like (16b) is only that LEFT and RIGHT are assigned by the speaker (origo), since the tree has no intrinsic LEFT and RIGHT on its own. Thus, although, the co-ordinate system is logically and referentially construed as in any physiomorphic mapping, its orientation is governed by the origo's current location. This is why the transposition of physiomorphic mapping is usually not treated differently from personmorphic mapping in the literature (for instance, by Clark 1973, Hill 1982 or Herskovits 1986).

In traditional terminology, both phenomena would be called 'deictic', i.e. speaker-related. Since physiomorphic mapping has been called 'intrinsic' or 'inherent' use (e.g., Miller & Johnson-Laird 1976, Levelt 1984, Svorou 1994), phenomena as in (16b) would call for the oxymoron 'deictic intrinsic' or 'deictic inherent' in order to find a place in the traditional typology. The difference between personmorphic and physiomorphic mapping has also been explicated by a difference in the logical structure of the respective descriptors

(Herskovits 1986, Levinson 1994). Personmorphic mapping constitutes a three-place predicate (with the arguments figure, ground and origo), whereas physiomorphic mapping underlies a binary relation between figure and ground. The ternary logic of personmorphic mapping, however, is not its *differentia specifica*. Also physiomorphic mapping can be ternary, i.e. if it is transposed. The distinctive property of personmorphic mapping is rather the referential extensions of the spatial descriptors, and these are based on a perceptual property of the anchor. As we have seen above, personmorphic LEFT and RIGHT denote the two halves in a binary division of the visual field, completely ignoring depth. This also holds for English as shown by (17), an example taken from Herskovits (Herskovits 1986: 71).

(17) *The North Star is to the left of the mountain peak.*

As Herskovits remarks, in (17) “*to the left of* could not be true of the mountain peak and the North Star themselves; one must instead consider the apparent relative position of star and peak in the plane of view [...]” (*loc. cit.*). For the expression to be true of the mountain peak it would need to be used physiomorphically (if this were possible with mountain peaks). In this use, LEFT, RIGHT, FRONT and BACK make up a coherent co-ordinate system of four non-overlapping quadrants found in clockwise rotation (cf. above). The proposed distinction between personmorphic and physiomorphic mapping solves a notorious puzzle in traditional typologies. Clark (1973: 46) and Talmy (1983: 253) note the anomaly that in the ‘deictic’ (Clark) or ‘imputed generated biasing’ (Talmy) uses, LEFT, RIGHT, FRONT and BACK do not follow in clockwise rotation as they would in the ‘intrinsic’ use. The *right* of a tree is found in anticlockwise rotation from its *front* but our *right* is clockwise from our *front*. This mismatch results from the fact that English is not like Tamil and does not allow transposition of physiomorphic mapping under a confronting strategy. The ‘deictic’ use is personmorphic and not based on a (metaphorical) transposition or ‘imputation’ of physiomorphic mapping onto an unfeatured object as Clark (1973), Talmy (1983), Herskovits (1986) or Svorou (1994) would have it. On such an account it is also unnecessary to invoke a pragmatic principle of metonymy (Herskovits 1986: 75f) that shifts the application of *left* and *right* from reality to the visual appearance of reality in order to account for (17). Apart from the fact that the rule is entirely *ad hoc* and is not independently justified, its status as a pragmatic rule is dubious since it does not seem to be cancellable. The referential extensions of *left* and *right* in personmorphic mapping like (17) are semantically given.

The transposition of physiomorphic mapping observed in (16b) makes reference to the speaker’s current location. This is not so, of course, in other cases of transposition. Usually, the ground object is rather an unspecified person whose position is established narratively. Such is the case in example (18), a common way to direct one’s interlocutor. (In Belhare, impersonal reference is conventionally encoded by first person plural inclusive, abbreviated as ‘1pi’, markers.)

- (18) *cuptaŋ-leŋ a-yu, thaŋ-i-na.*
 RIGHT-DIR be.located-NPT go.UP-1pi-TOPIC
 ‘It’s to the right, if you^{impers.} go upwards.’

In such examples, we are expected to transpose ourselves conceptually into the situation and to orient ourselves in the indicated manner (i.e., facing uphill). Much as the English expression *seen from* in (19), this enables us to compute LEFT and RIGHT in a straightforward way.

- (19) *Seen from the tree, the house is to the right.*

To some degree the ablative in (16b) reflects this manner of transposition. The Belhare ablative (*-huŋ* or, after locatives, *-nahuŋ*) does not simply mean ‘from N’ but includes the concept of an event (cf. Bickel 1993: 27). As can be gathered from instances such as *uthaŋmahuŋ* [3POSS-UP-ABL] ‘in an upright position’ in (9b) above, the case has the general meaning ‘matters having become so that N refers to a source’. In (16b), this change of ‘matters’ means that the speaker transposes himself conceptually to the tree, much as s/he does in the narrative transpositions in (18) and (19). If s/he does so, *siŋ taŋ* ‘tree’ applies as the correct source place from which *cuptaŋleŋ* is found. The Belhare pattern in (16b), therefore, is best understood as a grammaticalized variant of regular narrative transposition. In the English version (19) it is possible to delete *seen*, thereby imitating the Belhare pattern very closely. Judged by the over-all distribution of English *from*, however, the preposition does not seem to semantically entail a change of state as Belhare *-huŋ* does. Moreover, *from the tree* is only possible if it is in a left-detached position. In particular, it cannot appear as part of the NP: **[the right [from the tree]]* is ungrammatical. This shows that, in contrast to Belhare, English has not grammaticalized transposition of physiomorphic mapping.

3.2 Variation in the transposition of physiomorphic mapping

Hill’s (1982) way of distinguishing aligning from confronting transposition suggests that it is the front that is transposed and that the other quadrants are implied by the rotation logic of the human body (where FRONT, RIGHT, BACK and LEFT follow in clockwise rotation). Yet this need not be so. There is evidence that in Belhare it is rather LEFT and RIGHT that are transposed and that it is FRONT and BACK that follow by rotation logic. *Agari* ‘front’ and *pačhari* (or *eŋsua*) ‘back’ do not by themselves allow transposition. This is suggested by a curious behaviour of the terms in the putative transposition. If you have glimpses of a monkey through the branches of a tree, the monkey is *uAgari* [3POSS-FRONT] ‘to its front’; if he is at the same place but invisibly hid by the tree, the assignment of FRONT and BACK is

likely to be reversed since now the monkey would be said to be *ueŋsuae* [3POSS-BACK-LOC] 'in its back'. A similar phenomenon is reported for Hausa by Hill (1982: 23). What seems to be at first sight a competition between Hill's 'alignment' and 'confronting' strategy of transposition, however, is better not seen as a transposition at all. The contrast between the two uses can be captured straight away by postulating physiomorphic mapping. The concept of the ground object serving as anchor is usually defined in a cognitive matrix about the object in general or about its status in the current situation. In the example with the monkey, the perceived transparency of the tree ascribes perceptual prominence to the monkey. This gives rise to a matrix in which the tree and the monkey form an order of spatial succession or sequence, with the monkey being in FRONT. This cognitive assignment of a spatial sequence is reversed where the monkey is invisible. This analysis, which probably also applies to Hausa, is supported by the following.

The observed occurrences of Belhare *ʌgari* 'front' and *pʌchari* 'back' require that their physiomorphic meaning be analysed as relying on a wider variety of cognitive matrices than the meaning of their equivalents in English. In other words, there are more cognitive matrices that allow a Belhare speaker to conceive of an object having an intrinsic FRONT and BACK than in English. Specifically, FRONT and BACK are often assigned on the basis of mere assumptions about a social or temporal sequence so that the front is to the more important or prior side. Thus, with unfeatured objects (such as the squares in Figure 2 of Section 2.3; also cf. Figures 4 through 7 below) it is possible to call the thing closer to the speaker *ʌgari* and the other *pʌchari*, under the condition that the speaker is convinced that the closer one was first put on that place or that it is bigger or more important for some reason. Under such reasoning *ʌgari* and *pʌchari* can even refer to what English speakers would call *left* and *right* (cf. Pederson (1993) for Tamil parallels.) In these cases, FRONT and BACK are assigned without transposition and without reference to the deictic origin. The terms simply refer to a sequence. Interestingly, in this use *ʌgari* and *pʌchari* do not imply LEFT and RIGHT quadrants. Recall that physiomorphic *phɛŋsaŋ* and *cuptaŋ* can be transposed to unfeatured objects only under an aligned strategy. If *ʌgari* 'front' happens to face the speaker, rotation logic would assign LEFT and RIGHT in contradiction to the aligned transposition of LEFT and RIGHT. Yet such a use of *phɛŋsaŋ* 'left' and *cuptaŋ* 'right' does not occur. This is explained if we assume that it is LEFT and RIGHT that are assigned by transposition in the first place. On this account, FRONT and BACK follow by rotation logic. They are implied as the sides further away from and closer to the speaker, respectively. This implicature holds because transposing LEFT and RIGHT preserves the structure of the co-ordinate system in physiomorphic mapping. Specifically, it preserves the fourfold division of the co-ordinate system (cf. the dashed lines in Figure 3). This leaves space for FRONT and BACK, which logically follow by rotation in analogy to the human body. The observation that transposition in Belhare operates on LEFT and RIGHT rather than FRONT and BACK raises doubts about Svorou's (1994: 22) claim that aligned transposition is a mere sub-case of a

'movement' reference frame. Such a reference frame, in which FRONT and BACK are implied by a movement scheme, is in turn better analysed as a special case of physiomorphic mapping with construal of sequence induced by motion.

As mentioned before, it is impossible in Belhare to follow the logic of a facing front and to assign LEFT and RIGHT in a confronting strategy. In Figure 3 above, the house could not be said to be *phersanleŋ* 'to the left' just because the speaker has construed a transposition where we are to approach the scene from behind. Thus, although Belhare has a grammaticalized means to encode transposition, this transposition is bound to the alignment strategy. This demonstrates that in Belhare transposition of LEFT and RIGHT on unfeatured objects makes crucial reference to the speaker's (or another person's) location. The phenomenon cannot be reduced to non-transposed physiomorphic mapping since, unlike *agari* 'front' and *pachari* 'back', this sensitivity to the speaker's location cannot be overridden by an arbitrary construal that the speaker imposes upon the scene.

Much like Belhare speakers, also Tamil speakers transpose their co-ordinates on the basis of the speaker's current location. In one variety of this language,¹⁰ however, the transposition follows the logic of a confronting strategy (Pederson 1994): "the *front of the tree* is towards the speaker and *the right of the tree* is to the speaker's left." (p. 5). Since a 'sequence' use of FRONT and BACK terms (*muŋ* and *piŋ*, respectively) is readily found in Tamil (Pederson 1993), it could be that this language is like Belhare in transposing LEFT and RIGHT, rather than FRONT and BACK. On such an account, the uses of the latter terms with unfeatured objects are analysed as either defined by the construal of a sequence or as pragmatic side-effects of transposing LEFT and RIGHT. From a semantic point of view, then, Belhare and Tamil terms for FRONT and BACK are monosemous. They are defined by physiomorphic mapping based on the conceptualisation of a sequence or an intrinsic shape. Pragmatically, however, the terms can serve to fill the gaps left over in the co-ordinate system when LEFT and RIGHT are transposed (in the sense discussed above). This pragmatically driven use is different in Tamil and Belhare. Because Tamil speakers operate under a confronting strategy, the FRONT is closer to the speaker, whereas in Belhare it is further away. This predicts the following. In Belhare, all uses of *agari* 'front' and *pachari* 'back' are semantically driven and therefore entail the construal of a sequence, except the use of *agari* 'front' to refer to the side further away from the speaker. In Tamil, it is not a sequence construal in the case where *muŋ* 'front' is on the side closer to the speaker. Here, *muŋ* would designate the closer area as a pragmatic gap filler induced by the transposition of LEFT and RIGHT in the confronting strategy. These predictions are difficult to test, but at least for Belhare I have some informal evidence that they are borne out. First, the predictions agree with the intuitions native speakers have. Second, the pragmatically driven use of *agari* 'front' is the one that regularly comes up first. It appears to be the unmarked use in an abstract setting where the construal of a sequence is unlikely (for example with the cards

reproduced below in Figure 4). Third, the proposed analysis starts from the assumption that the FRONT and BACK terms have only a general 'sequence' meaning. This is in perfect line with the etymology of *agari* 'front' and *pachari* 'back', which are borrowings from Nepali (*agāḍi*, *pachāḍi*) and which seem to have included temporal meanings ('before' and 'later') more or less throughout their attested 3000 year old history (see Mayrhofer 1986ff). Judged from the material in Burrow & Emeneau (1984), this is probably also the case with the Dravidian histories of Tamil *muṇ* 'front' and *piṇ* 'back'. Also Dravidian, which is attested as far back as Indo-European, is unlikely to come up with a body part etymology.

A corollary of the proposed analysis is that the confronting and the aligning strategy do not co-occur as semantic phenomena in a given language. What at first sight seems to be a competition between the two strategies turns out to be the cumulative effect of a 'sequence' meaning of FRONT and BACK and of a pragmatic gap filling use of FRONT and BACK in the sequel of LEFT/RIGHT transposition. Also Japanese shows at first sight a competition between confronting and aligning transposition.¹¹ Under further scrutiny, however, what translates as FRONT/BACK-transposition under an aligning strategy appears to be generated by a sequence construal with consequent physiomorphic mapping. Accordingly, *mae* 'front' and *ushiro* 'back' can be used, as much as in our two South-Asian languages, wherever the speaker conceives of unfeatured objects as in a sequence. With such a conceptualisation, also Japanese speakers, just like Belhare or Tamil speakers, use *mae* 'front' and *ushiro* 'back' for what English speakers have to distinguish by *left* and *right*. Japanese is different from Belhare and Tamil, however, insofar as anatomic space cannot be transposed. Accordingly, there is no use of *mae* 'front' and *ushiro* 'back' as mere gap fillers for the case where LEFT and RIGHT are transposed. This is shown by the following. With unfeatured objects *hidari* 'left' and *migi* 'right' are always on the same side as they are in English. So, if there is transposition at all, it cannot operate with a confronting strategy, but only, as in Belhare, with an aligning strategy. This would imply that *mae* 'front' and *ushiro* 'back' entail a sequence construal in all cases except where FRONT is on the farther side, i.e. where its use is pragmatically rather than semantically driven (cf. Belhare). Yet this is precisely not so. According to Sotaro Kita (p.c.) the construal sense is intuitively absent in the opposite case, viz. in the case where *mae* 'front' denotes the side closer to the speaker. Since this cannot be an effect of a confronting transposition, I conclude that Japanese has genuine **person-morphic** mapping of *mae* 'front' and *ushiro* 'back'. This is like English but unlike Belhare or Tamil. In the two South-Asian languages, personmorphic mapping of FRONT and BACK, which I will consider in the following section, is not part of semantic structure.

3.3 Peculiarities of personmorphic mapping

Personmorphic mapping occurs, for instance, in English when a speaker (α) differentiates the two squares in Figure 4 by saying (20).

(20) *The square to the back is smaller than the one to the front.*

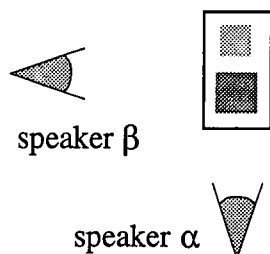


Figure 4: Personmorphic FRONT and BACK

Unlike in Belhare, this use cannot be explained away by postulating a pragmatic side-effect of transposing LEFT and RIGHT or a 'sequence' based physiomorphic meaning. To postulate a pragmatically driven use is impossible because it would require transposition of *left* and *right* under a confronting strategy, which is simply not available in English (nor in Japanese). The postulation of a 'sequence' meaning is counter-intuitive since the use in (20) does not seem to press us to imagining a sequence (as it would in Belhare). Moreover, if the speaker is at position β , he cannot use *front* and *back*, unlike Belhare *agari* 'front' and *pačhari* 'back'. In English, the construal of a sequence is possible but highly restricted. In situations like Figure 4, it is probably only possible if the speaker β is convinced that the card is the still photo of two squares in motion or that s/he imputes an other dynamic feature onto the scene (cf. Miller & Johnson-Laird 1976, Hill 1982, Herskovits 1986). Such a construal, however, is very unlikely when the speaker is at position α . If it does occur, we would in fact expect the speaker to call the front one the small square rather than the large one. It is this configuration which relies on physiomorphic mapping in English and which is apparently extremely rare (reported for only 2.6 % of the subjects in Hill's (1982) study). In Belhare, in contrast, even in mapping from position α there is a construal involved. This shows once more the stark contrast between personmorphic and physiomorphic mapping on seemingly unfeatured objects. The former is not derivative of the latter as some authors (for example, Clark 1973, Talmy 1983, or Svorou 1994: 125) seem to suggest. Both are operations of their own. Historically, however, the physiomorphic use seems to precede personmorphic applications since there are languages with the former but not with latter whereas we do not know of a language having personmorphic but not physiomorphic mapping.¹²

The finding that Belhare and Tamil have not lexicalised personmorphic FRONT/BACK might surprise given that both languages also have personmorphic use of LEFT and RIGHT.

The picture emerging from the literature is that in general terms for FRONT and BACK are more basic than terms for LEFT and RIGHT. Child language studies, for instance, show that the use of FRONT and BACK is mastered before the use of LEFT and RIGHT (Clark 1973, among others). However, these terms are usually under-analysed with respect to the difference between egocentric-physiomorphic vs. personmorphic mapping. Therefore, it is difficult to assess whether the present finding challenges the assumed universality in the acquisition of these terms. From a typological point of view, there does not seem to be any 'natural' implicational hierarchy involved. Whereas from a 'South Asian' point of view,¹³ personmorphic LEFT/RIGHT seems to be more 'natural' than personmorphic FRONT/BACK, the picture is exactly reverse from a Meso-American perspective, where, for instance, Mopan Maya (spoken in Belize) and Totonac (of the isolated Totonac-Tepehua family in Mexico) are both reported to have personmorphic mapping of FRONT and BACK terms but not of LEFT and RIGHT terms (Danziger 1994b and Levy 1994, respectively).

These findings also suggest that in the domain of personmorphic mapping the LEFT/RIGHT or 'transverse' and the FRONT/BACK or 'sagittal' axis can be independent from each other. This independence is even found within the confines of a single language since the two axes have very distinct referential properties (also cf. Pederson 1994, Levy 1994). When LEFT and RIGHT are personmorphically mapped, they are, as we have seen in example (16a), not constrained by FRONT and BACK quadrants. This is different with personmorphic use of FRONT and BACK. If in Figure 5 the small square is too much away from the big one, it is not any longer to its *back*, but rather to its *right*.

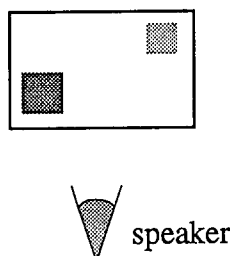


Figure 5: Personmorphic FRONT/BACK vs. LEFT/RIGHT

This effect, and the general independence of the transverse and sagittal axes, is due to a difference in the anchor of personmorphic mapping with FRONT and BACK terms as opposed to LEFT and RIGHT terms. Let me take up this issue from a cross-system perspective.

3.4 Personmorphic and physiomorphic mappings across lexemic systems

Personmorphic mapping in anatomic space operates in the same way as in environmental space. The anchor is a grammatical person, usually the speaker. In environmental space we have seen that the mapping operation is motivated by the cognitive matrix of a specific expe-

rience of perceptual geometry. The vertical gaze shift of a person underlies the distinction of closer and farther objects by applying UP and DOWN terms. The ACROSS quadrants follow from the nature of the co-ordinate system, which contains two axis defining four quadrants. Perceptual experience also motivates personmorphic mapping when applied to LEFT and RIGHT terms. Here, it is the lateral rather than the vertical gaze shift that defines what is to be called LEFT and RIGHT. This explains why personmorphic LEFT and RIGHT ignore depth perception. In discussing personmorphic mapping of environmental space I have insisted that the operation is crucially based on the condition that the anchor is a grammatical person. The perceptual geometry underlying the operation motivates the fact that some languages grammaticalise personmorphic mapping in environmental and anatomic space. This cognitive matrix is not part of the semantic definition of personmorphic mapping, though. It is presupposed by the concept of person included in the semantic representation. Without this matrix, the concept would be underdefined. Thus, the relation between the cognitive matrix and the semantic representation is mediated by the concept of person. It is unlikely that linguistic semantics has immediate and constant access to a level of visual cognition where perceptual geometry is formalised (but see Levinson (1992c) for speculations in this direction.) Apart from providing the framework within which to define semantic concepts, cognitive matrices motivate semantic structure by making semantic structure better compatible with the rest of cognition and thus easier to acquire and to operate. This does by no means conflict with one of the most important and most successful tenets of modern linguistics, viz. that language has a structure *sui generis* that is reducible neither to psychology nor to history. Just as language structure cannot be reduced to historical developments so does the motivation of a semantic phenomenon not substitute for the phenomenon itself (cf. Bickel, in press).

The semantics of personmorphic mapping only requires that the anchor be a person, viz. the first person in egomorphic mapping, the second or third person in allomorphic mapping. In terms of the Conceptual Semantics representation briefly discussed in section 2, this means that the anchor constituent that modifies the [LEFT()] or [RIGHT()] function constituent, is filled by a person feature. This definition is also satisfied by personmorphic mapping of FRONT and BACK terms. As we have seen in Figure 4, a person (the speaker) determines what is FRONT and what is BACK. Also here, allomorphic mapping can be observed. In this case, the FRONT is what is closer to the addressee. Under allomorphic mapping, the addressee in Figure 6a picks the small square when told to take the one *to the front*. Likewise, s/he will take the small one if told to take *the right one* in Figure 6b. Notice that the variation between egomorphic and allomorphic mapping is different from the variation we have found in the construals of *agari* 'front' and *pachari* 'back' in Belhare (or similar instances in Tamil). Although at first sight such construal variation may look like the phenomenon illustrated by Figure 6a, further investigation shows that the variation is independent of whether there is an addressee or not to whom the mapping can be relegated.

This is evidenced by instances of a Belhare speaker in Figure 6b using *ʌgari* 'front' and *pʌchari* 'back' (cf. the preceding section).

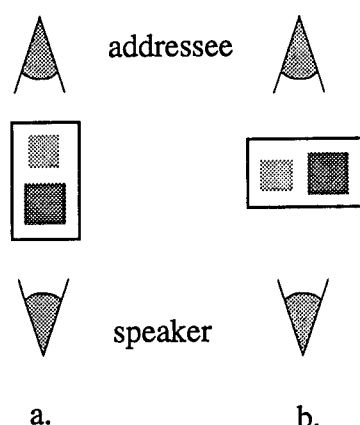


Figure 6: Allomorphic mapping

While personmorphic mapping of FRONT and BACK satisfies the general definition of this operation, it is not motivated by the same cognitive matrix as personmorphic mapping of LEFT/RIGHT and UP/DOWN terms, i.e. not by perceptual geometry. This need not surprise given the general independence of the transverse and sagittal axis discussed earlier. At least two different cognitive matrices come to mind on which personmorphic mapping of FRONT and BACK could be based on. Both hinge crucially on a specific experience of the anchor. On the first scenario, the mapping is based on the following experience of the anchor, i.e. a person: what is in our front is immediately accessible, whence conceptually close (cf. Vandeloise 1986). What is behind us is conceptually further away, less immediately accessible. This experience, then, induces an association of FRONT with closeness and BACK with distance. This scenario explains the frequent phenomenon that BACK terms in personmorphic mapping include notions of visibility in their semantic representation (*op. cit.*, Landau & Jackendoff 1993). On such an account, then, the cognitive matrix underlying the personmorphic structuring of the sagittal axis is very different in anatomic (FRONT/BACK) and environmental space (UP/DOWN). This also explains why the two implementations of the mapping operation are not entirely co-extensional. In Belhare the extension of personmorphic 'above' (*utemme*) is limited by the two ACROSS quadrants (cf. Figure 1). These quadrants cannot be substituted, however, by the extensions of personmorphic RIGHT and LEFT because these terms create a binary field division rather than two 45 degree quadrants.

On a second, less convincing scenario the mapping is modelled after physiomorphic mapping with featured objects (cf. Clark 1973, Talmy 1983, Herskovits 1986). The front of a tree would correspond to the front of people in what Clark (1973) calls a 'canonical encounter', i.e. a face-to-face encounter. This and similar proposals assume personmorphic FRONT/BACK to be derived from physiomorphic mapping with pseudo-intrinsic features

assigned in transposition. The preceding observations, however, suggest that personmorphic mapping has very distinct properties. First, in contrast to physiomorphic mapping, personmorphic mapping does allow referential overlap between LEFT/RIGHT and FRONT/BACK (cf. Section 3.1). Second, if applied to unfeatured objects, personmorphic mapping is distinguished from physiomorphic mapping precisely by the absence of pseudo-intrinsic featuredness (Section 3.2). Third, origo-governed transposition appears to be based on general narrative transposition rather than on a metaphorical shift from people's face in a canonical encounter to a pseudo-encounter with a tree or with any other unfeatured object (Section 3.1). Moreover, as Vandeloise (1986) points out in his study on French spatial prepositions, Clark's scenario also creates unexplained paradoxes. In the 'canonical encounter' model it is difficult to see, for instance, why a person further away from a tree is said to be *derrière l'arbre* even if that person faces away from the speaker (p. 149).

Also physiomorphic mapping is anchored in the same way across lexemic systems. What is conceived (in a given culture) as the intrinsic orientation of the ground object determines the orientation of the co-ordinates. This orientation is computed by a large range of methods defined in object specific or situation specific cognitive matrices. Not only perceptual and functional notions about shape, function and dynamics are involved (Fillmore 1971, Miller & Johnson-Laird 1976: 400ff, Levelt 1984, Ehrich 1985, Herskovits 1986: 165ff, etc.) but also construals about the history of a scene. If, for instance, in Belhare one thing is thought of as having been there prior to another one (on the basis of the current narrative setting or other situation specific ideas), it is likely to be called the *agari* 'front' one. Comparison of physiomorphic mapping across lexemic systems suggests that (non-narrative, origo-governed) transposition of physiomorphic mapping is far more general in anatomic than in environmental space terms. For instance, if a Belhare speaker is lying supine s/he would not usually distinguish two horizontally aligned squares on a wall by *tona* [UP:TRANSP-ART] 'the upper one' and *napmuna* [PROX-DOWN-ART] 'the lower one'. In Belhare, the two squares in Figure 7 are more commonly differentiated by ecomorphically used *yona* [ACR:TRANSP-ART] 'the one over there' and *natyana* [PROX-ACROSS-ART] 'the one over here'.

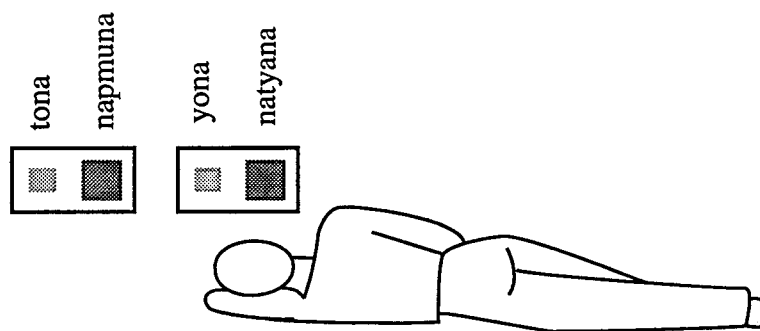


Figure 7: Personmorphic and ecomorphic mapping of Belhare environmental space

Tona 'the upper one' and *napmuna* 'the lower one' can be used if the squares are somewhat away from the head.¹⁴ In this case, however, the mapping is personmorphic, not physiomorphic. It codes, much as personmorphic *front* and *back* in English, the difference in distance so that *tona* means 'the one further away' and *napmuna* 'the closer one'.

In English, we might use personmorphic *front* and *back* (or *this* and *that*; on which cf. Section 4.1). However, also transposition of physiomorphic mapping of UP (*above*) and DOWN (*below*) is attested. As Friederici & Levelt (1990) have demonstrated such expressions can be used under specific experimental conditions (e.g., weightlessness) for non-vertical patterns analogous to the one depicted by Figure 7. Such use even overrides clues as to what might be visually construed as a vertical axis, for example an axis suggested by the drawing of a tree under 90 degree rotation. This shows that UP and DOWN can indeed be assigned to objects on the basis of the viewer's position.

3.5 Geomorphic and ecomorphic mappings across lexemic systems

So far we have seen that personmorphic and physiomorphic mapping are defined in the same way across lexemic systems. Also the other mapping operations found in terms for environmental space can be replicated in terms for anatomic space. More precisely, lexical units corresponding to the notions LEFT, RIGHT, FRONT and BACK and encoding personmorphic and/or physiomorphic mapping, can also encode geomorphic and ecomorphic mapping operations. To see this, we must slightly enlarge our data base.

Geomorphic mapping of anatomic space occurs in both the large-scale and the small-scale variant. Large-scale mapping is a recurrent phenomenon in Indo-European and Polynesian languages (C. Brown 1983, cf. already Hertz 1909: 567). A complete convergence of FRONT/BACK/LEFT/RIGHT with cardinal directions is attested, for instance, by Sanskrit *dakṣiṇa* 'right, south', *uttara* 'left, north, up', *paśca* 'behind, west, later' and *pūrva* 'in front, east, before'. As far as I can judge from the examples and translations given by Monier-Williams (1899), the meaning distinctions are semantic and not pragmatic. Specific contexts exclude one or the other meaning. In compounds such as *dakṣiṇa-pūrva* 'south-east' and *dakṣiṇa-paścima* 'south-west', for instance, the terms refer only to cardinal directions and are not used in a physiomorphic or personmorphic sense. Geomorphically mapped anatomic space is also attested in other Indo-European languages, especially from the Celtic branch. Old-Irish had *dess* 'right, south, convenient' and *tuath* 'left, north, malign' (Vendryes 1978) and Cornish is reported to have *clēth* 'north, left' and *dyghow* 'south, right, right hand' (Nance 1955). In Polynesian languages the associations are sometimes inverse. Hawaiian *ākau* means 'north, right' and *hēma* 'south, left'. Yet Rennellese, Maori and Tuamptuan follow the same logic as Indo-European and combine 'behind' with 'west'. On

can imagine several scenarios of how such convergences develop historically. The least plausible is to assume that “the human body is naturally oriented along an east-west axis” (C. Brown 1983: 136). Also problematic, but not completely implausible is the assumption that “primitivement les Celtes, comme les Indiens, s’orientaient en regardant le soleil levant” (Vendryes 1978, s.v. *tuath*). More plausible is an association chain in which one side of a house or temple (e.g. the entrance side) comes to be called *its front*. If, as is the case in many cultures (cf., e.g., Hindu temples), this side has to face a particular cardinal direction (e.g., east), terms for FRONT can easily acquire an alternative meaning ‘east’. The other terms follow by rotation logic in analogy to the human body (cf. section 3.1 above). Another scenario does not incorporate a fixed orientation at all but builds on a temporal ‘sequence’ use of FRONT as ‘before’. For example, Sanskrit *pūrva* ‘front, east’, which derives, together with words such as Old Church Slavonic *prvъ* ‘first’, from Proto-Indo-European **prH-uo-* (Mayrhofer 1986ff), is etymologically related to *prá* ‘before, in front’ just like *prātar* ‘in the early morning, at daybreak’. Terms for sunrise or morning are, in turn, well-known to relate to words for ‘east’. (Recall that, incidentally, English *east* itself is a reflex of Proto-Indo-European **ausos* ‘dawn’). Such a scenario is supported independently by the fact that also Sanskrit *paśca* ‘behind, west, later’ appears to derive from a sequence meaning. It goes back to the same root as Modern Nepali *pachāḍī* ‘back’. Its Proto-Indo-European etymon **po(s)* ‘after, behind’ is reflected in some daughter languages with purely or predominantly temporal meanings, e.g. Old Church Slavonic *pozdě* ‘late’.

Also small-scale geomorphic mapping is found in anatomic space. In French, for instance, the LEFT/RIGHT co-ordinate is recurrently oriented according to the direction of a river as in *rive-gauche* and *rive-droite*. However, the mapping does not seem to have become a lexical meaning of *gauche* and *droite* themselves. Such a development is found in Allemanic dialects with FRONT and BACK. In Züritütsch, for instance, *hine* ‘at the back’ (or *hindere* ‘to the back’) and *foorne* ‘at the front’ (or *füre* ‘to the front’) can conventionally refer to the upper and lower side in a valley or, accordingly, on a lake. For instance, on a hike in the Alps, an expression like (21), literally ‘we must [go] further to the back yet’, suggests that one has to go further upstream in the valley.

- (21) *Mer müend no wiiter hindere.*
 we must yet further to.the.BACK
 ‘We have to [proceed] further upstream.’

In the High Allemanic *Walser* dialect of Saley/Salecchio, geomorphic mapping is even used in settings on a smaller scale. According to Frei (1980: 50), to put something *i di fóder tšivru* ‘into the front basket’ is to put something into the basket that is further downstream in the valley. Such use with small-scale manipulable objects shows that the mapping follows the same method of goal computation that was postulated for geomorphic mapping in

environmental space. The *föder* basket is to the FRONT because a trajectory running from the origo (the speaker) through the ground object (the basket) would end up at the mouth of the valley. Toponymically anchored geomorphic mapping does not seem to occur with anatomic space. (Recall that so far it has not yet been proved for environmental space either.) The place name *Hinderrii* (literally, 'back-Rhine') in eastern Switzerland, for instance, cannot determine co-ordinates so that to go *hindere* 'to the back' could conventionally mean to go to this place if, with respect to the valley, you go *füre* 'to the front', i.e. downstream.

In environmental space the anchor of geomorphic mapping is defined as a region that provides the goal of a real or imagined trajectory. This region is determined variably by the global (large-scale) or local (small-scale) hill inclination or by a place name (in toponym-based mapping). In the anatomic space systems reviewed here, the anchoring region is determined variably by cardinal directions (regions) in large-scale mapping or, in small-scale mapping, by the source and goal areas of the river in a valley or of the current in a lake.

Ecomorphic mapping in environmental space is defined by the concept of verticality or of another dominant axis in a specific environment (such as the interior of a house, cf. Section 2.3). The mapping operation is also found in anatomic space. However, here the anchor is never provided by verticality but only by other ecological concepts, most commonly by ideas about room divisions. In English, for instance, the *front* in a church or a class room is always where the altar or the teacher's desk is. Notice that the current environment, e.g. the interior of a church, defines the co-ordinate layout. This is, as pointed out in Section 2.3, unlike physiomorphic mapping, which is anchored in the ground object. In ecomorphic mapping the ground object can be different from the anchor. This is the case in example (22) which refers to the situation depicted in Figure 8:

- (22) *John is in front of the pulpit.*

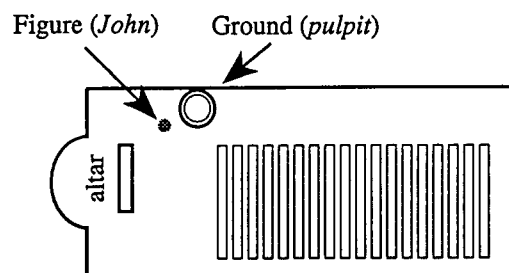


Figure 8: Ecomorphic mapping of English anatomic space

The ground against which which John is located is the pulpit but the anchor that determines the FRONT/BACK axis is the nave of the church. If the anchor were the pulpit and the mapping physiomorphic one would have to think of it as intrinsically oriented. If this is possible at all, I guess its front would be the side which the priest usually faces, i.e. the side

directed toward the benches. Accordingly, John would have to be at a different place in Figure 8. Another instance can be observed when one sits inside a tramway wagon. Imagine somebody standing next to a large suitcase. To say that s/he is front of that suitcase can and often does mean that the person is between the suitcase and what is currently the front in the wagon, viz. the part which is in direction of the motion. These examples confirm the conjecture that ecomorphic mapping is a distinct operation, in particular different from physiomorphic mapping. This distinction is completely blurred by the traditional notion of an 'intrinsic' reference frame.

Ideas about room divisions vary from culture to culture, but also, on pragmatic grounds, within cultures. Whereas in Figure 8, the altar is to the FRONT, designations in a Belhare house are directly inverse: the more important and private part, where the well-protected altar with the family gods is, is called *pachari* 'back', whereas the public entrance side is *agari* 'front'. The same goes for neighbouring Limbu (Sagant 1976: 170). But also in English, the BACK of a room is sometimes the part that is furthest away from the entrance. This is the case, for example, if the speaker is standing right in the entrance (Herskovits 1986: 165f). Systematic use of LEFT and RIGHT terms in an ecomorphic way seems to be less common. A clear instance is the fixed division of the tiers in a theatre into a left and a right side. In such an environment, then, you can be told to take your seat on, say the *left* side, and this is unambiguous wherever you and the attendant happen to stand. Fixed associations of LEFT and RIGHT with room divisions seems to occur also in Limbu: the lower side of a house is associated with the LEFT and the upper side with the RIGHT (Sagant 1976). There is so far no evidence, however, that this ideology has developed into semantics and underlies ecomorphic use of *phenchanj* 'left' and *cupsanj* 'right' in everyday communication.

4. Spatial deixis systems as lexical bundles of mapping operations

The anchor of ecomorphically mapped anatomic space is never verticality. This claim provides a means to define the difference between anatomic and environmental space in a principled way. If we come across a language where certain expressions differentiate referents along the vertical axis, we analyse these expressions as containing the features UP and DOWN. This fieldwork practice works even if the expressions are also applied geomorphically for distinguishing things on the flat ground, where an idiomatic translation into English would rather call for terms like *front* and *back*. The reason why this works is that semantic features like UP and DOWN can and often do stand for bundles of operations. Indeed, the only crucial difference between 'anatomic' and 'environmental' space is that we do not postulate the features UP and DOWN in the former system but in the latter. Notice that all other operations that might be associated with our newly found expressions could be

associated both with anatomic and environmental space systems. As I have shown in the preceding, personmorphic, physiomorphic and geomorphic operations are found in both types of lexemic systems. Suppose, for instance, you find some terms of a language being used in personmorphic mapping differentiating things further away from closer things and also differentiating a left and right side. Probably you would analyse the system as an 'anatomic' one, i.e., containing the features FRONT, BACK, LEFT and RIGHT. If the language happens to be Belhare, however, further investigation would immediately teach you that the expressions are also used ecomorphically on the vertical dimension. That discovery would have you diagnose the terms as bundling up meanings in the way of 'environmental' rather than in the style of 'anatomic' space. This suggests the following general definition of lexemic systems in spatial deixis, i.e., of word groups encoding spatial mapping operations.

- (23) A system or lexical 'bundle' of mapping operations is 'environmental' if it includes verticality-based ecomorphic mapping; it is 'anatomic' if it does not include verticality-based ecomorphic mapping but allows at least physiomorphic mapping.

In this definition, I have included the proviso that anatomic space contains physiomorphic mapping. This is necessary in order to distinguish the system from two other commonly found systems, viz. 'personal' and 'geographic' space:

- (24) Personal space includes personmorphic mapping only. Geographic space consists of geomorphic mapping (potentially in both its large and small-scale variants) only.

These two systems are illustrated in the following.

4.1 Personal space systems

The crucial property of personmorphic mapping is that it anchors the co-ordinate system in a person. This holds also true for the paradigm cases in traditional discussions of spatial deixis, viz. *here* vs. *there* oppositions as found in many languages around the world. The speaker's (or another person's) position determines the lay-out of a deictic fields with two radial zones, a proximal and a distal one. A straightforward instance of such a system occurs in Belhare. Pairs of terms, including demonstratives, manner adverbs, Aktionsart derivatives and motion verbs, are distinguished by whether something is (or moves) close to the speaker or not. No other notion is involved. It does not matter, for instance, if something is near the

addressee. As long as it is not near the speaker it is referred to by the distal demonstrative *ina* (as opposed to the proximal form *na*):

- (25) *ina* *laitar ka-pir-a!*
 DISTAL.DEM lighter 1sU-give-IMP
 'Give me this lighter!' [which is in your hand.]

Personmorphic mapping is, as we have seen in the preceding, motivated by two cognitive matrices, one based on gaze shifts, the other on the conceptual association of accessibility with closeness. In personal space, the matrix appears to be different from both of these. In this system, another aspect of the *condition humaine* is responsible for the grammaticalization of the mapping operation. The operation appears to be based on the interactional aspect of human existence, viz. on the fact that to be person is to a large degree defined by playing a role in communication. On this account it does not come as a surprise that some languages incorporate a whole range of communicative categories in their systems of personal space. This can result in a three-way distinction of first, second and third person demonstratives (as in Japanese) or, more commonly, in a complex system where the distinction of persons interplays with factors like information access (as in Maya, cf. Danziger 1992, Hanks 1990: ch. 6), illocutionary appeal (as in Turkish), current relevance for the interactional framework (Hanks 1990: ch. 9) and much else beside (see Anderson & Keenan (1985) for a survey).

To be sure, personmorphic mapping in any lexemic system is crucially anchored in the interactional dimension of the *condition humaine*. Whereas in environmental and anatomic systems, this is complemented by cognitive matrices of perceptual geometry and conceptual associations, in personal space, the operation is motivated by the very anchor itself: the social nature of 'persons'.

4.2 Geographic space systems

Geographic space is universally well represented and particularly prominent in Australian languages (cf., for instance, Laughren 1978 on Warlpiri or Haviland 1979, 1993, Levinson 1992a on Guugu Yimithirr). Most commonly, the system consists of large-scale geomorphic mapping, with a potential extension to small-scale mapping. The crucial difference between the two variants of geomorphic mapping is the conceptual reachability of the goal regions that determine the lay-out of co-ordinates. The logical effect of this difference is that the co-ordinates in large-scale mapping can be shifted (translated) in parallel whereas this does not hold in small-scale mapping. If two persons go north (in a large-scale sense) from different places, the two shall never meet (except in the uncommon case of a Northpole expedition). If

they go uphill (in the small-scale sense) from different places, however, they meet on top of the hill (unless a Haugen effect distorts their paths). Systems with only large-scale mapping seem to be rare. It is very common that cardinal direction terms also denote reachable places, just as UP often denotes the top of a hill as a goal region. Haugen's (1957) study of Icelandic orientation provides the paradigm case. In Icelandic, the terms *norður* 'north', *austr* 'east', *súður* 'south' and *vestur* 'west' are not only used in large-scale mapping so as to specify true cardinal directions. The terms are also used as designations for specific regions on Iceland. In such use, to say that somebody is going *norður* comes to mean that the person goes to the northern region on the island, irrespective of the 'true', i.e. local cardinal direction on the current path. If somebody travels, for instance, from the north westernmost peninsula Strandir to the northern region of Iceland, s/he will first have to go almost due south before turning east. Nevertheless the person is said to go *norður* throughout his or her journey. Accordingly, it is possible that two persons meet if they both go *norður* in the sense of going towards the northern region of Iceland. This phenomenon is indicative of small-scale mapping of cardinal direction terms. Notice that the Haugen effect discussed in Section 2.2 should not be mistaken for small-scale mapping itself. Haugen effects can occur in both large-scale and small-scale mapping, although Haugen himself discussed only the latter instance. Such a case is reported, for instance, by Allen (1972) for the Tibeto-Burman language Thulung (spoken, like Belhare and Limbu, in Nepal). Much as in Tzeltal or Belhare, it is common in Thulung to use environmental space terms, i.e. terms for UP, DOWN and ACROSS, in large-scale geomorphic mapping with UP referring to a northern direction. Allen observes (p. 83): "Tingla lies two hours to the west of Mukli, and only marginally to its south, yet it is obligatory in Mukli to speak of coming UP from it. This might be because it lay close to the route ultimately leading southwards to Bahing territory (along which the souls of the dead are conducted)". In Appendix B, I discuss a similar skewing of cardinal directions in Belhare. In that case the deviation from the straight line in goal computation is not culturally fixed as in Allen's example. Rather, it is due to a specific narrative setting in which villages on a curved river are enumerated. The river then defines the path on which the goal points are computed.

As soon as cardinal direction terms are used to designate well-defined and reachable regions, small-scale mapping becomes a possible meaning operation. Such use of cardinal direction terms seems to be extremely common since it provides a ready-to-hand means to generate toponyms. Therefore, although I cannot produce statistical evidence, I hypothesize the following.

- (26) With greater than chance frequency, lexemic systems with large-scale geomorphic mapping include also small-scale mapping .

The reverse is unlikely to hold. Especially Austronesian languages are known to provide clear examples of systems containing only small-scale mapping. To the exclusion of other mapping operations, Manam spatial deixis distinguishes four terms, the reference of which is anchored in the shape of an island. One term denotes an angle towards the sea and the other three angles are found by uniform rotation (Figure 9; after Lichtenberk 1983: 571ff).¹⁵

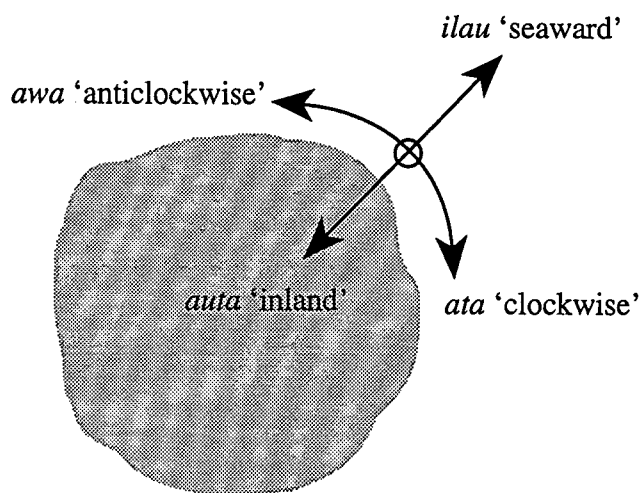


Figure 9: Small-scale geomorphic mapping in Manam

Among the anchors of geomorphic space we have encountered so far cardinal directions, hill inclinations, river sources in valleys and island shapes. Other possible anchors seem to be wind directions. Such systems are employed by Austronesian navigators and, as noted by Levinson (1992b), underlie the predecessors of the modern compass, i.e. 'wind-roses'.

It has been suggested that cardinal direction systems, or at least some of them, are based on a kind of abstract 'mental compass' (Levinson 1992a, 1994). On the present account, cardinal directions are analysed as geomorphic mapping with a goal region as anchor point. What is special about cardinal directions is only that this region is thought of as unreachable (at least within most of daily discourse settings). This is in agreement with Hallowell (1955), Fourie (1991), Widlok (1993) and others who emphasise that cardinal directions do not form an abstract mental grid but are conceptualised in terms of physical, socio-cultural or geographic notions (such as sunrise/sunset, wind directions, homes of supernatural beings, economic and social concepts, climate, etc.) and even tied up with biographical contingencies and other social facts inscribed into landscape (Haviland 1993). Even on a world-wide scale, cardinal directions are anchored in (unreachbale) regions. This is not only evident in the case of *north* and *south*, which are anchored in the Northpole and the Southpole, respectively (Cruse 1986: 223f). Also *east* and *west* have the properties of regions rather than those of vectors. If they were vectors, it is hard to explain why they do not always support transitive inference: although *Japan is west of America* and *America is west of Europe*, we do not say in Europe that **Japan is in the west*.¹⁶ Rather, Japan belongs to the

area we call the *Far East*. Cardinal 'regions' are potential goals of a path, much in parallel with the hill top in the computation of small-scale geomorphic mapping in Belhare. This explains why Haugen effects are common in cardinal direction systems. In a Haugen effect, the curving of the current path induces a deviation from the usual reference of cardinal direction terms. It is difficult to see how a path could affect a mental grid or a vector system that does not involve the notion of goal and goal computation. We cannot be confident of course that all cardinal direction systems do indeed allow Haugen effects in a fairly unrestricted manner. However, this is, on the present account, the crucial empirical question in the semantic analysis of cardinal direction terms. If they allow Haugen effects, they are instances of geomorphic mapping based on goal computation.

5. Conclusions and prospects

I have started the discussion by laying out the parameters involved in spatial deixis: figure, ground, origo, zero-point, co-ordinate system, and anchor. For the semantic structure of spatial designators the last of these parameters turns out to be crucial. It is the anchor that defines the different meanings of terms for FRONT, LEFT, UP, etc.. The anchor is a specific conceptual entity that determines how co-ordinates are mapped onto the world so as to allow spatial reference. In the theory of Conceptual Semantics, the anchor can be represented as a conceptual constituent modifying a general Place constituent, for example, a [FRONT()] or [UP()] function with the ground object as argument. Except perhaps for verticality, which is the anchor of a very common ecomorphic operation, the anchor concepts are defined in (partly universal, partly culture specific) cognitive matrices about particular object and phenomena, e.g. about persons and how they apprehend their surrounding environment, or about ecological divisions of the interior of a house. In some mapping types, especially in physiomorphic and ecomorphic operations, the required cognitive matrices vary to a large degree across languages. A particularly prominent variation is the degree to which a language allows the conceptual construal of a spatial order of succession or sequence in order to locate objects on a FRONT/BACK axis. Belhare, Tamil and Japanese seem to allow much more construal of this sort than, say, English. Another important parameter is the nature of the coordinate field. Especially personmorphic mapping allows much variation as to whether the field is organised by radial zones, by a simple two-side distinction or by four distinct quadrants.

We have seen that the mapping operations found as distinct meanings of spatial designators form a limited set (Table 2). The members of this set recur across lexemic systems. Some, for instance ecomorphic mapping, allow for some variation in the nature of the anchor. Most importantly perhaps, physiomorphic mapping varies as to whether the co-

ordinate system can be transposed onto unfeatured objects in a grammaticalized (non-narrative, origo-governed) way and whether such transposition follows a confronting or aligning strategy. The observation of transposed physiomorphic mapping in Belhare and Tamil, which is as 'speaker-dependent' as personmorphic mapping, is one of the major reasons why I propose to abandon the traditional typology of 'deictic' vs. 'intrinsic' uses.

| Operation | Anchor | Parameter(s) |
|-------------------------|--|---|
| Geomorphic: large scale | unreachable region as goal of trajectory from origo through ground | — |
| Geomorphic: small scale | reachable region as goal of trajectory from origo through ground | region determined by hill inclination, island shape, river directions in a valley, area names, wind directions, etc. |
| Ecomorphic | environment (perceptual background) | verticality or ecological (room) divisions |
| Personmorphic | person | radial or two axis or only the sagittal or the transverse axis |
| Physiomorphic | ground object | ± transposable (aligning or confronting) and much variation as to what counts as intrinsic featuredness of ground (e.g., is thinking of the ground as being part of a sequence enough?) |

Table 2: General definition of basic mapping operations

The operations are universally defined. However, languages differ as to which operation(s) they lexicalise and grammaticalise. Also, some languages or language groups seem to favour one or the other operation. Meso-American languages, for instance, seem to strongly favour physiomorphic mapping (see, for instance, Casad 1988, Levinson 1992c, Levy 1994, Danziger 1994b) whereas Australian languages have a strong preference for geomorphic mappings (see, among others, Laughren 1978, Levinson 1992a, Haviland 1993). Such biases notwithstanding, the operations are universally the same, they follow from the same definitions given in Table 2 and produce the same referential extensions. There is preliminary evidence that they are ultimately grounded in a cognitive faculty more general than language. Work in cognitive anthropology (e.g., Danziger 1994a, Bickel 1994) has shown that linguistic mapping operations are frequently replicated in non-linguistic symbolisation patterns (like

rituals, architecture, mythological associations, etc.). Moreover, on the basis of our ability to mentally rotate objects, psychologists have demonstrated the psychological reality of different cognitive co-ordinate systems or frames of reference (see, among many others, Just & Carpenter 1985 or Shepard & Hurwitz 1985), and there is a good chance that these frames translate into linguistic co-ordinate systems defined by specifically anchored mapping operations (cf. Levinson 1994). This makes it likely that the proposed operations are grounded in constraints on general spatial cognition. This could help explain why the set in Table 2 is so small and why there is not more language variation.

Actual lexemic systems, i.e., word groups encoding spatial deixis are constituted by bundling these operations in specific ways. Table 3 gives an overview on some systems encountered in the discussion. The systems are ordered by increasing complexity.

| | |
|--|--|
| PERSONAL SPACE (Belhare, English) | ANATOMIC SPACE (Belhare) |
| • Personmorphic (radial) | • Physiomorphic [transposable in an aligned strategy, allowing much sequence construal] |
| GEOGRAPHIC SPACE (Manam) | • Ecomorphic (room divisions) |
| • Small-scale geomorphic (anchored on island) | • Personmorphic (transverse axis only) |
| GEOGRAPHIC SPACE (Icelandic) | ANATOMIC SPACE (Tamil) |
| • Large-scale geomorphic | • Physiomorphic [transposable in a confronting strategy, allowing much sequence construal] |
| • Small-scale geomorphic | • Ecomorphic (room divisions) |
| ANATOMIC SPACE (Mopan, Totonac ¹⁷) | • Personmorphic (transverse axis only) |
| • Physiomorphic [not transposable] | ANATOMIC SPACE (Zürütütsch) |
| • Personmorphic (sagittal axis only) | • Physiomorphic [not transposable] |
| ANATOMIC SPACE (English) | • Ecomorphic (room divisions) |
| • Physiomorphic [not transposable] | • Personmorphic (two axis) |
| • Ecomorphic (room divisions) | • Small-scale geomorphic (anchored in valley) |
| • Personmorphic (two axes) | ENVIRONMENTAL SPACE (Belhare, Tzeltal) |
| ANATOMIC SPACE (Japanese) | • Ecomorphic (gravitation-anchored) |
| • Physiomorphic [not transposable, allowing much sequence construal] | • Large-scale geomorphic |
| • Ecomorphic (room divisions) | • Small-scale geomorphic (hill-anchored) |
| • Personmorphic (two axes) | • Personmorphic (sagittal axis only) |
| | • Physiomorphic [not transposable] |

Table 3: Some lexemic systems of mapping operations

These systems are identified by principled definitions:

- (27) a. PERSONAL SPACE includes personmorphic mapping only.
- b. GEOGRAPHIC SPACE includes (large-scale and/or small-scale) geomorphic mapping only.

- c. ANATOMIC SPACE includes at least physiomorphic mapping but excludes ecomorphic mapping anchored in verticality.
- d. ENVIRONMENTAL SPACE includes at least ecomorphic mapping anchored on the concept of verticality.

These definitions also provide the basis on which spatial reference terms can be translated from one language to the other and how their meaning can be identified in field-work research.

In the present paper, I have confined myself to the discussion of four lexemic systems. There is tentative evidence, however, that the postulated mapping operations also occur in other systems, notably in IN/OUT or 'topological space' systems. cursory evidence are uses of IN and OUT terms in a geomorphic sense as when one talks of going 'out' of a valley or in the direction of another geographically defined region. This is attested for Icelandic (Haugen 1957) and some Germanic and Romance idioms in the Alps (see, for example, Frei 1980, Rowley 1980, Ebneter 1984). Other evidence for the replication of mapping operations from Table 2 in 'topological space' might come from Cora, an Uto-Aztecan language, where terms for IN (*u-*) and OUT (*a-*) appear to have some personmorphic uses, locating a figure within or outside the line of sight (see Casad & Langacker 1985, Casad 1988). Finally, languages recurrently conflate terms for vertical UP with terms for OUTSIDE (Belhare *tem* is an instance). This might be due to a conflation of the operations of environmental space (geomorphic, ecomorphic, personmorphic, physiomorphic) with a specifically topological IN/OUT operation. Whether such analyses are justified, however, must be left for future research:

Appendix A: A Synopsis of Spatial Deixis Typologies

Table A1 gives an overview on some of the spatial deixis typologies that are currently available. I focus on three perspectives from Cognitive Psychology (Bühler 1934, Miller & Johnson-Laird 1976 and Carlson-Radvansky & Irwin 1993) and on two recent proposals from Cognitive Anthropology/Linguistics (Levinson 1994, my proposal). The typology put forward by Carlson-Radvansky & Irwin (1993) directly continues the dominant line of research (including Fillmore 1971, Clark 1973, Hill 1982, Levelt 1984, Ehrich 1985, Herskovits 1986, etc.), except for the addition of an 'extrinsic' type.

| Bühler 1934 | Miller & Johnson-Laird 1976 | Carlson-Radvansky & Irwin 1993 | Levinson 1994 | My proposal |
|---------------------|--------------------------------|--------------------------------|---|--|
| topomnestic | absolute | extrinsic | absolute (binary, without socio-geographic anchor) landmark-anchored | large-scale geomorphic small-scale geomorphic toponymically anchored geomorphic |
| | absolute (up/down) | extrinsic (up/down) | absolute (up/down) | ecomorphic |
| (partly egocentric) | relative: intrinsic | intrinsic | intrinsic | physiomorphic |
| | relative: deictic (egocentric) | deictic (egocentric) | relative with secondary coordinates | transposed physiomorphic |
| egocentric | relative: deictic | deictic | relative | personmorphic |

Table A1: Comparison of some typologies of reference frames

The major difference between the Psychology and the Anthropology/Linguistics proposals is the dissociation of the centre of the co-ordinate system (ego-centric vs. non-egocentric or deictic vs. non-deictic) from the anchor of the system (egomorphic vs. non-egomorphic or, generally, personmorphic vs. non-personmorphic). This makes the typologies not fully commensurate.

Appendix B: Haugen Effects and Conceptual Semantics

In Section 2.1, I have proposed that geomorphic mapping has a semantic structure in which places are found by computation of the goal of a (real or imaginary) path. Here I present another example that justifies the proposed treatment of geomorphic mapping. Then, I show how the semantic structure of this mapping type can be made explicit in an insightful way by adopting the formalism of Conceptual Semantics (Jackendoff 1983, 1990).

In the following example, environmental space terms are used large-scale geomorphically, referring to a village east of *Sāntāng*, down in the basin of the Tamur River (cf. the map in Figure B1).

- (B1) *tu-lleŋ-cha yuŋŋa, Sāntaŋ yo-lleŋ*
 UP-DIR-also is S. ACROSS:TRANSP-DIR
 ‘There are [some low-caste Newar] also up there, east of *Sāntāng*.’

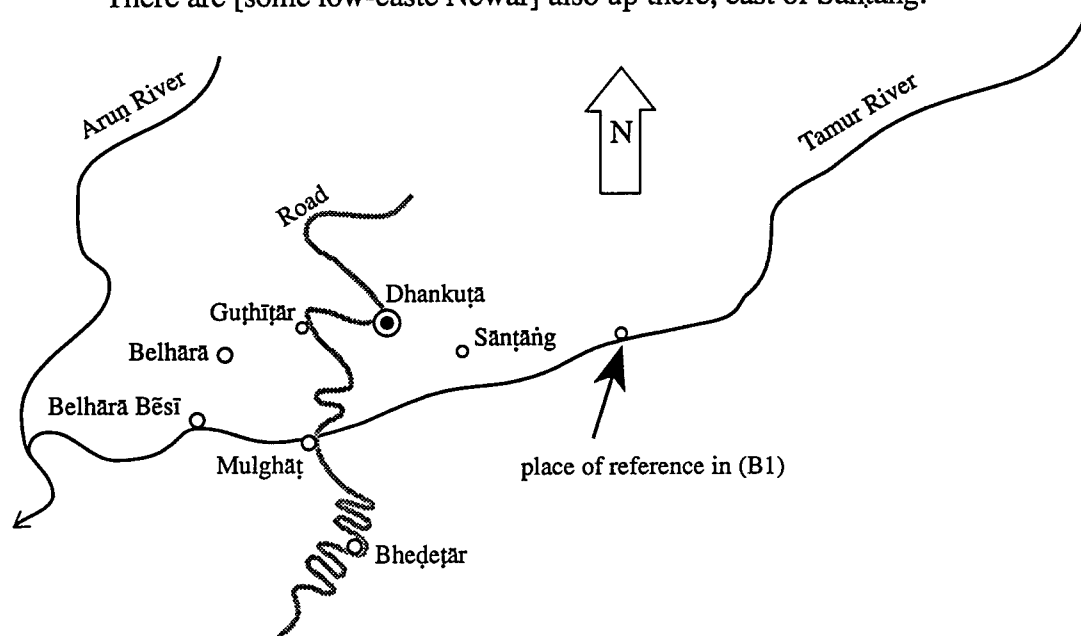
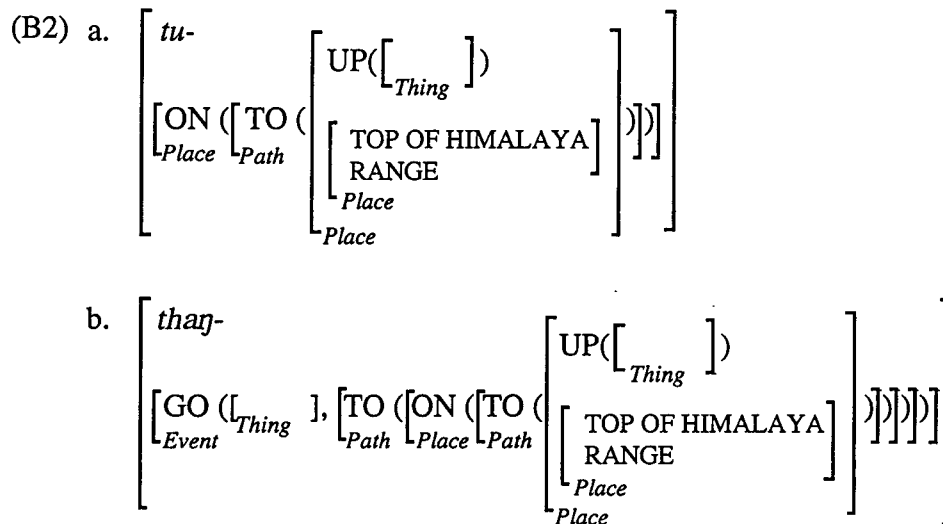


Figure B1: Map of Dhankuṭā district

This sentence was uttered in Guṭhīṭār on the foot of the Belhārā hill. In no direct sense could the Newar place be ‘up there’: it is about the same elevation as Guṭhīṭār and due east of this place. This is also indicated by the large-scale geomorphic use of *yolleŋ*, which locates the place ‘east’ of *Sāntāng*. A look at the narrative context of our example, however, shows that the distortion is brought about by a Haugen effect. Before mentioning the people ‘up there’, the speaker observed that there are low-caste Newar settlements to the south of Belhārā at different places on the Tamur River, notably at *Belhārā Bēsī* and *Mulghāṭ* (cf. Figure B1). This suggests that he mapped the space terms on the path of this river, which is circumjacent to the Belhārā and Dhankuṭā hills after coming down from its source in the north (at Mount

Kanchenjunga). On such an account, the place referred to in (B1) is clearly on a path leading north and there is no longer any contradiction with being east of Sāntāṅg and Belhārā.

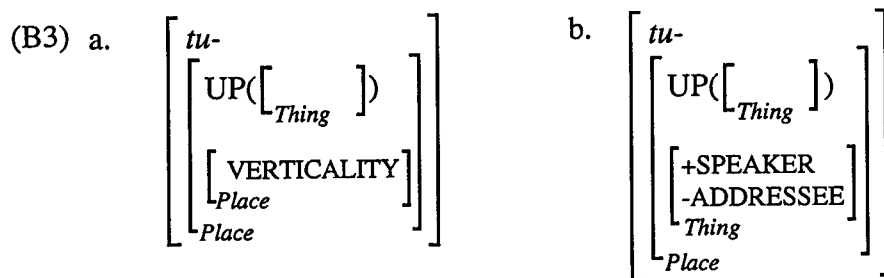
The path computation responsible for Haugen effects as in (B1) can be made explicit in Conceptual Semantics in the following way. The constituent structure rules of this theory explicitly provide for goals and places to be located on paths (Jackendoff 1983: 167). The diagram in (B.2a) represents part of the semantics of demonstratives and (B.2b) exemplifies motion verbs. I illustrate both cases by a term for upward direction. I do not include other specifications than the Thematic tier. Since there is as yet no detailed account of demonstratives in Conceptual Semantics, I skip the issue of how notions like zero-point and origo are represented in this theory. Because Haugen effects are found equally with demonstratives as with verbs, I assume that demonstratives incorporate a Thematic Tier similar to the one postulated for verbs.



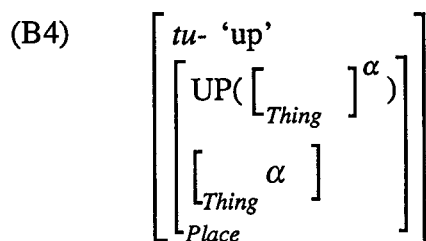
These representations make it explicit that the Place specifications, i.e. the static [ON ()] specification of the demonstrative *tu-* ‘up’ and the goal specification [TO ([ON ()])] of the motion verb *thaq-* ‘to go up’, are found on a Path leading to the top of the Himalaya range. They leave it open, however, how this Path is construed in reality, i.e. whether it is a straight line devoid of pragmatic effects or whether it is a curved line deformed by a Haugen effect. In the semantic representations in (B2), I have specified the goal of the Path as a Place which is [UP] or ‘above’ an unspecified Ground Thing (which can be instantiated for example by the first person as when something is *uphill from me*). This is at variance with Jackendoff (1983: 167) who takes [HILL TOP] as the argument of [UP] in the English expression *up the hill*. Such an analysis seems to be misled by the syntax of *up* which is superficially similar to *above* in English. In *up the hill* the hill is not the Ground from which something is said to be UP, i.e. the thing is not *above* the hill. Rather the hill top is the Anchor that determines how the UP-axis is to be construed. In (B2), I represent the Anchor

as a separate constituent specifying the meaning of the [UP] constituent. This relation of specification is taken as an instance of semantic modification, which I represent, following Jackendoff (1983, 1990), by putting the anchor constituent below [UP()].

The modifier function of the Anchor is general for all mapping types. In contrast to geomorphic mapping, however, other mapping types do not allow Haugen effects. Therefore, in these mapping types the innermost Place constituent [UP()] is not located on a Path constituent. Rather, the Place marker directly specifies the location. This is illustrated with ecomorphic mapping in (B3a) and with personmorphic (egomorphic) mapping in (B3b).



Physiomorphic mapping is defined by the identity of the Anchor constituent with the Ground Thing. This is indicated in (B4) by means of a notation introduced in Jackendoff (1990: 63) in order to deal with arguments having multiple thematic roles. The specification of the Ground, i.e., the argument of [UP()], is marked by a Greek superscript which ‘binds’ the value of the Greek letter in the Anchor constituent:



With anatomic, geographic and personal space terms, the mapping operations are analysed in parallel with (B2) through (B4). The only difference is that the [UP()] function must be substituted by [LEFT()], [FRONT()], [NORTH()], [CLOSE()] (for *this*), etc. as appropriate. Obviously, these functions must be specified so as to capture the difference in the coordinate system of, say, personmorphic *tu- ‘up’* in Belhare, which refers to a quadrant (cf. Section 2), and personmorphic *this* in English, which refers to a radial zone (cf. Section 4.1). Since the proposed typology treats differences between terms like *left* and *up* as differences in lexical bundling, no other difference seems necessary to be represented semantically. However, how exactly the difference between the form of coordinate systems can be handled in Conceptual Semantics, must be left for future research.

Notes

This paper is based on talks delivered to the Cognitive Anthropology Research Group, Nijmegen, in January 1993, to the Sprachtypologischer Arbeitskreis der Universität Osnabrück and to the Seminar für Allgemeine Sprachwissenschaft der Universität Zürich in June 1993. A poster version was presented at "Multiple Worlds: a Conference on Spatial Representation", 29 November - 3 December 1993, Nijmegen. I thank these audiences for stimulating discussions. My work has also much profited from the many debates and discussions on spatial deixis typology in the Cognitive Anthropology Group, and in particular from the numerous discussions I had with Eve Danziger. My warmest thanks also go to Bimala Pa (Lekh Bahādur Rāi), whose teaching of Belhare had a heavy influence on my understanding of deixis. I am much indebted to Steve Levinson, Eric Pederson, Sabine Stoll and David Wilkins for comments on earlier written versions, to Inge Tarim for the man in Figure 7, and to Gertie de Groen for the tree in Figure 3 and for producing the stimuli cards discussed in sections 2 and 3. For all remaining mistakes and misconceptions I am of course alone responsible. The research reported here was sponsored by the Max-Planck-Gesellschaft.

¹Here, I draw on discussions in the Cognitive Anthropology Research Group, especially with Eve Danziger, Steve Levinson, Eric Pederson and David Wilkins (also cf. Pederson 1993, Levinson 1994). The following notions are part of virtually all typologies of spatial deixis, including traditional approaches from Bühler (1934) through Svorou (1994).

²The terms 'figure' and 'ground' are borrowed from Gestalt psychology, by the mediation of Talmy (1983). The term 'origo' goes back to Bühler (1934), who does not seem to distinguish between 'origo' and 'ground', though (cf. Ehrich 1982). Alternative terms for 'ground' in the literature are 'relatum', 'point of reference', 'reference object', 'reference space' or 'landmark'.

³I hope philologists excuse this hybrid coinage: *prosopomorphic* seems just too opaque!

⁴In Tzeltal orthography, <ch> stands for /c/, <j> for /h/, <tz> for /ts/ and <x> for /ʃ/.

⁵In Belhare, <t,d,r> are retroflex consonants and <c> and <j> stand for /ts/ and /dz/, respectively.

⁶This rule is cancelled when the terms are used in a non-spatial sense. In both Belhare and Tzeltal, a temporal use of the terms reduces the system to a single co-ordinate. For example, if one says in Belhare that somebody is *90 barsa utemme* [90 years its-UP-LOC] 'above 90 years old', no ACROSS quadrant is implied (see Bickel (1994) for discussion). This provides the emic justification for isolating spatial deixis as a formal domain of research.

⁷The gloss TRANSP stands for 'transposition of the zero-point onto a place different from the deictic origo', i.e., 'uphill from where the bottle is now' rather than, say, 'uphill from me'. See Bickel (forthcoming) for the analysis. Other abbreviations include A 'actor', ART 'article', CIT 'citation form (infinitive)', DIR 'directive (case)', IMP 'imperative', INCOMPL 'incompletive (aspect)', N.ASP 'neutral aspect (in Tzeltal)', NOML 'nominalizer', NPT 'non-past', ns 'non-singular (dual or plural)', p 'plural', PROX 'proximal', s 'singular', and U 'undergoer'.

⁸Hill (1982) calls both mappings 'transpositions' and many authors (e.g., Clark 1973, Herskovits 1986, Svorou 1994) think of personmorphic mapping as transposed physiomorphic mapping. To my knowledge, the difference was first discussed by Steve Levinson, collaborating with Eric Pederson, on the basis of Tamil data and inspired by Piaget (cf. the *Annual Report of the Max-Planck-Institute for Psycholinguistics 1992*, Nijmegen, the Netherlands, p. 93ff).

⁹This goes back to a suggestion by Steve Levinson (cf. the *Annual Report* mentioned in the preceding note).

¹⁰Tamil is very heterogeneous both in terms of dialects and sociolects. Especially claims about spatial deixis are often not general for the whole language (Eric Pederson, p.c.).

¹¹Thanks to Sotaro Kita for explaining me the semantics and use of Japanese anatomic space terms.

¹²This claim is based on cross-linguistic research conducted by members of the Cognitive Anthropology Group, Nijmegen (cf. the *Annual Report* mentioned in note 8).

¹³This generalisation to South Asia as a linguistic area is certainly premature. There are exceptions even within Tamil, where some speakers use personmorphic FRONT/BACK to the exclusion of other mappings (Eric Pederson, p.c.). The same caveat applies to 'Meso-America'.

¹⁴I am indebted to Santi Pa for suggesting investigation of this possibility.

¹⁵Lichtenberk (1983: 572) glosses *ata* as 'to one's right when one is facing the sea, to one's left when one is facing inland' and *awa* as 'to one's left when one is facing the sea, to one's right when one is facing inland'. I suggest as a more compact gloss 'clockwise' and 'anticlockwise' defined as turning around an island.

¹⁶I owe this observation to Veronika Ehrich.

¹⁷I am indebted to Eve Danziger and Paulette Levy for information elaborating on the analyses put forward in Danziger (1994b) and Levy (1994).

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