# 6   *Absolute spatial reference and the grammaticalisation of perceptually salient phenomena*

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## 1 Introduction[1]

Traditionally, the way in which languages structure spatial reference has been assumed to in some way reflect the way humans conceptualise spatial relations. Until recently, it was widely assumed across a range of disciplines that the way in which familiar European languages structure spatial reference reasonably accurately reflects linguistic universals of spatial reference. Consequently, as Levinson (1992b:7) puts it, 'the semantics of Indo-European prepositions have been presumed to give us more or less direct access to the structure of innate mental categories'.

A major assumption proceeding from this has been that humans conceptualise spatial relations in a fundamentally egocentric way. Philosophers, psychologists, anthropologists, linguists and cognitive scientists have assumed that we think of spatial relationships in relation to ourselves, or to objects that we anthropomorphise. Our own bodies provide the initial and most basic tool for conceptualising of spatial relationships, and this is reflected in linguistic spatial reference. I have a front, so I can say *the table is in front of me*, and since houses can also be seen as having a front I can also say *the car is in front of the house*. I can even say *the red ball is in front of the blue ball*, or *behind it*, or *to the left of it*, or in some dialects even *to its right*, although balls have no front or back or left or right. While it is possible in English to refer to spatial relations in the absolute frame of reference by using cardinal point terms, English speakers would not normally say *the table is to my north* or *the car is to the west of the house*. The egocentric, anthropomorphic referential system is employed in English for a much wider range of relationships and scales than cardinal terms, and with far more confidence and accuracy. Consequently it has been assumed that spatial cognition is fundamentally egocentric and anthropomorphising, while the absolute frame plays

a minor supporting role. Levelt (1989:49–50) articulates this in saying 'the most basic system of local [i.e. spatial] reference is...primary deictic reference'. This system 'has the speaker as the origin...[and] two horizontal dimensions [these are] the speaker's front/back dimension [and] the speaker's... left/right dimension'.[2]

However in the last decade work on more diverse languages has demonstrated that this is not the only way languages code spatial relations. Many languages make much less use of an anthropomorphic referential framework than English, while others make virtually no use of it at all, employing instead systems of spatial reference that are fundamentally absolute. The Australian language Guugu Yimidhirr (Levinson 1992a; Haviland n.d., 1993), for example, makes no use whatsoever of notions such as 'in front of' or 'to the right of'. Spatial reference is only possible within an absolute frame, even in the most immediate scale. A Guugu Yimidhirr speaker would ask someone to 'move a bit east' on a bench, and would describe an object as being 'on the southern edge of the western table'. It is not simply that speakers tend not to use other frames of reference, the language actually does not make it possible. There is no grammatical way of saying the equivalent of *the car is in front of house*.

Evidence of this kind has dramatically challenged traditional assumptions. It has demonstrated that until now we have been looking at only part of the picture of linguistic spatial reference. The consequences of this for assumptions about spatial cognition are, needless to say, significant.

However, just as not all spatial reference systems are anthropomorphic, not all absolute systems are alike. The evidence of Australian, Mayan, Dravidian, Papuan, Austronesian and other languages indicates that absolute reference systems vary widely. Many of these linguistic groupings have been the subject of only very limited research in spatial reference. Given the overwhelmingly widespread use of Indo-European languages as the source for earlier spatial research, absolute reference is more poorly understood than relative or intrinsic reference. This can only be rectified by the examination of systems of spatial reference in numbers of genetically and culturally diverse languages spoken in varied topographic and geographic environments; and by the synthesis of this data as evidence of the parameters of linguistic spatial reference.[3]

The aim of this paper is to make a small contribution to these objectives in two ways. The first of these will involve examining evidence on absolute reference in a number of languages, primarily Oceanic. In particular, a number of features of absolute spatial reference that are widespread in Austronesian languages will be surveyed and characterised. This will include presenting data resulting from primary research carried out by the author among the Kokota (North-West Solomonic).[4]

The paper will make a number of tentative observations on the implications of the results of this survey for an understanding of the nature of linguistic absolute spatial reference, and the relationship between linguistic systems of reference and perceptually accessed phenomena

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[2]   See §2 of Brown and Levinson (1993) for a discussion of the egocentric assumption.

[3]   Levinson (1992b) is an essential starting point for any field research on this matter.

in the physical world. The implications of this for an understanding of cognition, and for the debate on linguistic determinism, will be foreshadowed.

The primary aim of this paper, however, is not to make any major claims about the nature of spatial cognition, or even of linguistic spatial reference. Instead, its aim is to canvas certain aspects of, and issues central to, linguistic absolute spatial reference, to form a basis from which future research into linguistic spatial reference, and consequently spatial cognition, can proceed.

## 2 Frames of reference

Before proceeding it is worth characterising explicitly what is meant by absolute reference. This is particularly important for the present purposes because absolute reference in many Austronesian languages involve axes which appear to be directionally variable if viewed from the perspective of the English cardinal point system. In fact these directions are wholly consistent within the systems in which the axes occur, but to an English speaker they may not appear on casual inspection to be 'fixed'.

### 2.1 A typology of frames

The typology of frames of reference adopted here is that proposed by Levinson (1996:134–148). This is an advance on previous typologies. Each frame of reference is characterised explicitly, and independently, rather than in part defining one in terms of another as many previous typologies have done. Although each is characterised independently, this is done on a consistent basis using an inventory of primitives, rather than defining each on separate criteria. Finally Levinson clearly disassociates deixis from frame of reference, a crucial distinction that is frequently blurred.

Levinson proposes that all spatial reference operates within one of three possible frames: intrinsic, relative and absolute.

The intrinsic frame is employed in expressions such as:

(1) a. *The cat is in front of the TV.*

b. *John is in front of the car.*

c. *The desk is in front of me.*

An intrinsic relationship is binary, meaning that it has exactly two arguments: the referent and the relatum. The referent (also known as the figure) is the object to be located—*the cat, John, the desk*, while the relatum (or ground) is the coordinate centre (the object the referent is to be located in relation to)—*the TV, the car, me.*[5] Crucially, the search domain (the region which the relation indicates the referent is to be located in) is projected off the relatum on the basis of an asymmetry assigned to the relatum itself. In example (1) each relatum is assumed to have a 'front'. This may be determined on the basis of a perceived 'inherent' structure (*my* 'front'), or functionally (the 'front' of *the TV*), or on the basis of canonical motion (the 'front'

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[5] Levinson uses both sets of terms 'figure' and 'ground', and 'referent' and 'relatum'. I have adopted the terminology proposed by Levinson (1992b, fn. 24), including 'referent' and 'relatum'. For a discussion of the notions 'figure' and 'ground' see Talmy (1983).

of *the car*), and so on.[6] Fundamentally, an intrinsic relation involves locating the referent on the basis of perceived features of the relatum, not merely its location.

Unlike the intrinsic frame, the relative frame is ternary, involving three arguments—the referent, the relatum, and the 'viewpoint'. The relative frame is employed in expression such as:

(2)  a. *The ball is in front of the post.*

b. *John kicked the ball to the left of the post.*

c. *The ball is in front of the post from where you are standing.*

Here the search domain is projected off the relatum on the basis of the location of a viewpoint (which is the primary coordinate centre). In example (2a) the location of *the ball* is identified in terms of a search domain projected off the post towards an unstated viewer, assumed to be the speaker. In (2b) the search domain is projected off *the post* in relation to the location of *John*, and in (2c) it is projected off *the post* towards the addressee. In each case, the referent is located on the basis of the location of the relatum and the viewpoint, but without reference to any features other than location.

Absolute reference resembles intrinsic in that it is binary, but resembles relative in that it does not involve any features of the relatum other than its location. It is employed in expressions such as:

(3)  a. *The car is north of the house.*

b. *The cat is east of me.*

In this frame, relations are pre-established arbitrary fixed bearings. The search domain is projected off the relatum on the basis of a bearing which is codified by a culture and language. So in (3b) *the cat* is located in terms of a search domain projected off *me* in the arbitrary direction we as English speakers agree on and agree to call *east*. An absolute system involves a culture and language-specific set of such bearings which are superimposed onto the referent and relatum (or perhaps within which the referent and relatum are placed).

A crucial difference between the absolute frame and the intrinsic and relative is that with intrinsic and relative frames each array in question provides its own internal spatial framework. The absolute frame on the other hand requires constant recalculation within the arbitrary set of bearings. As Levinson says, this

> requires that persons maintain their orientation with respect to the fixed bearings at all times. People who speak such languages can be shown to do so... How they do so is not known at the present time, but we may presume that a heightened sense of inertial navigation is regularly cross checked with many environmental clues. (1996:145)

The complexity of this task may be presumed to vary depending on the specific nature of the absolute system employed, and the extent to which clear environmental clues are present. However, the need to constantly maintain this orientation remains.

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[6]   Note, however, that there is considerable cross-cultural diversity in the assignment of 'inherent' asymmetry. Two cultures may assign the 'front' to an object in different ways. In other instances an asymmetry may be assigned to an object in one culture but not in another. For example in Muna (Van den Berg 1997:211) objects such as nails, peanuts, leaves and eggs have an 'intrinsic' front and back.

## 2.2  Deixis and frame of reference

It will be noted that none of these frames of reference correspond to a notion of deixis.[7] In fact 'whether the centre is deictic... is simply irrelevant to this classification' (Levinson 1996:138). Deixis may occur in any frame:

(4) a. intrinsic:    *The desk is in front of me.*

    b. relative:    *The ball is in front of the post.*

    c. absolute:    *The cat is east of me.*

However it is not an essential feature of any frame:

(5) a. intrinsic:    *The cat is in front of the TV.*

    b. relative:    *John kicked the ball to the left of the post.*

    c. absolute:    *The car is north of the house.*

It should also be noted that the fundamental distinction between deixis and other aspects of spatial reference, such as frame of reference, is often obscured by the widespread use of the term deixis simply to refer to any aspect of spatial or temporal relationships.  In fact, deixis more accurately refers to a particular kind of spatial or temporal relationship: that which is dependent on the spatio-temporal coordinates of the speech event.  It is one parameter of spatial reference, which interacts with other parameters.  Discussion of this parameter and the nature of these interactions may be confused by this terminological overuse.

## 2.3  Frames of reference in Austronesian languages

What systems of spatial reference occur in Oceanic and other Austronesian languages?[8] Many, perhaps all, make some use of the intrinsic frame, usually coded linguistically using local or relational nouns, adpositions and so on.  Notions such as *in front of the house* can be expressed in that way in some Austronesian languages.[9]  In others it is not possible.  In Taba, for example, the notion 'front' can be used to locate a packet of cigarettes in relation to a chair, but they must be actually making contact with the surface of the chair (they are literally 'on the face of the chair').  If they are not making contact, even if the distance is small, this intrinsic reference is impossible (Bowden 1997:260).

Relative reference also occurs in at least some Austronesian languages, but with extremely limited functions, typically only occurring to the extent that a search domain can be projected off a symmetrical relatum on sides expressed in relation to the speakers left and right, and on the *side towards* or *side away from* the viewpoint.

While the intrinsic frame occurs widely, referential systems operating within the absolute frame appear to be universal in Austronesian languages.  In some languages it appears that very small-scale relations are expressed using an intrinsic system, while larger-scale relations

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are expressed absolutely. This superficially resembles English, however in Austronesian languages absolute systems are typically used for much smaller-scale relations than in English, sometimes apparently to the extent of Guugu Yimidhirr.

The present paper is concerned only with referential systems operating within the absolute frame of reference. It is beyond the scope of this work to deal with the relationship between intrinsic, relative and absolute systems and the ways they interact in individual languages. Instead the focus will be on what kinds of absolute systems exist in Oceanic and other Austronesian languages and how they are structured.

# 3 Absolute referential systems in Austronesian—some basic features

To survey some of the fundamental features of absolute spatial reference in Austronesian languages it will be useful to begin by looking at Longgu (Hill 1997). Spatial reference in this language has been described in detail, and its spatial system includes several features which are crucial to an understanding of absolute reference in many Austronesian languages. These features can be usefully introduced by proceeding from Hill's case study. A number of further features of absolute reference that are tangential to the present discussion can also be dealt with in this way.
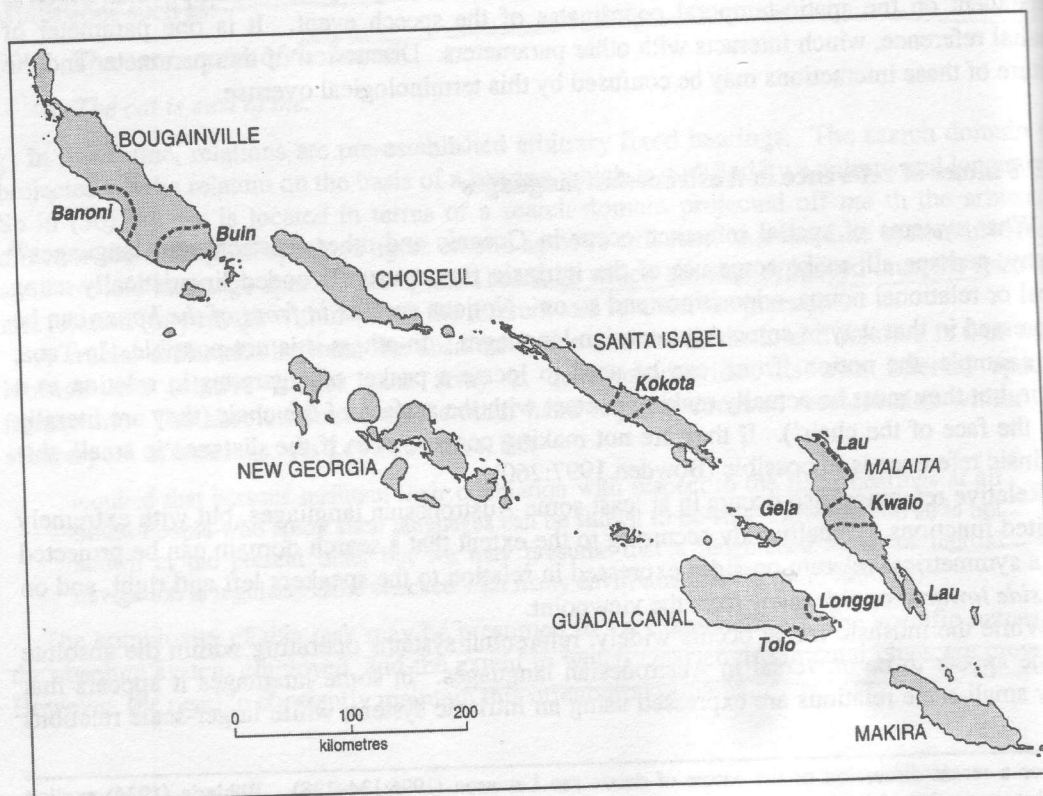


**Map 1**: The language loci of Longgu, Tolo, Kwaio, Lau, Gela, Kokota, Buin and Banoni

### 3.1  Spatial reference in Longgu

Longgu (South-East Solomonic) is spoken along a narrow coastal strip of north-eastern Guadalcanal between the mountains and the sea, and in Nangali, a region about a mile and a half inland, from which the sea is not visible.

Spatial reference in Longgu makes use of several strategies in which the relation between referent and relatum is intrinsic, the main one involving a system of local nouns. A limited relative system makes use of the body part terms for left and right, as well *as aba mai* 'side hither' and *aba hou* 'side thither'. However most of the spatial referential work is done by a system operating within the absolute frame (referred to by Hill as 'geographical reference').

The Longgu absolute system involves a pair of crossed axes representing two non-vertical dimensions, plus the vertical axis. Both of the two non-vertical axes are differentiated for direction, giving a four-direction, four-term horizontal system.

Both of these horizontal axes represent conventionalised directions. One represents a conventionalised line corresponding to a regularised coastline, northwest–southeast, about 45 degrees off our cardinal east and west. This is expressed by the directional terms *toli*, glossed by Hill as 'west;' and *ala'a*, glossed as 'east'. The other axis is a landward–seaward axis involving the directionals *longa*, glossed by Hill as 'inland', coding a direction away from the coast towards the inland; and *asi* 'sea', coding the opposite direction towards the coast. The landward–seaward axis crosses orthogonally a regularised coastal line, while the 'east–west' axis corresponds to that line.

The possibility that the relationship between the bearings of these crossed axes and the coastline is coincidental can be ruled out. The form *asi*, while functioning as a grammaticalised directional glossed as 'seaward', is also a common noun meaning 'sea' (discussed in more detail in §3.4). Moreover, cognates of *longa* in closely related languages indicate directions away from the coast towards the hinterland, regardless of the direction this indicates in our cardinal terms. In Tolo (Crowley 1986), spoken on the opposite side of Guadalcanal from Longgu, *longa* refers to a direction which in cardinal terms is the opposite to that in Longgu. It would be implausible to suggest that this term has been arbitrarily assigned to an arbitrarily selected direction which only coincidentally runs away from a coast towards a hinterland wherever it occurs.[10] Moreover, Longgu speakers associate *asi* and *longa* with directions towards and away from the coast. It is clear that there is a psychologically real relationship of some kind between this axis and the coastline.

An implication of this is that the system of spatial reference in this language involves axes the directions of which correspond to some phenomenon in the physical world. This may seem wholly unremarkable until we realise that this means that this grammatical system is structured on the basis of something which is accessed through a perceptual modality, a matter I will return to later.

The facts of the Longgu system also prompt a question as to why a coastline should provide the basis for a system of spatial reference.
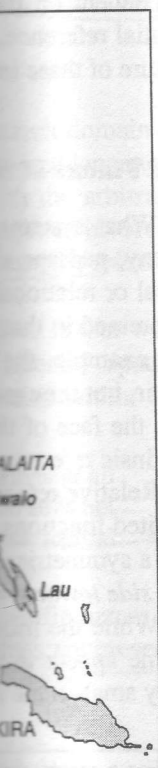
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[10]  In some other South East Solomonic languages such as Gela (Fox 1955), where the language is spoken everywhere on relatively small islands, cognates of *longa* unambiguously encode 'landward'.

## 3.2  The boundary between land and sea

The role of a coastline in shaping the system of spatial reference in Longgu is repeated throughout the Austronesian world.[11]  In an attempt to explain why this should be so I offer the following hypothesis.

Humans are terrestrial creatures, and as such the boundary between land and sea is perceptually highly salient for humans who encounter it.  It separates our natural physical domain from an alien environment in which we are at a considerable disadvantage, where we are 'out of our element'.  It marks off inhabitable space from a domain we can only pass into or onto for short periods.  Many Austronesian languages are spoken by communities who live by or near the sea.  For members of these communities this boundary is consequently highly salient, and this is reflected in the fact that many of these languages have systems of absolute spatial reference that make some use of directionals that can be glossed as 'landward' and 'seaward'.   These languages demonstrate that the boundary between land and sea is sufficiently perceptually salient to form the basis of a grammaticalised system of spatial reference.

This boundary in part forms the basis of the system of absolute spatial reference in Longgu.  The 'east–west' axis corresponds to the boundary, while the landward–seaward axis is orthogonal to it.  However the axes of the Longgu system do not correspond directly to that boundary as a real coastline with all its irregularities and variances in the form of bays, headlands and so on.  Instead the axes relate to a conceptual line representing a regularised version of the real coastline.

As Map 2 indicates, the coastline in the Longgu area runs roughly northwest–southeast.  Indeed, as Map 1 shows, the Solomon Islands consists primarily of longish islands oriented along that rough line.  Consequently most Solomons speech communities are located on or near a coastline following that orientation.  The Longgu conceptual coastal line is one common in the Solomons:  a regularised northwest–southeast line (though the precise bearings in cardinal terms vary somewhat).  The Longgu 'east–west' axis corresponds to this conceptual line, representing a line oriented in cardinal terms northwest–southeast.  The landward–seaward axis is orthogonal to that conceptual line, and therefore represents a line oriented in cardinal terms northeast–southwest.

## 3.3  The path of the sun

The Longgu 'east–west' axis corresponds to a regularised coastal line that does not, in fact, run exactly east–west in cardinal terms.  This raises an important issue associated with understanding (and glossing) directional terms.  What does it mean to say a direction is 'east' or 'west'?  English cardinal terms are often used in discussions of other systems of spatial reference as though they have an independent natural world existence.  In reality they are merely features of certain culturally specific systems of spatial reference (the English system among others).  It is a striking illustration of how fundamental to human world-view concepts spatial relations are, that even researchers into spatial reference often proceed from a tacit assumption that north, south, east and west have some independent natural world existence.  A striking example is C.H. Brown's (1983) extensive crosslinguistic survey intended to identify universals in the lexical coding of 'the four cardinal directions'.  He correctly

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[11]   See Adelaar (1997), Bowden (1992:57–58), Senft (1997a:18–22).

concludes (1983:146) that cardinal directional terminology often reflects a basis in the 'rising and the setting of the sun', being 'the most obvious natural features associated with these directions'. But for Brown these features are merely *associated* with the cardinal directions, which implicitly pre-exist the terminology.[12] At no point does Brown deal with, or appear to be aware of, the question of what these cardinal directions actually represent. Moreover, the results of his survey are of limited value, as all the data is interpreted in terms of cardinal directions. Thus while it is true that east–west terminology often relates etymologically to features of the path of the sun, much of Brown's data relates *only* to the path sun, and not to any spatial referential or conceptual structure.
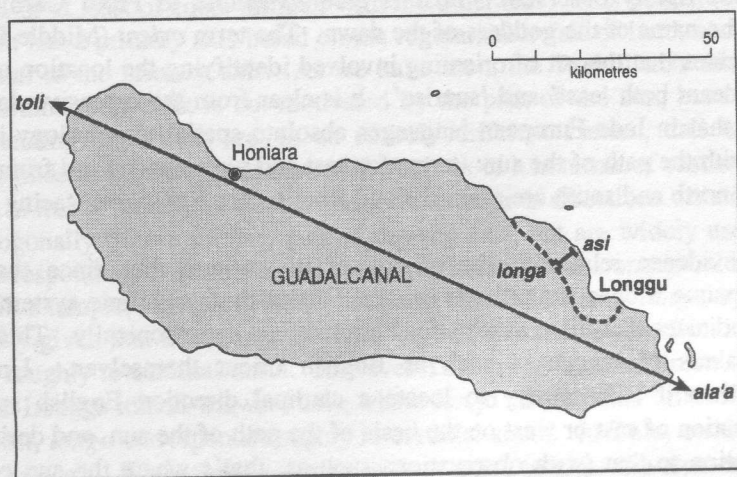


**Map 2**: Longgu directional terms mapped (after Hill 1997)

He finds, for example, that in the Mayan language Tzeltal the term for east is literally 'direction where the sun goes up' (1983:128) and west is 'direction where the sun puts down' (1983:129). However, these look like descriptive references to the path of the sun, rather than terms in a grammaticalised system of spatial reference, because that is exactly what they are. Tzeltal absolute referential structure in fact makes primary use of an axis derived from a regularisable overall fall of land, lexified by directional terms glossed as 'uphill' and 'downhill' (P. Brown 1991; Brown & Levinson 1991). In the mountainous Tzeltal-speaking region a significant overall change in altitude occurs from one end of the region to the other, with dramatic commensurate differences in climate, flora, land use and so on. This overall fall of land corresponds to an axis which is a regularised version of the real topography. Trivially, this axis happens to correspond roughly to north–south in cardinal terms. A secondary derived cross axis runs orthogonal to the uphill–downhill axis, trivially corresponding to cardinal east–west. However Tzeltal speakers do not associate this cross axis with the path of the sun, but purely as orthogonal to the uphill–downhill axis. The locations of sunrise and sunset can be referred to in Tzeltal using *slok'ib k'aal* 'the coming out

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[12] Brown (1983:142–143) says, for example, that the 'frequently encountered etymological transparency of terms for cardinal directions and the fact that these generally do not seem to reconstruct for languages of the remote past suggest that for much of human history cardinal points have been of little interest to people'. 'East' and 'west' tend to be lexified before 'north' and 'south' because they 'are clearly, if only roughly, defined by the rising and setting of the sun'.

of the sun' and *smalib k'aal* 'the spilling of the sun', but these do not lexify directions on the cross axis, and do not form part of the grammatical system of spatial reference (see Brown & Levinson 1991:7–8).

So what are the cardinal directions? The English absolute system is often treated as though the orienting direction is 'north', as indicated by a compass.[13] However, this is not usually the primary orienting direction in the system. Firstly, compasses have only become widespread in recent times, and cardinal point terminology (and therefore the cardinal referential system) substantially predates this development. More significantly, etymologies of the associated terminology indicate that it is not north but east that is the orienting component of the system (as Brown (1983) rightly observes). *East* is reconstructable to Proto Germanic, and is associated with the name of the goddess of the dawn. The term *orient* (Middle English from Latin) itself indicates that the act of orienting involved identifying the location of 'east', and in Latin *oriens* meant both 'east' and 'sunrise'. It is clear from the extensive data presented by Buck (1949) that in Indo-European languages absolute spatial terminology is associated etymologically with the path of the sun: terms for east and west are derived from sunrise and sunset, terms for north and south are often derived from left or right when facing sunrise, and so on.

This lexical evidence relates to the origins of the system, but since the forms are synchronically opaque it does not provide evidence about the synchronic system. However, other evidence indicates that these associations are retained synchronically. This is apparent in the way speakers of languages such as English orient themselves. Under normal circumstances, when it is necessary to locate a cardinal direction English speakers will determine the location of east or west on the basis of the path of the sun, and derive the other directions in relation to that (with observations such as 'that's where the sun comes up so that's east', 'sunset's over there so this must be north' and so on). Functionally, European cardinal point terminology is primarily based on the path of the sun.[14]

Like the boundary between land and sea, the path of the sun is a physical world phenomenon which is accessed through a perceptual modality. The sun is a prominent celestial body that moves perceptibly, and is apparent a considerable amount of the time. More significantly, the events of the sun rising and setting mark the boundaries between a period of light, when humans are able to operate at their perceptual optimum, and a period of dark, when our capacities are diminished. Moreover, these salient events occur in readily perceptible and relatively constant locations. It is not surprising then that this physical world phenomenon is also perceptually highly salient, sufficiently so to form the basis for systems of spatial reference.

The English cardinal system is associated with the perceptually salient phenomenon of the path of the sun, and English cardinal terms have meaning on that basis, so what does it mean

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[13] The standard map arrangement of placing North at the top, and the widespread cartographic strategy of indicating only north, play their part in giving North the appearance of the orienting direction. However, maps are not orienting tools. Instead, they require the user to already be oriented. In doing so, however, they do direct the user to attend to the location of North.

[14] With a recent, marginal overlay of magnetic north. In fact the so-called 'true north' or map north only roughly corresponds with magnetic north. There are apparently in fact two magnetic north poles at present, one under Siberia and one under Canada. A magnetic south pole is under Chile, but a second is forming under the Indian Ocean. All these move around at a rate of several kilometres each year. Of course, for ordinary purposes magnetic north is close enough to 'true' north to correspond as closely as is practically necessary on a compass.

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to use the terms 'east' and 'west' to gloss directions in the spatial referential systems of other languages? The terms are usually used to refer to any axis that even vaguely correlates to the cardinal east–west axis. But there are in fact unintentionally two distinct uses. One involves glossing as 'east' and 'west' directional terms on an axis which is motivated by the path of the sun. The other involves glossing as 'east' and 'west' directions on an axis which has nothing to do with the path of the sun but is based on some other phenomenon. This second use fundamentally misrepresents and obscures the nature of the system being described. It is perfectly possible, for example, to say that Tzeltal has an east–west axis. But to do so implies that this axis is motivated by the path of the sun, and creates an expectation that it is primary in the system, or at least of equal primacy with the other axis. This obscures the fact that the Tzeltal system has a primary axis based on the regularisable fall of land, and a derived cross axis orthogonal to the primary axis. As we have seen, the Tzeltal axis which corresponds roughly to cardinal east–west is not motivated by the path of the sun, but is a derived axis trivially coinciding with what we, in an entirely different system, call east–west. It is impossible to understand the Tzeltal system if we think of it in terms of east and west.

The same is true of north and south. These terms refer to directions on a cross axis that is derived orthogonally from a primary path-of-the-sun axis, but are widely used to define any directions corresponding to our north and south, regardless of the conceptual basis of the axis. As a typical example, Crowley (1986) defines the Tolo term *longa* as 'north', quite understandably given that in the region where Tolo is spoken the direction lexified by *longa* corresponds roughly to cardinal north. However Tolo *longa* lexifies 'inland' on an axis that resembles the Longgu inland–seaward axis, where *longa* also lexifies 'inland'. In Longgu, on the north coast, *longa* corresponds roughly to cardinal south. In Tolo, on the south coast, it corresponds to north. While those correspondences exist, to gloss the term as 'north' in Tolo or 'south' in Longgu obscures not only the real meaning of the term *longa*, but the nature of the systems of spatial reference that exist in those languages.

Consequently I propose that the terms 'east', 'west', 'north' and 'south' with an initial lower case letter should only be used to describe systems of spatial reference with the following definitions:

(6) east       'the direction of sunrise on an axis associated with the path of the sun'

west       'the direction of sunset on an axis associated with the path of the sun'

north      'the direction left when facing sunrise on an axis which is a secondary axis derived from, and crossing orthogonally, a primary axis associated with the path of the sun'

south      'the direction right when facing sunrise on an axis which is a secondary axis derived from, and crossing orthogonally, a primary axis associated with the path of the sun'

In certain domains of activity, however, a system is used in English and some other languages, in which the orientation of the axes is based on compass north (often represented as map north). In these domains the basis for the system is different to the normal path-of-the-sun based system, although in English the same terminology is used. To distinguish directions on axes that are based on compass bearings from those in (6), alternative terminology could be used:

(7) compass north   'the direction indicated by the pointer on a compass on an axis associated with the direction indicated by a compass'

compass south   'the direction opposite the direction indicated by the pointer compass on an axis associated with the direction indicated by a compass'

compass east   'right when facing the direction indicated by the pointer on a compass, on an axis which is a secondary axis derived from, and crossing orthogonally, a primary axis associated with the direction indicated by a compass'

compass west   'left when facing the direction indicated by the pointer on a compass, on an axis which is a secondary axis derived from, and crossing orthogonally, a primary axis associated with the direction indicated by a compass'

In synchronic English it is likely that for many speakers the system has simultaneous associations of both path-of-the-sun and compass directions. Thus to many English speakers 'North' is both 'the direction indicated by the pointer on a compass' and 'left as you are facing the sunrise', and east is simultaneously 'the direction of the sunrise' and 'right as you are facing magnetic north'. Nonetheless, the associations are separate. Capitalised variants of the forms in example (6) should be used only to refer specifically to the directions in (6) and (7) as they pertain in the English system of spatial reference:

(8) East   'east and compass east in the English system of spatial reference'

West   'west and compass west in the English system of spatial reference'

North   'north and compass north in the English system of spatial reference'

South   'south and compass south in the English system of spatial reference'

The terms in (6) and (7) belong to a cross-cultural set of spatial concepts. The terms in (8) are directions in a language-specific referential system.

So what is the basis of the Longgu 'east–west' axis, which runs northwest to southeast, corresponding to a regularised coastal line? Two main possibilities exist: it is a true east–west axis associated with the path of the sun; or it interacts with the land–sea axis in a system based solely on the boundary between land and sea in a way that trivially coincides with a rough east–west. The first of these possibilities appears to be the case: according to speakers of Longgu, directions on this east–west axis 'are derived from the rising and setting of the sun' (Hill 1997:106). Longgu speakers associate this axis with the path of the sun, and so unlike the Tzeltal cross axis this Longgu axis is an east–west axis in the narrower definition proposed above.

The structure of the Longgu spatial systems thus differs in a crucial way from that of Tzeltal. In Tzeltal the uphill–downhill axis is based on a regularisable overall fall of land. The cross axis is not independently based, with its own associated phenomenon, but is derived from the uphill–downhill axis. Its line is determined solely by the line of the primary axis. The Tzeltal system thus involves a primary axis based directly on a salient phenomenon, with an orthogonal secondary axis with no independent basis. Interestingly, both directions on this cross axis are lexified by *ta jejch*, glossed by Brown and Levinson (1991:7) as 'the traverse'. But it is misleading to think of this as colexification. Within the Tzeltal system there are three conceptual directions—uphill, downhill, and orthogonal to uphill–downhill. While in one

sense the traverse instantiates two directions, in another sense it represents a single direction. It is noteworthy that the traverse axis is both secondary and derived, and undifferentiated for direction.

By contrast Longgu has two independently based axes. The *longa-asi* axis is a landward–seaward axis based on the boundary between land and sea, while the *toli-ala'a* axis is an east–west axis based on the path of the sun. However, this east–west axis does not correspond exactly to cardinal east–west. Instead it is skewed to allow it to run orthogonal to the land–sea axis. The path of the sun appears to be representable in a way that is sufficiently flexible to allow this skewing, apparently more so than the boundary between land and sea.

This raises the question of the extent to which such skewing is possible. In Longgu's close relative Kwaio (Keesing 1985, 1997) an axis exists which corresponds to a regularised coastal line, and is lexified with cognates of the Longgu east–west terms. Keesing identifies these directions as 'northwest' (*'aitori* or *'aisifo*) and 'southeast' (*'ala'a*). However the orientation of the island of Malaita is not the same as that of Guadalcanal. While the Longgu *toli-ala'a* axis runs less than 45° off cardinal East–West, the Kwaio axis runs considerably more so, as Map 3 indicates. The same is true in neighbouring Lau, where the bearing of the same axis in fact prompted Fox (1974) to define the cognates *toli* and *'alaa* as 'north' and 'south' respectively. Keesing does not discuss what conceptual basis the Kwaio *'aitori-'ala'a* axis might have. He does say that although Kwaio speakers 'sometimes distinguish between east and west (*ta'elana sina* "rising of the sun" and *suulana sina* "setting of the sun"), they are generally unconcerned with cardinal points and absolute directional grids' (1997:139). In fact the *'aitori-'ala'a* axis functions within an absolute frame of reference as defined in §2.1, and as Longgu and other languages illustrate, the absence of an axis corresponding exactly to cardinal east–west does not remove the possibility of the existence of an axis motivated by the path of the sun. The terms he presents for east and west are descriptive phrases and do not form part of the Kwaio grammaticalised system of spatial reference (like the Tzeltal phrases cited earlier in this section). However his remarks do carry the implication that he is unaware of an association between the directions on this axis and the path of the sun, and it seems unlikely that Keesing would have missed such an association. However, it remains to be determined whether this axis in Kwaio and Lau is in fact motivated by the path of the sun, or by some other phenomenon, or is a secondary cross axis derived from another, primary, axis.

### 3.4 Grammatical systems, directional terminology and ordinary nominals

In the discussion above, the Tzeltal and Kwaio terms for the location of the sunrise and sunset were excluded from those languages' systems of absolute spatial reference because they were not part of a grammaticalised system. This paper is concerned with linguistic evidence on the nature of spatial cognition. This evidence is sought in grammatical systems of spatial reference. Any location can be referred to in a language and used to locate an object or a direction of motion, but this does not necessarily constitute part of a grammatical system. In this paper evidence is sought in what Talmy (1983:227–229) refers to as the 'fine-structural level' of language. As Talmy points out, 'within the scope of a sentence, a paragraph, or a whole discourse if need be, one can convey conceptual content of any sort, including...the organization of space... The main resource for this level is a language's stock of open class lexical items...' In contrast, the fine-structural level consists of closed class grammatical forms 'including grammatical elements and categories, closed-class particles and words, and the syntactic structures of phrases and clauses' (1983:227). Forms at this level are only able

to express limited aspects of the conceptual domain they represent. As such 'the closed-class forms of a language taken together represent a skeletal conceptual microcosm' (1983:228).
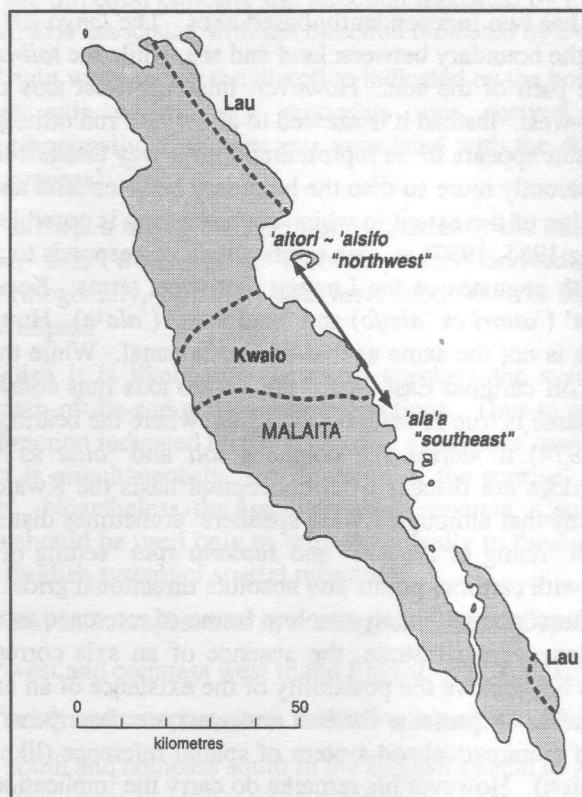


**Map 3**: The language loci of Kwaio and Lau, and the Kwaio *'aitori-'ala'a* axis

The Longgu system has four directional terms lexifying horizontal axes. These in turn may reflect a conceptualisation of spatial relations. This conceptualisation may be argued to be a cognitive response to perceptually highly salient phenomena in the physical world. All this follows for Longgu because the directional forms constitute a grammatical system in the sense described by Talmy.

Three of the four Longgu directionals are members of a closed class, and behave syntactically in a way that distinguishes them from ordinary nominals. Any nominal which may express a location can function as the complement of the preposition *vu* 'towards', and this is also true of the directionals, as (9) and (10) illustrate. However, the directionals may also function as the complement of a verb of motion, such as *lae* 'go', while ordinary nominals may not. Conversely, ordinary nominals may function as the complement of the

locative relational noun *ta-*,[15] while the directionals may not, also exemplified in (9) and (10).[16]

(9) a. *\*Lae malaba.*
    go    garden
    *\*'Go gardenwards.'*

   b. *La vu    malaba.*
     go towards garden
     'Go towards the garden.'

   c. *La vu    ta-na    malaba.*
     go towards LOC-3SGP garden
     'Go to the garden.'

(10) a. *Lae longa.*
     go  inland
     'Go inland.'

   b. *La vu    longa.*
     go towards inland
     'Go towards the inland.'

   c. *\*La vu    ta-na    longa.*
     go towards LOC-3SGP inland
     *\*'Go to the inland.'*

The syntactic possibilities shown for the directional *longa* 'landward' also apply to *toli* 'west' and *ala'a* 'east'. The situation is somewhat different with *asi*, which Hill glosses as 'sea'. It occurs both as a directional meaning 'seaward' and as an ordinary nominal referring simply to the sea.[17] This polysemy is reflected in the form's syntactic behaviour:

(11) a. *Lae asi.*
     go  sea
     'Go seaward.'

   b. *La vu    asi.*
     go towards sea
     'Go towards the sea[ward].'

   c. *La vu    ta-na    asi.*
     go towards LOC-3SGP sea
     'Go to the sea.'

---

[15] The form *ta-* is obligatorily marked with an inalienable possessor suffix. Hill describes *ta-* as a nominal preposition (1997:103) and a locative preposition (1997:109–111), following the common practice of analysing such forms in Oceanic languages as prepositions which are somewhat noun-like. I prefer to analyse the form as a locative relational noun whose argument structure subcategorises for a locative complement, and would gloss the form as something like 'the location of'.

[16] The examples in (9), (10) and (11) are from Hill (1997 and pers. comm.).

[17] The form is cognate with ordinary nominal terms for 'sea' found widely in Oceanic languages. (See for example the discussion of Tokelauan in §5.3.)

The fact that (11a) and (11c) are both grammatical indicates that the form has both a directional and a nominal function. The form *asi* may refer to the sea in the same way that *malaba* refers to a garden, but it may also refer to a location that is not consistent with the location of the sea, but is a location which is seaward on a landward–seaward axis. Example (12) refers to Nangali, a region out of sight of the sea in the Longgu-speaking hinterland. The use of *asi* in line two does not indicate that the woman in question lived at the sea, but that she lived in the part of Nangali that is seaward on the landward–seaward axis.

(12)   *Rua geni    ni  nangali-gi arua gale-'a,*
      two woman of  PLACE-PL  3DL  child-full of
      'Two Nangali women were pregnant,'

      *te'e ii'o asi,      te'e ii'o longa.*
      one stay seaward one stay inland
      'one lived to the seaward, one lived to the landward.'

In the following discussion it may be assumed that source materials indicate that directional terms given for various languages function as directional or locative particles or affixes, either uniquely like *longa*, or alongside other nominal senses like *asi*, and that the systems under discussion are closed grammatical systems of absolute spatial reference and are thus comparable.

## 3.5  Unbounded versus bounded axes

Within the English absolute spatial system the axial directions indicated by *North*, *South*, *East* and *West* tend to be treated as though they are unbounded, that is, as though they extend in the relevant direction without any end point. That is certainly true of East and West. An aircraft flying due East can continue around the curve of the earth until, fuel permitting, it reaches its point of departure and beyond. At every point on this journey the direction of the plane remains East. There does not, for example, come a point where the plane is flying West. East and West have no conceptual end points. This is not the case with North and South. English speakers tend to include within their conceptualisation of these directions notions of north and south poles—the conceptual end points of these directions. An aircraft flying due North will reach a point where it is no longer thought of as flying North but is suddenly now flying South, even though it has not veered from a straight trajectory. The plane can continue to fly South until eventually it reaches a point where it is suddenly flying North again. The poles form conceptual end points to these directions. However, although North and South have end points, they do provide exhaustive coverage—there is no point on the planet which is outside the scope of the concepts of North and South. More to the point, in the normal course of human experience and activity, these directions are for all practical purposes unbounded. They indicate a conceptual line which continues to the edges of any speaker's habitual environment and beyond, outside the range that most speakers are likely to ever cover. However, not all axes occurring in linguistic systems of spatial reference involve directions which are unbounded, or only bounded by conceptual end points outside the scope of the normal speaker's life.

In Longgu the *toli-ala'a* east–west axis is unbounded. These terms refer to directions which extend northwest and southeast to the edge of Longgu-speaking territory, beyond that to

the far ends of Guadalcanal, to the northwest and southeast extremes of the Solomon Islands, and beyond, with no conceptual end point. In addition, the axis can be used on land, or at sea.

This is not also true for the landward–seaward axis. This axis is in fact highly constrained. According to Hill (1997:106, 116), *longa* and *asi* only refer to directions within the two areas inhabited by Longgu speakers—the traditional Longgu area, and the Solomon Islands' capital Honiara. It is hard to imagine this is a principled feature of the system. These terms would presumably be used if possible in other locations, for example if Longgu speakers found themselves on the coast between Honiara and the Longgu-speaking area. Nonetheless, wherever it may be used, the extent of each direction on the *longa-asi* axis is limited. *Asi* 'seaward' codes a direction starting from the inland extending directly towards the coast as far as the shoreline itself, but does not extend beyond that out to sea. It refers only to that direction on land. Conversely, *longa* 'inland' begins at the shore line and extends only to the inland edge of the Longgu-speaking area, or to the inland boundary of Honiara. Other terms are available for areas beyond this, including *tolo* 'bush', *aba* 'other side' (of the island), *rara* 'shore' and *mwatawa* 'ocean, out to sea'. However, these are ordinary nouns not grammaticalised directionals, and do not refer to any axis or specific direction. The landward–seaward axis is constrained to inhabited areas of land.

Constraints on the scope of landward–seaward axes occur in a number of Oceanic languages, but many are not as highly restricted as in Longgu, while in others directions on

n.d., 1993) the four absolute spatial terms refer to regions delineated by right angles that expand out from any given point, dividing the world into four equal quadrants.[18]
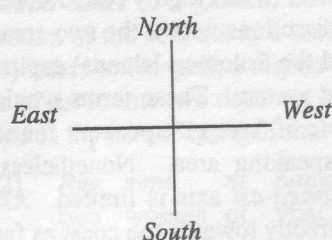
North
East — West
South

gungga-
guwa-    naga-
dyiba-
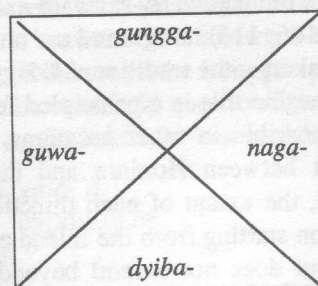
**Figure 1**: English vectors        **Figure 2**: Guugu Yimidhirr quadrants[19]

In English we refer to the Blue Mountains as being *West* of Sydney, and we also refer to Canberra as *West* of Sydney. But Canberra is not 'real' *West* in the way that the Blue Mountains are: we think of it as South of true West, and we can express that with *Southwest*. In Guugu Yimidhirr, however, both would be located within the same conceptual quadrant, so Canberra would really be *guwa* in relation to Sydney in a way that it's not true *West*.

In Longgu the directional terms refer to quadrants rather than vectors. So as Map 4 indicates, the directional *asi* 'seaward' when used in the inland region of Nangali refers to an area bounded at the coast by Bulo village and the Simiu River. Everything on the far side of the Simiu River is *ala'a* 'east', and everything on the far side of Bulo is *toli* 'west' (Hill 1997:109–110).

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[18]  In English we talk of cardinal points, with the idea that vectors referred to by directional terms extend from the origo to some 'point' which is the furthest location on that vector that we choose to think about at any given time. This use of the term 'point' imposes arbitrary end points on directions which in the case of East and West are unbounded, and in the case of North and South involve end points that may not correspond to the cardinal point in terms of distance along the vector away from the origo. The same applies to Guugu Yimidhirr, where the four directional roots are described as referring to the edges of a 'hypothetical rectangular plane' (Haviland 1993:5). However, although Haviland goes on to say that 'if something is *guwa* "westward", it lies on the western <u>edge</u> or in the western <u>quadrant</u> of the space in which one is centred', there is nothing in the literature to indicate that these Guugu Yimidhirr directionals are actually bounded, or that speakers have this rectangle with its outer edges as part of their conceptual spatial structure. Moreover, these directionals are used to refer to locations at any distance from the origo. The term 'edges' is thus misleading, and as Levinson implies (1992a:4), 'edges' in this context really refers to the quadrants themselves.

[19]  Note that although the Guugu Yimidhirr roots are usually glossed with English cardinal terms, with *gungga-* as 'north' and so on, the correspondence is not exact. The Guugu Yimidhirr system is about fifteen or twenty degrees clockwise of the English system. This means, for example, that more of the *gungga-* quadrant is east of cardinal north than is west of it.

t angles that



Komungelea

Bulo village

*asi*
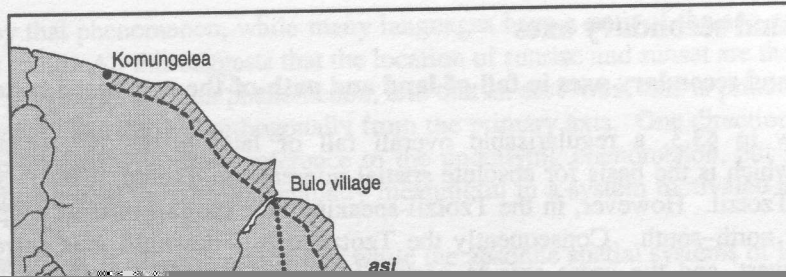
# 4 Primary and secondary axes

## 4.1 Primary and secondary axes in fall-of-land and path-of-the-sun based systems

As we saw in §3.3, a regularisable overall fall of land is the perceptually salient phenomenon which is the basis for absolute spatial reference in Tzeltal. This is also true in neighbouring Tzotzil. However, in the Tzotzil-speaking area the fall of land happens to run east–west, not north–south. Consequently the Tzotzil uphill–downhill axis corresponds to cardinal east–west, and the cross axis to north–south. In both languages the axis which corresponds to the fall of land is the primary axis. The cross axis is simply derived orthogonally from the primary axis and is thus secondary: there is no evidence of a perceptually salient phenomenon underlying the traverse axis in either language. That axis is oriented differently in relation to other phenomena such as the path of the sun in the two languages, but identically in relation to the uphill–downhill axis. Furthermore, the fact that the directions are not differentiated itself suggests that this axis is conceptually less important. It would be hard to imagine a system motivated by a single perceptually salient phenomenon that distinguishes direction on a derived axis, but not on the primary axis. Secondary derived axes are not always directionally undifferentiated, however it seems plausible to suggest

motivated by that phenomenon, while many languages have a path-of-the-sun east–west axis but no solar south. All this suggests that the location of sunrise and sunset are the most salient elements of the path-of-the-sun phenomenon, and that an east–west axis is primary. The cross axis is secondary and derived orthogonally from the primary axis. One direction on the cross axis may be lexified with direct reference to the underlying phenomenon, but I suggest that this association would only be conceptually meaningful in a system motivated by the path of the sun.

Having said that, it is worth noting that while the absolute spatial systems of languages like English were originally motivated solely by the path of the sun,[20] this is not the case in the synchronic system. The east–west axis remains conceptualised in relation to the path of the sun, the conceptual basis of the north–south axis has altered to include a notion of magnetic/map north and a conceptual line running between the north pole and the south pole. In a sense English has a system like Longgu where each axis has its own conceptual basis. However for most English speakers' north–south axis this conceptual basis is quite weak.[21] The phenomenon that underlies it is not apparent without special equipment, and speakers normally locate directions on this axis with reference to the path of the sun. However, to the extent that the north–south axis has its own conceptual basis, it illustrates an important point. The etymologies of terms in an absolute system do not necessarily tell us anything about the conceptual basis of the synchronic system, especially if the terms are synchronically semantically opaque to speakers. The etymology of semantically opaque terms may provide information about the nature of a spatial system at earlier stages in a language community's history, or changes that have taken place in the system over time (and presumably therefore in some cases evidence about the geography of earlier homelands), but it provides extremely weak evidence about the synchronic basis of a system.

Before proceeding I would like to propose formalising the distinction between primary and secondary axes by explicitly defining the term 'primary axis' as an axis which is directly motivated by a perceptually salient physical world phenomenon; and 'traverse' as a secondary axis, an axis which has no motivating physical world phenomenon of its own, and which derives its bearing from another, primary, axis. I would also like to define the term 'undifferentiated traverse' as a derived axis for which a language does not lexically distinguish the opposing directions.

On the basis of these definitions, Longgu can be seen to have two primary axes operating together in a single system, with no traverse, and Tzeltal can be seen to have a primary axis crossed by an undifferentiated traverse. For most speakers English has a primary axis (East–West) with a traverse that does differentiate direction (North–South). For the few English speakers in one specific situation, navigating by compass, the motivating phenomenon is not the path of the sun but the direction of magnetic north. In this situation it is the compass north–south axis that is primary and compass east–west that is derived.

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[20]  Buck suggests that the English *North* is probably ultimately traceable from a term for 'left', while *South* is derived from a term which may relate to the sun at midday or a sunny region.

[21]  Except perhaps for people like sailors and pilots who deal frequently with compass directions.

## 4.2 Primary and secondary axes in systems motivated by the boundary between land and sea

The evidence from Tzeltal and Tzotzil suggests that a regularisable overall fall of land will motivate a primary axis oriented along the fall of land, and the evidence from Indo-European languages suggests that the path of the sun will motivate a primary east–west axis corresponding to that path. The question remains, what primary axis does the boundary between land and sea motivate? Evidence on this is found in certain Oceanic languages with spatial systems motivated at least in part by the boundary between land and sea.

Nemi (Ozanne-Rivierre 1997), like Longgu, is spoken on a regularisably straight section of coast on a longish island (Grand Terre, New Caledonia). Like Longgu its system of absolute spatial reference includes an axis that corresponds to a regularised coastal line, and an axis that runs at right angles to it. However, unlike Longgu, Nemi makes a distinction on the basis of scale of reference, with different systems applying in two scales. One system is used for relations across the whole island or for inter-island travel. The other applies to smaller-scale relations: within a single valley, a village or a house. The large-scale system makes use of an axis corresponding to the regularised line of coast, and an axis orthogonal to that line.

```
                    -dic
                  'seaward'
                     |
                     |
   -dic   _____|_____   -da
 'northwest'         |           'southeast'
                     |
                     |
                    -da
                 'landward'
```
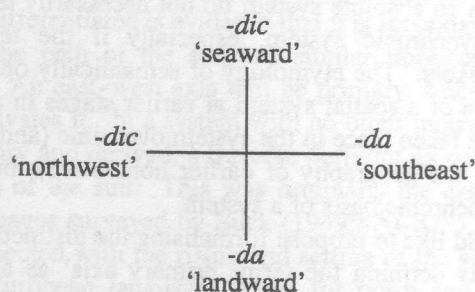
**Figure 4**: Large-scale reference in Nemi[22]

It is not clear whether these directions reflect quadrants or vectors.

The Nemi landward–seaward axis is much less bounded than its Longgu equivalent. The seaward direction is unbounded, extending from the hinterland towards the coast, across it, out to sea to the Loyalty Islands and beyond towards Vanuatu. Landward, however, is bounded. It extends from out to sea towards the coast and across it into the island, extending as far as the west coast, but apparently no further. The axis that corresponds to the line of coast is unbounded, as in Longgu, and extends indefinitely to the northwest and southeast (see Map 5).

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[22] It will be noted that in Figure 4 the pair of terms on each of the two axes are colexified. The colexification of one non-vertical axis with the vertical axis is common in Oceanic languages. Large-scale reference in Nemi represents an extreme example of this, with the axes in all three dimensions colexified. This does not undermine the discrete status of each axis:

| | verb | directional | verb | directional |
|---|---|---|---|---|
| | *ta* | *-da* | *tic* | *dic* |
| vertical | ascend | upward | descend | downward |
| landward–seaward | go landward | landward | go seaward | seaward |
| 'northwest'–'southeast' | go southeast | south-eastward | go northwest | north-westward |
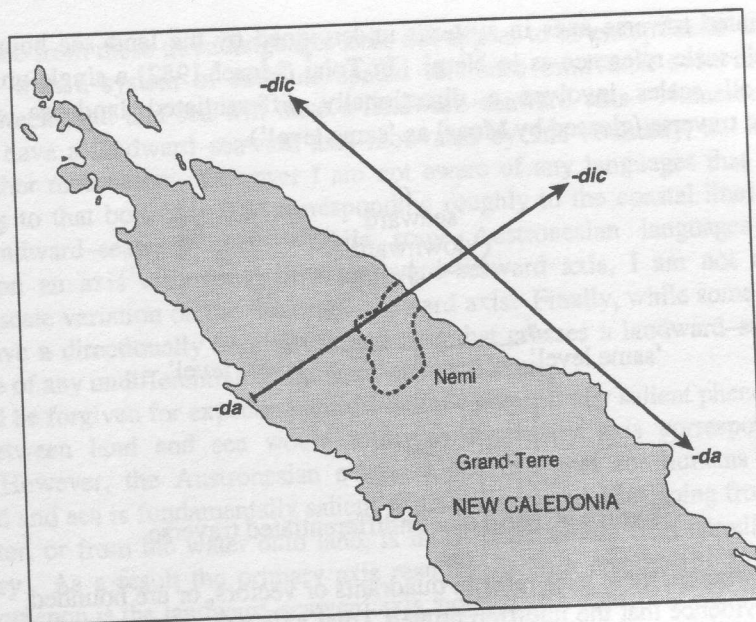
**Map 5**: Nemi large-scale reference mapped (after Ozanne-Rivierre 1997)

The same landward–seaward axis is used in the smaller scale. The difference between the two scales lies with the other axis. In the smaller scale the axis orthogonal to landward–seaward is an undifferentiated traverse (lexified by Ozanne-Rivierre as 'across'), and is lexified separately to its large-scale counterpart.
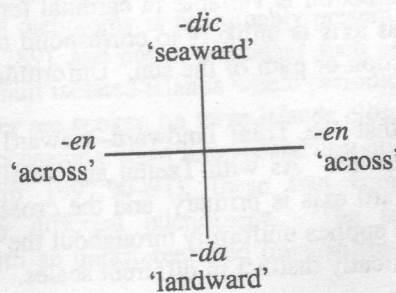


**Figure 5**: Small-scale reference in Nemi[23]

The Nemi landward–seaward axis applies consistently throughout the system of absolute reference. The axes that cross this are conceptually distinct. The larger-scale orthogonal axis is differentiated for direction, and like the equivalent axis in Longgu, it is based on a separate underlying perceptually salient phenomenon, in this case the direction of the prevailing winds. Ozanne-Rivierre reports (pers. comm.) that the axis corresponding to the line of coast is defined in terms of the path of tradewinds that blow from southeast to northwest. In the small scale, wind direction appears to play no part. The axis orthogonal to the landward–seaward axis is an undifferentiated traverse derived from a primary landward–seaward axis.

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[23] This figure is not intended to imply that these axes involve vectors rather than quadrants. A system similar to that shown in this figure is found in the nearby language Cèmuhî (Ozanne-Rivierre 1997).

Undifferentiated traverse axes in systems underpinned by the land–sea boundary are not limited to small-scale reference as in Nemi. In Tolai (Mosel 1982) a single uniform system operating in all scales involves a directionally differentiated land–sea axis and an undifferentiated traverse (glossed by Mosel as 'same level').

```
                        -a
                    'seaward'
                   ('downward')
                        │
    -o                  │                  -o
'same level' ───────────┼─────────── 'same level'
                        │
                        │
                       -ä
                   'landward'
```

**Figure 6**: The Tolai undifferentiated traverse

It is not clear whether these axes refer to quadrants or vectors, or are bounded.

There is no evidence that the undifferentiated Tolai axis has any associations independent of the landward–seaward axis. The absence of a motivating phenomenon for this axis at any scale may reflect the geography of the Tolai-speaking ar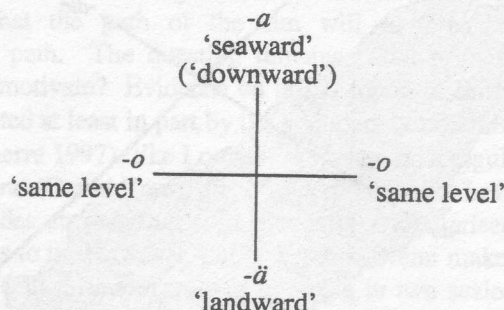ea. Here the coastline is significantly less regularisably straight than that of the Longgu-, Kwaio- or Nemi-speaking areas. Not all directional axes are straight. In many languages axes correspond to a motivating phenomenon the features of which do not allow a conceptual straight line. It may be that the Tolai coastal axis corresponds to the boundary between land and sea everywhere, even if the line of coast in various places means that this direction is variable in cardinal terms (as is the case in some other languages). If so, the cross axis is unlikely to correspond to any other physical world phenomenon, such as wind direction or path of the sun. Unfortunately it is not clear whether this is true for Tolai.

What is clear, however, is that the Tolai landward–seaward axis is differentiated for direction while the coastal axis is not. As with Tzeltal and small-scale Nemi, this in itself suggests that the landward–seaward axis is primary, and the cross axis derived. Further, in Nemi the landward–seaward axis applies uniformly throughout the absolute system, while the cross axis is conceptually and lexically distinct in different scales. This also suggests that the landward–seaward axis is primary.

The crucial evidence from Longgu, Nemi and Tolai regarding the comparative statuses of a landward–seaward axis and a coastal axis may be summarised as follows:

- Where the boundary between land and sea motivates only one axis in a system, that axis is the landward–seaward axis (as in Longgu and large-scale Nemi).

- Where the boundary between land and sea underlies both axes, but only one axis is differentiated for direction, that axis is the landward–seaward axis (as in Tolai and small-scale Nemi).

These points suggest that the boundary between land and sea will motivate a landward–seaward axis as a primary axis, and that where an axis orthogonal to the landward–seaward axis is not motivated by its own separate perceptually salient phenomenon, it will be a secondary and derived traverse axis.
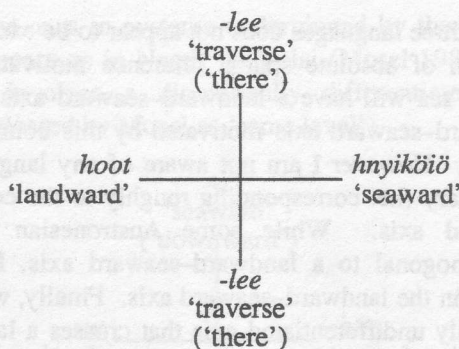
The evidence from these three languages does not appear to be exceptional. It appears that any language with a system of absolute spatial reference motivated even in part by the boundary between land and sea will have a landward–seaward axis. Numerous languages, like Longgu, have a landward–seaward axis motivated by this boundary, but a further axis with some other motivation. However I am not aware of any languages that have an axis corresponding to that boundary (i.e. corresponding roughly to the coastal line) without also having a landward–seaward axis. While some Austronesian languages make scale distinctions on an axis orthogonal to a landward–seaward axis, I am not aware of any examples of scale variation on the landward–seaward axis. Finally, while some Austronesian languages have a directionally undifferentiated axis that crosses a landward–seaward axis, I am not aware of any undifferentiated landward–seaward axes.

One could be forgiven for expecting apriori that the perceptually salient phenomenon of the boundary between land and sea would motivate a primary axis corresponding to that boundary. However, the Austronesian evidence suggests that for humans the boundary between land and sea is fundamentally salient when it is crossed, that going from land into or onto the water, or from the water onto land, is much more salient than travelling parallel to that boundary. As a result the primary axis resulting from a response to this perceptually salient phenomenon is the landward–seaward axis, not a coastal axis.

A clear illustration of derived secondary axes in path-of-the-sun and land–sea boundary based systems may be seen in the identity of the undifferentiated traverse in two distinct but complementary systems of absolute spatial reference operating in Iaai (Ouvea, New Caledonia). Like a number of languages in remote Oceania, Iaai has two distinct systems of absolute reference operating in two distinct domains: a system of small-scale reference used in relation to the immediate region, both on land and around the coast; and a large-scale system used on the scale of the entire island or archipelago (what one might call a 'navigational scale').[24] This dichotomy is presumably present in languages such as Iaai and Ponapean (Rehg 1981:288–289), and not in languages such as Longgu and Kokota, because the former are spoken on small isolated islands where periodic travel on the open ocean may be necessary, while the latter are spoken on large islands closely located to other large inter-visible islands, where only occasional short inter-island crossings are necessary.

In Iaai (Ozanne-Rivierre 1997:90–91), these two complementary systems are, not surprisingly, motivated by different phenomena. The small-scale system involves a landward–seaward axis, with an undifferentiated traverse (resembling Tolai and small-scale Nemi):

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[24] This parallels English, where the intrinsic and relative frames are used for small-scale reference, and the cardinal point system for long-distance travel. Note, however, that in Oceanic languages with this dichotomy, the systems applying in both scales are absolute.

```
                    -lee
                 'traverse'
                  ('there')


     hoot              |              hnyiköiö
 'landward' _____|_____ 'seaward'
                       |

                    -lee
                 'traverse'
                  ('there')
```

**Figure 7**: Iaai small-scale reference[25]

The Iaai system of large-scale reference is used for travel between islands and on the scale of the entire island 'to situate villages on the east and west coast'. This system involves an east–west axis, which Ozanne-Rivierre reports is 'defined with respect to the sun', and again an undifferentiated traverse:

```
                    -lee
                 'traverse'
                  ('there')


     -ü                |              -iö
  'west' _____|_____ 'east'
                       |

                    -lee
                 'traverse'
                  ('there')
```
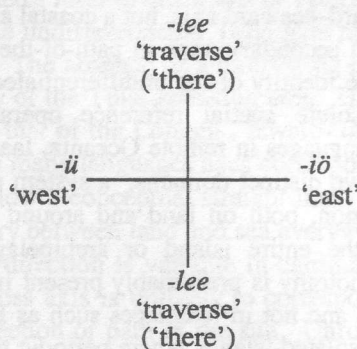
**Figure 8**: Iaai large-scale reference[26]

Here two distinct systems co-exist, one motivated by the path of the sun, the other by the boundary between land and sea. In the former it is the landward–seaward axis which is differentiated and uniquely lexified, and in the latter the east–west axis. In both, the other axis is an undifferentiated traverse, adding to the evidence supporting the secondary status of cross axes relating to both motivating phenomena. However, Iaai provides stronger evidence for the secondary status of these cross axes, in that the undifferentiated traverse in both scales is identically lexified. The use of the same term for directions on the cross axis in both scales, and the fact that this term also has a separate directionally non-specific demonstrative function, suggests that the term is used to lexify directions which have no independent basis, supporting the hypothesis that these undifferentiated traverses are derived and secondary.

To propose that a phenomenon in the physical world is perceptually highly salient is to make a universal claim about cognition. Any phenomenon which is claimed to be perceptually highly salient must be equally salient to all humans who encounter it, regardless of whether their language's system of spatial reference includes axes motivated by that

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[25] This figure is not intended to imply that these axes involve vectors rather than quadrants.
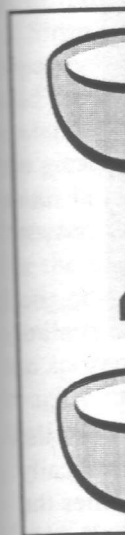
[26] This figure is not intended to imply that these axes involve vectors rather than quadrants.

phenomenon. This predicts that the path of sun will be salient to all sighted humans. It also predicts that the boundary between land and sea will be salient to all humans who encounter it. If it is also true that the primary axis motivated by the boundary between land and sea is one which is orthogonal to it, then it must suggest a conceptual line orthogonal to that boundary to all humans. It should, for example, be possible to appeal to it in English, even though a landward–seaward axis plays no part in the English system of absolute spatial reference. And there is evidence that this is so. Marine route descriptions may include statements such as: 'Head north along the coast until you reach the lighthouse'. The lighthouse in this example would never be reached as it is on land. The point referred to in this instruction would be interpreted by an English speaker as a point corresponding to that of the lighthouse on a line crossing the coast at right angles. It would not, for example, be interpreted as referring to a point where the lighthouse first becomes visible.

This interpretational appeal to a conceptual (but not linguistic) landward–seaward axis is evident in an Australian beach safety convention expressed by the phrase 'swim between the flags'. Crucial to this instruction is a superficially anomalous use of the preposition *between*. A referent encoded as being between two relata (or two parts of a complex relatum) will normally be interpreted as being located in a search domain projected off each relatum (or part of the relatum) towards the other relatum (or part of the relatum). In other words, it will be located somewhere on the conceptual line running directly from one relatum to the other and bounded by the two relata. In Figure 9, for example, the key is between the two cups, while in Figure 10 it is not. The location coded by *between* does not extend out from a conceptual line running directly from one cup to the other far enough to encompass the key in Figure 10, even though it may be less than a metre away from either cup.
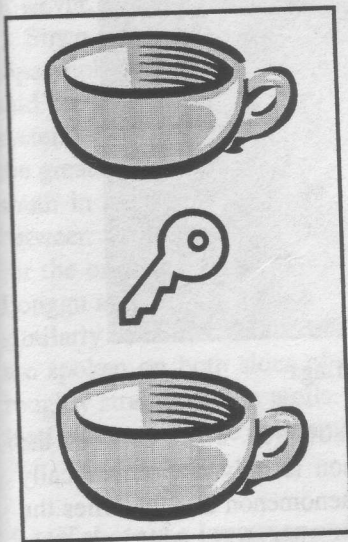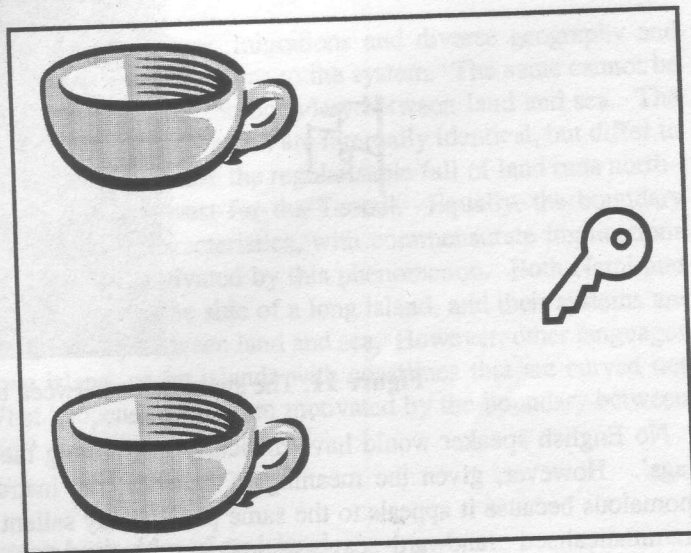


**Figure 9**: The key is between the cups

**Figure 10**: The key is not between the cups

However, if a comparable array is transferred to a coastline, the situation changes. On many Australian city beaches, an area of sea adjacent to one part of the beach may be designated by lifesavers as safe to swim in. This area of sea is indicated by placing two flags on posts into the sand well above the high tide mark, and erecting a sign with the instruction 'swim *between the flags*'. If *between in this instruction was interpreted in the way it is in* Figure 9 it would appear to require swimmers to swim on the sand half way up the beach. However, no English speaker would interpret this instruction in this way, or have any difficulty interpreting it correctly, even if encountering it for the first time. Swimming involves water, so the immediate interpretation of *between* here is semantically anomalous. Some other way of understanding the instruction must be found, and the one that immediately presents itself is that between refers not to a space bounded by the flags themselves, but by two conceptual lines running orthogonal to the land–sea boundary from the flags and out to sea. In Figure 11 the swimmer is between the flags in a way that the key is not between the cups in Figure 10. It is not clear how far out to sea this line can be interpreted as extending, however it appears to be some distance. It would, for example, be perfectly acceptable to say something like *the fool swam two hundred metres out to sea, but at least he was still between the flags*.
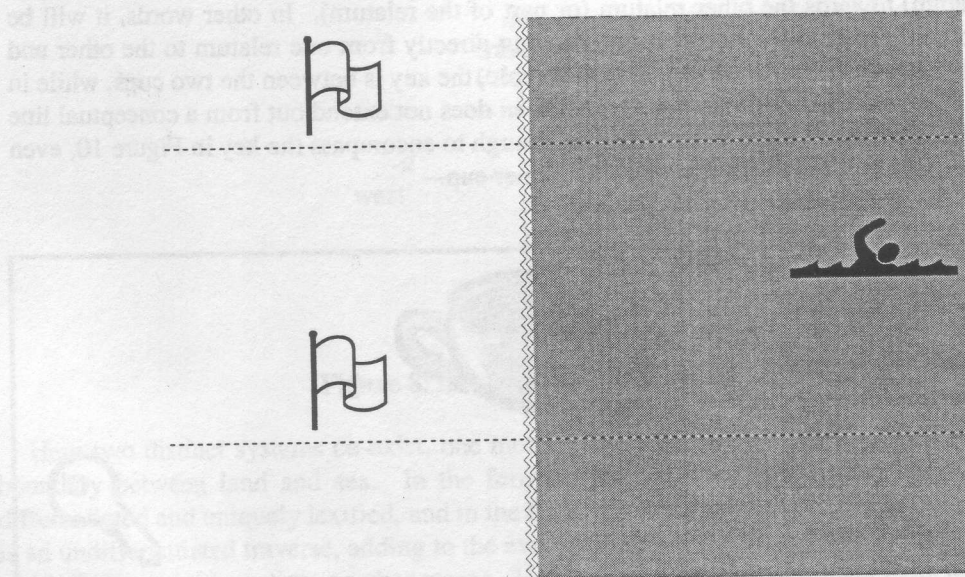


**Figure 11**: The swimmer is between the flags

No English speaker would have difficulty interpreting the instruction 'swim between the flags'. However, given the meaning of *between*, the instruction is only not semantically anomalous because it appeals to the same perceptually salient phenomenon that underlies the grammaticalised landward–seaward axis in Austronesian languages. Although this phenomenon is not grammaticalised as part of the English spatial system, the instruction shows that this phenomenon is highly salient, and any appeal to it makes immediate sense.

# 5 The dependency of systems of absolute spatial reference on motivating phenomena

In §4 it was suggested that phenomena in the physical environment of a community will underlie features of the systems of absolute spatial reference in that community's language. Implicit in this is a dependency of the system on the environment. Clearly a language spoken in the centre of a large continent will not have a system employing a landward–seaward axis, nor will a language spoken on an atoll make use of elevational terms like those found in some Papuan and other languages (see §6.2). This has implications for the integrity of systems which have been relocated due to speaker migrations, or to diversity of geographic or topographic features in the language locus. It also has implications for the way systems with the same conceptual basis will be structured in different environments. This is more significant for systems motivated by certain kinds of physical phenomena than it is for others.

The path of the sun is apparent everywhere humans normally live. Moreover, everywhere where it is apparent, its orientation is roughly the same. In far northern and southern latitudes sunrise will be more towards the south or north than due east, however that also applies to the location of sunset. Therefore, a straight axis motivated by this phenomenon is likely to point as close to the location of sunrise as possible in one direction while at the same time pointing as close to possible to the location of sunset in the other. The resulting axis will thus still roughly represent a line from east to west. (Such an axis may be skewed to allow it to interact orthogonally with an axis motivated by a different underlying phenomenon, as in Longgu.) It is interesting to consider the possibility of a hypothetical language spoken in very far northern or southern latitudes, which has a curved primary path-of-the-sun axis, with the annual average location of sunrise and sunset as the core directional points on this axis. I am, however, not aware of such a language.

Since the path of the sun is similar everywhere, migrations and diverse geography and topography will not necessarily require any modifications to the system. The same cannot be said for a regularisable overall fall of land, or for the boundary between land and sea. The systems of absolute reference found in Tzeltal and Tzotzil are internally identical, but differ to the greatest possible extent in cardinal terms because the regularisable fall of land runs north–south in the Tzeltal-speaking region and east–west for the Tzotzil. Equally, the boundary between land and sea varies in its physical characteristics, with commensurate implications for the orientation and structure of systems motivated by this phenomenon. Both Nemi and Longgu are spoken on sections of coast along one side of a long island, and their systems are similarly structured in terms of the boundary between land and sea. However, other languages are spoken on both sides of a long island, or on islands with coastlines that are curved not roughly straight, or on atolls. What happens to a system motivated by the boundary between land and sea in these environments?

## 5.1 Kokota—a language spoken on both sides of an island

Longgu and Nemi are each spoken on one side of a long island on a regularisably straight stretch of coast. Kokota (Solomon Islands) is also spoken on regularisably straight stretches of coast on a long island, but as Maps 1 and 6 show, it is spoken on both sides of that island. The system of absolute spatial reference in Kokota is conceptually similar to the Longgu system, however the language's location on opposing sides of the island has implications for that system.

Like Longgu, Kokota has a landward–seaward axis, and orthogonal to that, an east–west axis running northwest–southeast. Both axes are differentiated and all four directions are lexified with unique directionals.[27] But the system can not be identical on both sides of Santa Isabel. Kokota is spoken in three villages—Goveo and Sisiga on the northeast coast, and Hurepelo on the south-west coast.

In Goveo and Sisiga, a direction from the mountainous interior towards the coast, from the village to the shore, and away from the shore out to sea, is *rauru*. The opposite direction from the sea towards land and then on into the interior is *rhuku*. On the east–west axis northwest is *paka*, and southeast *fona*. This was schematised by my informant, James Tikani, in Goveo village:
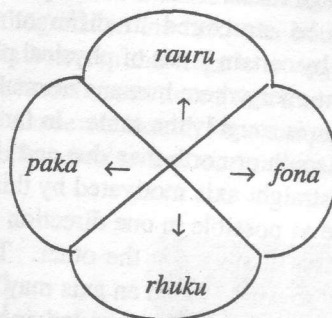


**Figure 12**: Kokota absolute directional schema, drawn in Goveo village

This Goveo speaker's own schema demonstrates that these directional terms refer to quadrants not vectors, as in Longgu. However unlike Longgu seaward is unbounded: the direction indicated by *rauru* crosses the coast and continues out to sea indefinitely. On the other hand *rhuku* is apparently bounded, ending somewhere in the middle of the island.

However the schema in Figure 12 is only applicable in Goveo and Sisiga, not in Hurepelo on the opposite coast. The spatial system can not be identical on both sides of Santa Isabel. If the landward–seaward axis and the east–west axis are motivated by separate phenomena and each maintains its internal integrity, then in Hurepelo *fona* must continue to mean 'east' and *rauru* 'seaward'. For this to be possible the relationship between the two axes must be different on each side of the island. This is in fact the situation—the system operating in Hurepelo is the mirror image of that operating in Goveo (see Map 6). In Goveo when you face *rauru*, *fona* is on your right. In Hurepelo it is on your left. Not surprisingly, speakers from Goveo find directions confusing when they are in Hurepelo and vice versa.

This demonstrates two facts about absolute spatial reference. Firstly, where two axes are each motivated by separate perceptually salient phenomena, and consequently are to a degree conceptually independent, they will interact differently in locations where the interaction of the motivating phenomena differs. Secondly, it demonstrates that this can occur within a single language, where what is fundamentally a single conceptual system can be manifest differently in different parts of the language locus. This is not dialect difference, but the effect of environmental constraints on an environmentally sensitive system.

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[27] Spatial reference in Kokota is described by Palmer (1999, 2001, in press), however a number of relevant representative examples are presented in Appendix 1.
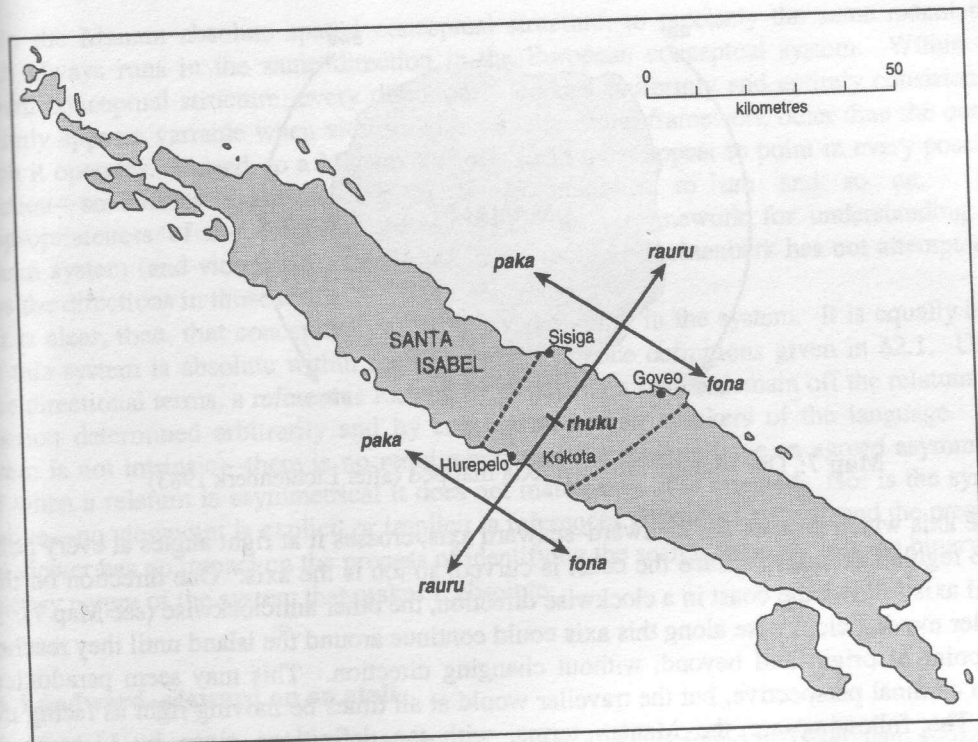
**Map 6**: Kokota absolute reference mapped

## 5.2 Landward–seaward on a round island

A quite different manifestation of the landward–seaward axis occurs when a system with such an axis is found in a language spoken on a round island. If an apparent landward–seaward axis corresponds to a single bearing in our cardinal sense, say southwest–northeast like in Longgu, Nemi and Kokota, then at almost all points around the coast the direction is not going to correspond to a line orthogonal to the boundary between land and sea. By definition such an axis could not in fact be a landward–seaward axis. On the other hand, if the integrity of the landward–seaward axis is maintained, then 'seaward' must point in every cardinal direction simultaneously, depending on where the relatum is located on the coast. If the origo is the westernmost point on the island, seaward will point due west. If it is the southernmost point, seaward will point due south, and so on, and landward will always be the opposite of that.

A system like this is found in Manam (Lichtenberk 1983:569–597). The boundary between land and sea is the sole motivating phenomenon in the Manam system of absolute spatial reference, and Manam is spoken on a round island. Consequently Manam has a landward–seaward axis which radiates out from the centre of the island, apparently in every direction, crossing a regularised but curved coastline orthogonally at every point. That being so, it is impossible to represent this axis on a map of the island in the way that it is possible to do so for Longgu, Nemi and Kokota.
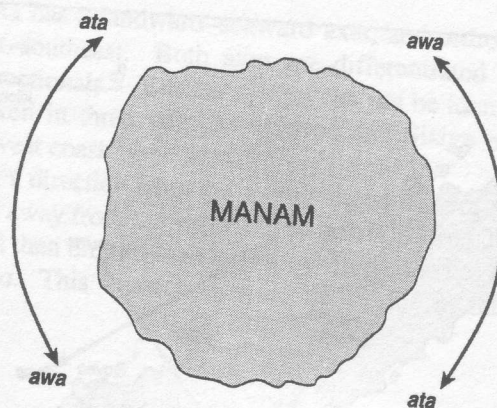
**Map 7**: The Manam *ata-awa* axis mapped (after Lichtenberk 1983)

The axis which crosses the landward–seaward axis, crosses it at right angles at every point on the regularised coast. Since the coast is curved, so too is the axis. One direction on this curved axis follows the coast in a clockwise direction, the other anticlockwise (see Map 7). A traveller moving clockwise along this axis could continue around the island until they reached their point of origin and beyond, without changing direction. This may seem paradoxical from a cardinal perspective, but the traveller would at all times be moving right as facing the sea. The following are the Manam terms, with the definitions given by Lichtenberk (1983:572).

(13)  *ilau*   'seaward'

      *auta*   'inland' [i.e. landward]

      *ata*    'to one's right when one is facing the sea, to one's left when one is facing inland'

      *awa*    'to one's left when one is facing the sea, to one's right when one is facing inland'

These are all unique directionals. In addition to these terms, a corresponding set of motion verbs exists indicating motion in each of these directions (1983:576).[28]

(14)  *oti*    'move in *ilau* direction'

      *oro*    'move in *auta* direction'

      *raʔe*   'move in *ata* direction'

      *bala*   'move in *awa* direction'

It might not seem immediately apparent how this system could be absolute, since both axes appear from a European perspective to be able to run in any direction. However, that is only true if we think of 'direction' purely in the culture-specific terms of the cardinal point system. In fact the Manam landward–seaward axis runs in exactly the same direction at all times

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28 A set of verbal directional suffixes also occurs which are formally identical to the motion verbs, with the exception of *-ria* corresponding to *awa/bala*.

within the Manam absolute spatial conceptual structure, to precisely the same extent that North always runs in the same direction in the European conceptual system. Within the Manam conceptual structure, every directional operates uniformly and entirely consistently, and only appears variable when viewed within a conceptual framework other than the one in which it operates. Indeed, to a Manam speaker North must appear to point in every possible direction—sometimes corresponding to *ilau*, sometimes to *ata* and so on. The inappropriateness of the English cardinal system as a framework for understanding the Manam system (and vice versa) is reflected in the fact that Lichtenberk has not attempted to gloss the directions in those terms.

It is clear, then, that conceptually there is no variability in the system. It is equally clear that this system is absolute within the frames of reference definitions given in §2.1. Using these directional terms, a referent is located by projecting a search domain off the relatum in a direction determined arbitrarily and by convention among speakers of the language. The system is not intrinsic—there is no requirement that the relatum have an agreed asymmetry, and when a relatum is asymmetrical it does not matter how it is oriented. Nor is the system relative—no viewpoint is explicit or implicit in references within the system, and the presence of a viewer has no impact on the process of identifying the search domain. It is the binary and arbitrary nature of the system that makes it absolute.

## 5.3 Landward–seaward on an atoll

Yet another manifestation of the landward–seaward axis is found in Tokelauan, spoken on an atoll (anon 1986; Hoëm 1993). Most atolls have the topographically unusual feature of having the land in a ring or fragments of a ring around a central lagoon. Tokelauan has a landward–seaward axis encoded by local nouns (shown in example (15)) and directional particles (in (16)):[29]

(15)  *gātai*  'seaward'[30]
      *gāuta*  'landward'

(16)  *ifo*  'seaward'
      *ake*  'landward'[31]

However, because the land forms a narrow strip along the fringe reef, each term refers to what superficially appear to be opposing directions, depending on whether the central lagoon or the open ocean outside the atoll is at issue. The 'landward' terms refer to a direction toward land, either towards the atoll as a whole from the sea outside the atoll, or towards land

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[29] Hoëm (1993) gives no indication as to whether terminology exists in Tokelauan for travelling along the shore of the island either on foot or by canoe, or whether terminology exists for travel around the atoll parallel to the reef, either inside or outside, comparable to the clockwise/anticlockwise cross axis in Manam.

[30] Note that Tokelauan orthographic g = /ŋ/.

[31] In many Oceanic languages a correspondence exists between landward–seaward and the vertical domain, with an association between landward and vertical up, and seaward and vertical down. (See, for example Nemi (fn. 21).) This association is maintained even where no actual ascent or descent is involved, such as when travelling across water towards or away from land. In Tokelauan the directional particles have this association, with *ake* also lexifying up and *ifo* down on the vertical axis. This correspondence is particularly striking for Tokelauan since none of the islands rise more than five feet above sea level.

from the lagoon, and to a direction further inland from on land, including going along the island from the village (the controlled environment) into the bush (the wild environment). The 'seaward' terms refer to a direction away from the atoll as a whole at sea, or away from the shore towards the centre of the lagoon, as well as towards the shore from on land.[32] (See Map 8.) In this system, each term refers to both superficially opposing directions on any given line running orthogonally to the coast. However, this is an illusory paradox imposed by the cardinal point system on what is an internally consistent and coherent system: *gātai* refers to a single conceptual direction, seaward. It is a consequence of the specific nature of the topography that in Tokelauan seaward represents both away from and towards the centre of the atoll when the atoll is treated as a unitary whole.
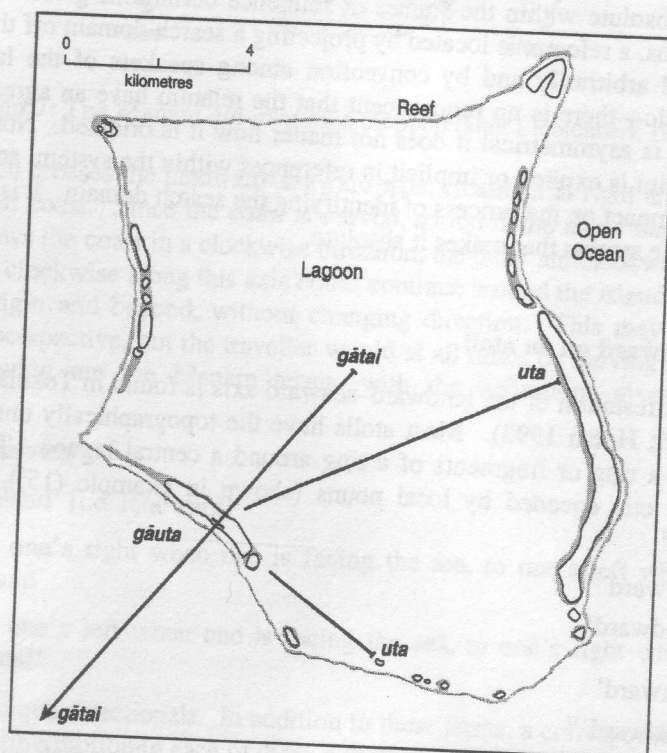


**Map 8**: The Tokelauan landward–seaward axis mapped for Nukunonu
(modified from Hoëm 1993)

Nonetheless, this manifestation of the landward–seaward axis appears to give the system a kind of perimeter focus, where the directional focus of the atoll is the boundary between the lagoon and the open ocean. Within that, *gātai* and *ifo* indicate a direction away from this

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[32] The form *gātai* is in fact a reflex of Proto Oceanic *tasik* 'sea', with a frozen prefix *gā-*. When in the village its lagoon side may be referred to as *gātai* 'seaward' or by the open class noun *namo* 'lagoon'. The open ocean side of the village may be referred to as *gāuta*, however it is more typically referred to as *i tua*, a locative prepositional phrase meaning 'at the back'. Because the focus and orientation of the villages is towards the lagoon and away from the ocean side of the island, 'it is not common that people refer to the open ocean side of the village as *gātai*, only *i tua*'(1993:141). The interaction of absolute and intrinsic elements represented by this use of *i tua* warrants further investigation, but is beyond the scope of the present work.

perimeter focal point, and *gāuta* and *ake* indicate a direction towards it. The extent to which this apparent perimeter focus is psychologically real is unknown. It would be instructive to examine the way these terms are used in relation to points on the fringe reef where there is no land. Interestingly, a further closed class locative/directional term, *uta*, refers to a direction towards fringe islands, apparently other than the main inhabited island, regardless of whether this involves crossing the lagoon or travelling around the perimeter, as Map 8 shows. Details of the operation of this term within the overall system of spatial reference are not clear.[33]

There can be little doubt that the *gātai-gāuta* axis is connected to directions towards sea and land in a psychologically real way. It is clear from Hoëm's remarks that speakers associate *gātai* with sea and *gāuta* with land. Moreover, the directionals formally consist of the form *gā-* with the locative *uta* 'islets' and the common noun *tai* 'sea', giving the terms almost the semantic transparency of the English *seaward* and *landward*.[34]

Further information is needed to fully understand the way absolute systems operate on atolls. Unfortunately at this stage no other studies on spatial reference in atoll-based languages have been published.

## 6  The significance of comparative research

Over the last decade and a half research into spatial reference has increasingly turned away from the familiar European languages, and towards so-called 'exotic' languages. Due to the previous absence of significant information about spatial reference in non-Indo-European languages, this initial phase of cross-linguistic research has by necessity taken a macro perspective: research has been carried out into languages which are as diverse as possible, genetically, typologically, and geographically, in an attempt to broadly identify some of the diversity that exists in linguistic spatial systems. There can be no doubt that this aim has been achieved. Many traditional assumptions about the nature of spatial cognition have been proven false as a consequence. This initial phase has set the scene for a new phase of research, at least as far as absolute reference is concerned. In this new phase a more fine-grained approach to cross-linguistic research is needed, in the form of comparisons of spatial systems in languages targeted within two related paradigms of comparison: languages which are closely related but spoken in diverse topographic and geographic environments; and the corollary, languages which are unrelated but spoken in similar topographic and geographic environments.

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[33]  In fact, Hoëm claims *gāuta* 'landward' is derived 'from *ga-* and *uta* meaning the islets on the far side of the lagoon' (1983:141). She goes on to say that 'The islets on the far side of the lagoon where the coconut plantations are, are called *uta*'. These remarks suggest that *uta* may in fact simply be an ordinary noun meaning 'land', or 'islet' or some such, while of the two only *gāuta* is actually a grammatical locative. Nevertheless, this requires further investigation.

[34]  The frozen prefix *gā-* appears to have no synchronic independent semantics, while the English *-ward* does occur elsewhere (*toward*, *northward* etc.). However the semantic independence of *uta* and *tai* must give the terms psychologically real topographic associations.

## 6.1 The comparison of related languages spoken in differing environments

The languages discussed so far in this chapter all have systems of spatial reference which make use of a landward–seaward axis. However, this is not the extent of the significance of a comparison of these systems. In addition these languages are all genetically related. A comparison of such languages allows conclusions to be drawn about the way in which particular elements of a system have been modified or adapted to fit new topographic and geographic environments encountered by ancestral language communities. The common ancestor of these languages, Proto Oceanic, can be assumed to have had a system of spatial reference. As Oceanic speech communities spread out into the Pacific they settled in new locations which were not identical to their former homes. As with the bi-coastal nature of Kokota, this change of locus would have necessitated changes to the system of spatial reference. As the languages described in §5 show, a single component, in this case a landward–seaward axis, will be manifested differently on islands of different shapes. A comparison of the spatial systems of related languages reveals the nature of responses to environmental phenomena. This diachronic perspective potentially provides a window onto the way humans will respond conceptually to specific environmental features.

Pre-existing system elements may be manifested differently, but remain fundamentally conceptually the same, as the landward–seaward axes in the languages in §5 show. While they are manifested differently, each remains a landward–seaward axis. Re-analyses and adaptations of system elements may be more dramatic, however, when the motivating phenomenon of a system element is absent from a new environment. This is exemplified by a comparison of certain western Austronesian languages. In Balinese, for example, a landward–seaward axis is lexified by -*lod* 'seaward' and -*aja* 'landward' (Adelaar 1997).[35] These are cognate with terms in a watercourse-based system in Aralle-Tabulahan, spoken in the interior of Sulawesi, some distance from the coast (McKenzie 1997). In Aralle-Tabulahan two absolute systems operate in conjunction, one of which is a watercourse-based system comprising an upstream–downstream axis, with an undifferentiated traverse (the other is elevational, i.e. based on the vertical domain and used in very mountainous regions). Watercourse-based systems of this kind are common in the interiors of large islands in the region, including Borneo, Sulawesi, and New Guinea.[36] In Aralle-Tabulahan, this axis is lexified by the locatives *yaling* 'upstream' and *lau'* 'downstream', cognate with the Balinese landward and seaward terms respectively. Both sets of terms are reflexes of the reconstructed Proto Austronesian \**Daya*, and \**laSud*, glossed by Adelaar (1997:53) as 'towards the interior' and 'towards the sea' respectively. Blust (1997:39) reconstructs for Proto Malayo-Polynesian \**daya* and \**lahud*, glossed as 'upriver, towards the interior' and 'downriver, towards the sea'. Whether these reconstructed forms lexified a watercourse-based axis or a landward–seaward axis (or perhaps both), their reflexes in daughter languages lexify axes of both types. In coastal languages, where the boundary between land and sea is salient, this has been interpreted as a landward–seaward axis. In landlocked languages, where that boundary is not salient, but large rivers exist, the axis has been interpreted as an upriver–downriver axis. Which came first is not important for the present purposes. The crucial point is that what was

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[35] Adelaar discusses these terms in relation to cardinal north and south, however he notes that 'the directional terms [are] dependent on the geography of the place where they are used. The points of reference of the system are not the absolute north and south, but the direction of the sea and its correlate, the interior'. He goes on to present evidence of these terms corresponding to cardinal east and west at the eastern end of Bali.

[36] Adelaar (1997:68–71) discusses the situation in Borneo.

originally a single system has been re-analysed to cope with diverse topographic and geographic environments.

A differing re-analysis is evident in the non-Austronesian language Asmat, spoken over a large area of southern Irian Jaya both on the coast and up to 120 kilometres from the sea (Voorhoeve 1965; Drabbe 1959; Palmer n.d.). Almost all the Asmat live by the region's many rivers, and the language's system of spatial reference makes use of an upriver–downriver axis (lexified by *en* and *ni* respectively), and an upstream–downstream axis (lexified by *tep* and *tak*). The two axes differ functionally only in the size of the watercourse to which they are applicable. In addition an undifferentiated traverse refers to crossing watercourses. There is also an axis orthogonal to the watercourse-based axes which appears to correspond conceptually to a landward–seaward axis. This codes a direction from the centre of a watercourse towards the bank, onto land, and away from the watercourse, and the reverse direction towards a watercourse.

In the coastal region this system can obviously not operate as just described. In this region the directional system has an axis which runs roughly cardinal northwest to southeast corresponding to the line of coast. This system is lexified with the terms lexifying upriver and downriver in the interior. The landward–seaward axis applying to watercourses also appears to apply here.
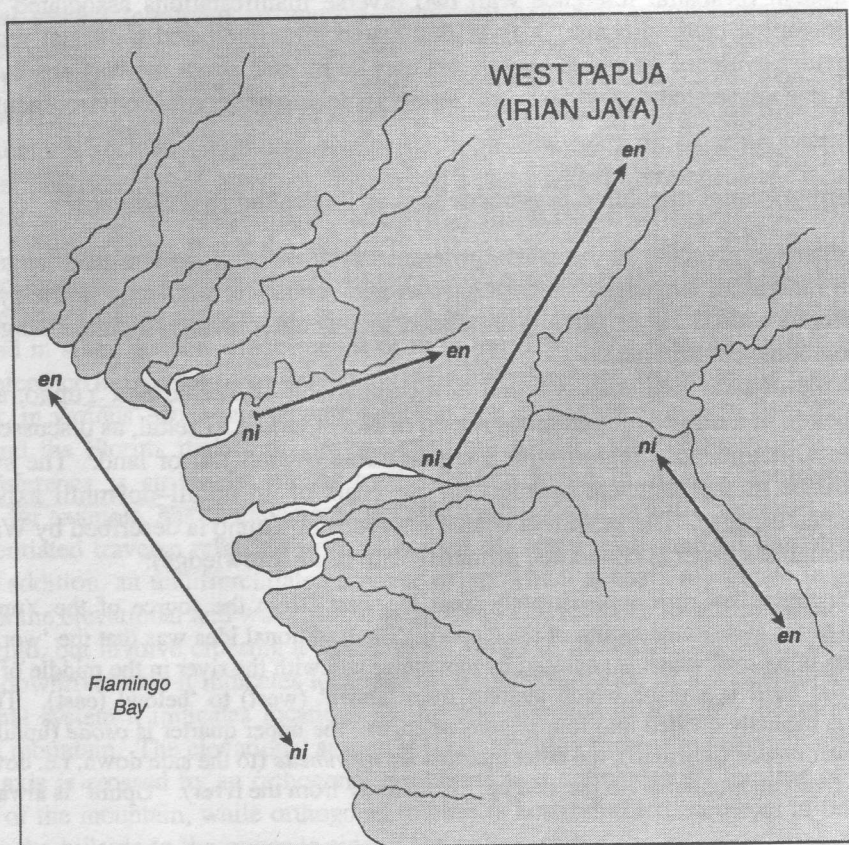


**Map 9**: The Asmat language locus, with the *en-ni* axis mapped

This differs markedly from the Austronesian correspondence between landward – seaward and upriver – downriver. However, the directions on the Asmat coastal axis are instructive: upriver corresponds to northwest along the coast and downriver to southeast. In Austronesian languages with a path-of-the-sun based axis and an association between this axis and the vertical axis, it is east which is treated as corresponding to up, and west to down, apparently due to the association between the rising and setting of the sun. This association is clearly not present in Asmat, as the opposite correspondence exists. It is possible to hypothesise that the upriver–downriver correspondence is based on sea currents. The prevailing currents along the south coast of Irian Jaya flow in a south-easterly direction. The direction of the flow thus corresponds to downriver, and the direction against the flow to upriver. If this association has psychological reality, then it may suggest that the inland, watercourse-based system came first, and the coastal system is an adaptation of it. This would contrast with the Austronesian case, where it appears likely that the upriver–downriver interpretation exemplified by Aralle-Tabulahan developed from a landward–seaward axis. These hypotheses correlate to non-linguistic information about population origins, with the Austronesians being a maritime people (and note that the distant ancestors of the Aralle-Tabulahan came to Sulawesi by sea), while the Asmat have no significant maritime tradition. However, comparisons of the Asmat and Austronesian systems aside, Asmat itself presents an example of a fundamentally unitary linguistic system of spatial reference with two diverse manifestations associated with two diverse topographic environments: a river dominated hinterland and a coastal region. As such, it provides evidence on which hypotheses may be formed about the way absolute spatial systems are re-analysed to cope with diverse topographic and geographic environments.[37]

## 6.2 The comparison of unrelated languages spoken in similar environments

The corollary to diversity in the spatial reference systems of closely related languages (or even within individual languages, as with Kokota and Asmat) is similarity in the systems of absolute reference used by genetically unrelated and geographically separate languages in similar topographic environments.

An example of such similarity is found in a comparison of Tzeltal and Yupno, a Papuan language spoken in a rugged mountainous region of New Guinea. Tzeltal, as discussed above, is spoken in a mountainous region with a regularisable overall fall of land. The system of spatial reference in the language operates on the basis of an uphill–downhill axis and an undifferentiated traverse. The system of spatial reference in Yupno is described by Wassmann (1997) (although his paper is concerned primarily with route knowledge):

> The Yupno valley runs approximately from the west (from the source of the Yupno River) to the east (to the mouth of the Yupno). The traditional idea was that the 'world' consists of an oval which is enclosed by mountains and with the river in the middle of it. The oval itself is a plane which inclines from 'above' (west) to 'below' (east). This plane is mentally divided into four regions or edges: the upper quarter is *osode* (uphill), the lower *omode* (downhill), the other quarters are *ngwimede* (to the side down, i.e. down to the river) and *ngwiside* (to the side up, i.e. up away from the river). 'Uphill' is always

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[37] The modification of linguistic systems of spatial reference is not limited to re-analyses of elements of absolute systems. Pederson (1993) presents evidence that while rural Tamil speakers employ an absolute frame of reference almost exclusively, urban Tamil speakers (at least in one community) operate primarily in the intrinsic reference.

the mountain region with the source of the Yupno in its middle, 'downhill' is always the coastal area where the mouth of the river is. (Wassmann 1997:155–156)

As with Tzeltal, a regularisable overall fall of land is associated with an uphill–downhill axis (in this case clearly quadrant-based). One of these languages is Mayan, spoken in Mexico, the other Papuan, spoken in New Guinea. There can be no question of genetic or areal influence. However, both are spoken in similar physical environments, and both have similar systems of spatial reference.

Similarly, comparable elevational systems are found in unrelated languages in unrelated locations. As mentioned above, Aralle-Tabulahan has an elevational system operating in conjunction with its upriver–downriver system. This elevational system comprises an upward–downward axis, and an undifferentiated traverse which, because of the vertical nature of the primary axis, refers to locations on the same level (i.e. altitude). Elevational systems are only found in languages spoken in mountainous regions where there is implicitly no perceived regularisable overall fall of land. Austronesian languages tend not to be spoken in mountainous highland regions, so Aralle-Tabulahan is unusual among Austronesian languages in having such a system. However, numerous non-Austronesian languages in the mountainous interior of New Guinea have elevational systems (see Foley 1986:148–152; Heeschen 1982). Absolute spatial reference in Yale (Heeschen 1997) operates only with an elevational system involving an upward–downward axis and an undifferentiated traverse, glossed as 'across' (from the examples apparently meaning 'on the same level'). In Yale the additional element of distance from origo is factored into the cross axis. Nimboran (Steinhauer 1997; Voorhoeve 1997) has a very similar system (analysed by Steinhauer on the basis of features such as + high and + low, the -high -low category seemingly representing a same-level undifferentiated traverse). Nimboran has the added component of visibility. This may not be as deictic as it appears at first glance, instead perhaps representing visibility from the origo (whether or not that is the speaker).

The presence of similar elevational systems in Papuan languages and in Aralle-Tabulahan is not the extent of the genetic and regional distribution of such systems. Such systems are also found in some dialects of German spoken in the Alps. The standard system of absolute spatial reference in German, like English, is the cardinal system, based on the path of the sun. However, in various Alpenmundarten (including that of Kanton Wallis in Switzerland (Krier 1986), and the Florutz dialect of German-speaking Italian Tyrol (Rowley 1980)), absolute spatial reference is strikingly similar to the system found in Aralle-Tabulahan. Florutz German, for example, has an elevational system involving an upward–downward axis, with an undifferentiated traverse referring to locations on the same level; and an upriver–downriver axis. In addition, an undifferentiated traverse exists which appears to operate in conjunction with both the elevational and watercourse axes. This axis refers to locations on the same level as the origo, but involve crossing a watercourse, valley or mountain. In conjunction with the upriver–downriver axis it indicates locations on the opposite side of a watercourse. With the elevational system it indicates locations on the opposite side of a valley, or on the opposite side of a mountain. The elevational system is therefore truly three dimensional: an effectively vertical axis is crossed by an orthogonal horizontal axis delineated by the line of ground on the side of the mountain, while orthogonal to both, a horizontal axis projects in one direction out from the hillside to the opposite side of the valley, and in the other direction through the mountain to the other side. This third axis effectively refers to same-level locations which must be reached by going down then up or up then down, in contrast with the 'level' axis,

which refers to locations which can be reached by maintaining the same level.[38] The specifics of this cross axis aside, these Alpenmundarten share with Aralle-Tabulahan an elevational system operating in conjunction with an upriver–downriver axis. Again these striking similarities can not be the result of genetic or areal influence.

A comparison of the systems of absolute spatial reference in genetically unrelated languages in similar topographic and geographic environments may be interpreted as providing evidence of systematic linguistic responses to specific kinds of environments. A comparison of related languages in differing environments may provide evidence of the effect these responses have on existing systems transferred to new loci. The striking nature of the very preliminary comparative findings described above, drawn from secondary sources, point to the potential value of more rigorous fine-grained comparisons of selected linguistic systems.

## 7  The significance of remote Oceania for absolute spatial research

The way perceptually accessed phenomena are grammaticalised to form elements of linguistic spatial reference has the potential to provide a window onto spatial cognition, as does the way linguistic systems are restructured or modified to adapt to the topographic features of a new language locus. However, in most instances processes of grammaticalisation and modification are not insulated from other factors, such as external cultural influence. This point is usefully illustrated by certain languages of Halmahera (eastern Indonesia).
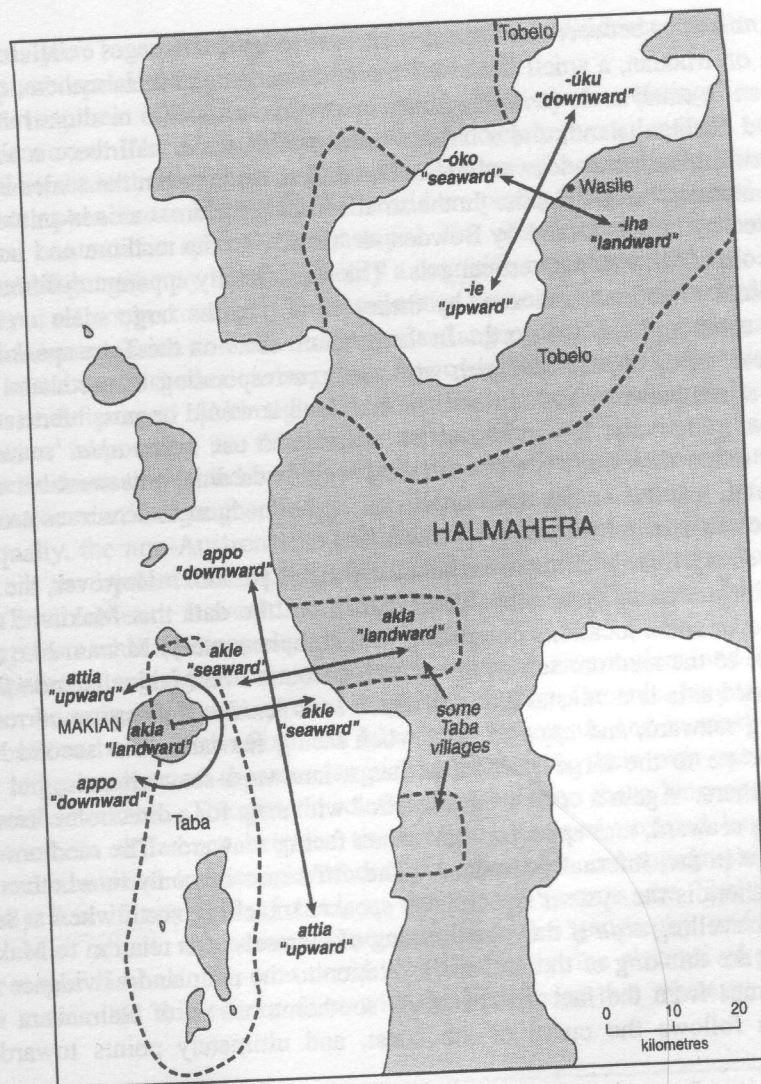
In Tobelo and Galela (Taylor 1984), two closely related non-Austronesian Halmahera languages, two axes operate in the non-vertical dimension. One is a landward–seaward axis, the other an axis that runs parallel to the line of coast in the various Tobelo- and Galela-speaking areas of mainland Halmahera, a line that runs roughly north–south in cardinal terms.[39] (See Map 10.) The coastal axis is colexified in both languages with directions in the vertical dimension, with 'south' corresponding to up and 'north' corresponding to down.[40]

In the dialect of the unrelated Austronesian language North Moluccan Malay (NMM) spoken in Wasile, in the middle of a Tobelo-speaking region, the system of absolute reference is virtually identical, although it is independently lexified (Taylor 1983). In a sense this is not surprising, since NMM is a Halmahera lingua franca, and most speakers of NMM in Wasile are bilingual with Tobelo. Indeed, Taylor claims that by colexifying the coastal and vertical axes 'NMM preserves local language usage' (1983:18), and observes that the overall system is the 'primary influence of local languages on NMM deixis' (1983:17). Note that it is the Papuan language which is interpreted as influencing the Austronesian language. Yet this shared system has the basic elements found throughout the Austronesian-speaking world.

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[38] Axes referring to locations which are on the same level but require a change in level to reach apparently exist in some New Guinea highlands languages (Rumsey pers. comm.), but I have seen no reference to this in print.

[39] The exact nature of the interaction between these two axes is not entirely clear.

[40] Taylor implicitly treats these vertical senses as basic, but provides no evidence justifying this assumption. (See also the colexification of axes in Nemi described in fn. 21.)

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**Map 10**: Makian Taba reference mapped
(modified from Bowden 1997)

In the Austronesian language Taba (South Halmahera – West New Guinea subgroup, Bowden 1997), spoken on the opposite side of Halmahera, a partially similar looking system exists. In the variety of Taba spoken on the west coast of mainland Halmahera, the system of absolute spatial reference resembles closely that found in Tobelo and North Moluccan Malay. A landward–seaward axis exists, crossed orthogonally by an axis which is colexified with the vertical axis, the direction corresponding to cardinal south colexified with up, the direction corresponding to cardinal north colexified with down. As Bowden (1997:265) observes, the languages of the Halmahera region, 'whether Papuan or Austronesian, have roughly comparable systems, distinguishing at least the same five basic categories', his five categories being up, down, landward, seaward, and 'there' (the latter among other things an undifferentiated traverse present in some scales).

Further similarities between the Papuan and Austronesian languages exist. In the variety of Taba spoken on Makian, a small island off the coast of mainland Halmahera, three scales of reference exist: a small scale (within a house or neighbourhood), a medium range scale used on and around Makian island, and a larger 'wider world' scale. All three scales involve an identically lexified landward–seaward axis. The difference between the scales lies in the axis crossing the landward–seaward axis. In the smallest scale the cross axis is an undifferentiated traverse lexified by *akno*, glossed by Bowden as 'there'. In the medium and large scales the cross axis is colexified with the vertical axis. The superficially apparent difference lies in the apparent cardinal directions indicated by these terms. In the large scale *attia* appears to correspond to south and *appo* to north. In the medium scale on the Taba-speaking east coast of Makian these terms appear reversed, with *attia* corresponding to north and *appo* south. Indeed, when at sea between Makian and the mainland it would be possible to use either for either direction. Crucially, it would also be possible to use either *akla* 'seaward' or *akle* 'landward' for either direction on a line running roughly cardinal east–west between Makian and the mainland. Moreover, the *attia-appo* axis in the medium scale curves around Makian island like the cross axis in Manam.

Bowden gives a primarily cultural explanation for this paradox. However, the explanation appears to be in fact more systematic. It appears from the data that Makian Taba has two overlapping and in some locations competing (not complementary) Manam-like systems. In one (appropriate to the medium scale), the system is centred on Makian island. Crossing the landward–seaward axis is a coastal axis for which *attia* lexifies a direction corresponding to left when facing seaward, and *appo* to right when facing seaward. The second Manam-like system (appropriate to the large scale) also has a landward–seaward axis, but centred on mainland Halmahera. Again a cross axis is lexified with *attia* for a direction corresponding to left when facing seaward, and *appo* for right when facing seaward. The medium- and large-scale systems are in fact internally identical. The difference lies only in whether Makian or mainland Halmahera is the system's centre. A speaker travelling north when at sea between the two will be travelling *attia* if they are thinking of themselves in relation to Makian island, but *appo* if they are thinking of themselves in relation to the mainland. Evidence supporting this analysis comes from the fact that once the southernmost tip of Halmahera is reached, large-scale *attia* follows the curve of the coast, and ultimately points towards cardinal northeast.

The system as it is manifest centred on mainland Halmahera bears a strong resemblance to the systems described for Tobelo and for North Moluccan Malay. All have uniquely lexified landward–seaward axes, and all have a coastal axis colexified with the vertical axis, with up corresponding to left as you face the sea, and down corresponding to right as you face the sea in the Makian-speaking region of mainland Halmahera, and in Tobelo- and NMM-speaking Wasile. Bowden (1997:265) comments that the similarities between this 'worldwide scale' and the systems found in Tobelo and NMM are not unusual, 'so long as we accept that Taba speakers have borrowed the notion of the up–down axis from the languages that they have been in contact with'. As with Taylor, Bowden assumes the system in the Austronesian language is borrowed from non-Austronesian sources. Again, however, elements common throughout the Austronesian-speaking world are involved. This is not to say their assumptions are wrong. It does however draw attention to a significant problem in using

systematic re-analyses in new topographical environments as evidence on the relationship between perceptual input and linguistic absolute reference.[41]

Systems of linguistic absolute reference, particularly those relating to topographic phenomena that are manifest as diversely as is the boundary between land and sea, they must modify or be restructured to cope with new environments. These processes may provide a window on which phenomena in the physical world are perceptually salient, and how they are interpreted as a context for spatial relationships. But observations on systemic variations between related languages may not reflect only a cognitive response to the new environment. They may instead reflect borrowings. The similarities between the systems of absolute spatial reference in the Austronesian and non-Austronesian languages of Halmahera may result from the ancestors of those Austronesian languages borrowing the system present in pre-existing non-Austronesian languages. (Although this in itself would be interesting as it would involve non-Austronesian responding to this island environment by developing a system that resembles the Austronesian island-based systems.) Alternatively, the resemblance may result from non-Austronesian languages borrowing the basic system brought by Austronesian speakers. Equally, the non-Austronesian and Austronesian systems may resemble each other because that is the system that humans will come up with in response to this specific geographical environment. It would be difficult to determine with certainty which of these possibilities reflects what has happened.

In this respect the languages of remote Oceania represent an excellent, and perhaps unique, laboratory to investigate human spatial cognition. The Oceanic languages spoken in Melanesia south and east of the Solomon Islands, in Polynesia, and in most of Micronesia, comprise a large number of separate languages, each with their own specific system of absolute spatial reference. The genetic relationships between these languages are relatively well understood, so difference between the systems of closely related languages may be compared, and examined in the light of diverse geographic and topographic environments (though sadly few if any fall of land or elevational systems are likely to be found). Hypotheses exist about successive homelands, and the geography and topography of intervening stages may also be considered. And crucially, the absence of previous human populations means that this can be done with the knowledge that whatever restructuring or

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[41] Likewise, there are similarities between the neighbouring Bougainville languages Banoni (Oceanic) and Buin (non-Austronesian). Banoni (Lincoln 1976:208) has one axis with directions described as '"upstream" or "northeast" or "easterly"' and '"downstream" or "southwest" or "westerly."' Orthogonal to this is a cross axis with directions described as being '*rina* "right of downstream" or "northwest" or "northerly"', and '*booŋa* "southeast" or "southerly" (left of downstream)'. Buin (Griffin 1970) is described as having cardinal direction terms, although no justification is given for assuming that the terms refer to cardinal directions. The terms given for 'east' and 'west' appear to be cognate with the Banoni left/right of downstream terms: Buin 'west' is *ree* and *rito* and 'east' *poo* and *pooko*. The difference in meanings assigned to these terms in the two languages corresponds exactly with differences in the direction of the coastline in the regions in which the two are spoken. Although they are neighbours, Banoni is spoken on the southwest coast of the island, while Buin is spoken on the southern end of the island. In Banoni, as Lincoln's insight suggests, *rina* is right when facing the sea and *booŋa* is left when facing the sea. The same is true of Buin *ree/rito* and *poo/pooko*. Further evidence of the landward–seaward/traverse nature of the Buin system may be found in the fact that nominalisation of the terms for 'east' and 'west' exist referring to 'easterner' and 'westerner', but no corresponding nominalisations exist with the 'north'–'south' axis. Instead terms meaning 'highlander' and 'coastal person' occur (Griffin 1970:21). What is significant for the present purposes is that these two unrelated languages have cognate terms for the same axis, clearly demonstrating at least lexical, if not systemic, borrowing by one.

adaptation is apparent is the result of human cognitive responses to new environments, and not the result of cultural influence.

## 8 Implications for an understanding of cognition

What cognitive implications do the variety of linguistic systems of absolute spatial reference, and their relationship with phenomena accessed through perceptual modalities, have? It is apparent from the evidence surveyed above that a correlation exists between central components of such systems and features of the physical world. Moreover, it is apparent that the perceptually accessed phenomena which correspond to components of the linguistic system are ones which in some way dominate the physical environment, certainly from the perspective of terrestrial animals such as humans. Elevational linguistic systems correspond to regions with steep and irregular mountainous terrain; fall of land systems correspond to mountainous regions with a perceivable overall change in altitude; upriver–downriver systems correspond to large inland regions dominated by one or more watercourses; landward–seaward systems correspond to island environments, and so on.

What is the nature of the correspondence between linguistic systems and these physical world phenomena? It is obvious, but non-trivial, that the linguistic systems do not precede the physical world phenomena. The ancestors of Manam speakers did not travel the world until they encountered a round island on which their system of spatial reference could work; the speakers of the Alpenmundarten did not roam Europe until they settled on mountains in which their elevation reference would make sense. The linguistic absolute systems present in these and other languages attend to certain physical world phenomena because for humans those phenomena dominate the environment of the language locus.

This is supported by the fact that systems correlating to features of the physical world are found in languages whose ancestors can be presumed to have had quite different systems. Aralle-Tabulahan, in its hinterland locus, has a system relating to watercourse and mountain, not to the boundary between land and sea as its Austronesian ancestors. The Alpenmundarten have systems correlating to mountains, not to the path of the sun as their steppe-located ancestor.[42] The fact that linguistic systems, regardless of their original nature, modify to correspond to features of the physical world in new loci, strongly suggests that it is the features of the physical world which motivate the linguistic systems.

This raises questions about the relationship between perceptual and linguistic modalities. Whatever the nature of the interface between these modalities may be, and whatever conceptual structure or processes may intervene, the evidence of absolute spatial reference suggests very strongly that perceptual input can determine linguistic structure, and that perceptually accessed phenomena may be grammaticalised as components of a linguistic system.

What implications does this have for spatial conceptualisation? It is apparent that systems of linguistic spatial reference correlate with strategies used in non-linguistic behaviour. Experimental evidence from Tzeltal (Brown & Levinson 1993; Levinson 1996) and Guugu Yimidhirr (Haviland 1993; Levinson 1992a), and comparisons between the behaviour of speakers of these languages and Dutch speakers, indicate that the choice of frame of reference used in linguistic systems of spatial reference corresponds to strategies adopted in other, non-

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[42]  See also the modified use of cardinal terminology in an island environment in Icelandic (Haugen 1969).

linguistic, behaviour such as orientation, memory recall, memory recognition, gesture, and inference (see Levinson 1996 for a discussion of this cross-modal evidence). This and further similar evidence demonstrates that both spatial language and spatial coding manifest in other modalities have access to a shared spatial conceptual representation, or at least that they have access to representations which are compatible and may interact by some means. I do not propose here to subscribe to any particular theory of conceptual structure or cross modal interaction. However, whatever theory one might have of the mechanics of cognition, it is apparent that linguistic spatial reference is a manifestation or component of broader cross modal conceptualisation.

The relationship between absolute linguistic systems of spatial reference and perceptually accessed phenomena suggests that perceptual input can determine features of a linguistic system. This taken with the evidence of cross modal correlation in spatial behaviour suggests that a relationship exists between perceptual input and conceptualisation. While the notion that linguistic structure provides input into conceptualisation is well known, it would surely be implausible to hypothesise that perceptual input reaches other non-linguistic modalities via language. If linguistic representations of space correlate to a wider cognitive representation or representations (and they appear to), and perceptual modalities provide input into these linguistic representations (and they appear to), then it must be concluded that perceptual modalities provide input into cross modal spatial conceptualisation. As it is implausible to propose that language intervenes in this input, it can only be concluded that perceptual modalities provide input directly into spatial conceptualisation. The role of perceptually salient phenomena in motivating linguistic systems of spatial reference effectively means that perception of these phenomena plays a part in constructing concepts of space.

This in turn has commensurate implications for notions of linguistic determinism. Levinson, noting that Guugu Yimidhirr speakers 'can be shown when not engaged in speaking the language to think in a way that is concordant with it', concludes, surely correctly, that this 'represents a serious challenge to the view that a particular language at most requires a special way of thinking just while speaking' (1992a:35). Given the further supporting evidence that has come to light since those remarks, it now seems beyond doubt that linguistic spatial reference does not merely reflect thinking for speaking. However, Levinson goes beyond this. Faced with evidence of cross modal correlations in spatial behaviour, Levinson concludes that this evidence demonstrates a Whorfian relationship between language and thought. Considering the Tzeltal and Dutch experimental data, for example, he is 'led to the conclusion that the frame of reference dominant in a language, whether relative or absolute, comes to bias the choice of frame of reference in various kinds of non-linguistic conceptual representations' (1996:125). This seems something of a leap. The fact that a relationship exists between linguistic representations of space and representations employed by other modalities is taken to demonstrate that language is determining non-linguistic conceptualisation. However, the existence of this relationship does not, in itself, provide evidence of the direction of influence. Needless to say Levinson is aware of and addresses this problem:

> It may be objected that the whole system of absolute orientation is much more than a linguistic phenomenon, and therefore cannot be considered an example of linguistic determinism. Why not, for example, reverse the argument, and claim that the cognitive system of absolute spatial conception drives the language? The answer is that there is no way in which a community-wide cognitive practice of this sort could come to be shared except through its encoding in language and other communicative systems like gesture. It is the need to conform to these communicative systems that requires convergence in cognitive systems, not the other way around. (1992a:35–36)

Or to put it another way, 'it is the communal possession of a shared linguistic system that coerces our private conceptual systems into shared directions' (1992b:25, fn. 67).

However, the need to conform to communicative systems is not the only imaginable way in which Levinson's 'community-wide cognitive practice' can come to be shared. The possibility remains that such practices may come to be shared at least in part as a result of universal human cognitive responses to certain perceptual input, as the 'shared' absolute spatial reference systems of Aralle-Tabulahan and the Florutz German suggest.

Yet in one sense Levinson's answer must be correct. A conceptualisation of space is acquired during the early years of life. Although recent research has suggested that some spatial concepts develop prior to the acquisition of language,[43] the system of linguistic spatial reference to which the child is exposed presumably plays a subsequent part in acquiring spatial conceptualisation.[44] It is probably safe to assume, for example, that infants in Tzeltal-speaking communities begin to acquire a spatial conceptualisation before they themselves can directly perceive the very large-scale overall fall of land that is central to the system they are acquiring.

However, the relationship between language and non-linguistic conceptualisation must be a two-way process. While an infant acquiring Aralle-Tabulahan in a mountain village will be directed by the language they are acquiring to attend to elevation and the direction of watercourses, it is unlikely that this alone would be enough. It is unlikely that, were such an experiment possible, an attempt to bring the child up attending instead to a distant, non-visible, and therefore non-salient boundary between land and sea would succeed. The child would surely resort to salient phenomena to construct an accessible and meaningful system. Moreover, the directing of attention by the language can not have applied to the child's ancestors when they first settled the region. Instead, its topography must have forced them to attend to phenomena other than those relevant to their pre-existing system of spatial reference. And this need not be a one-off diachronic shift faced by a single generation. It may apply repeatedly for mobile individuals. As discussed in §5.1, Kokota speakers from Hurepelo, when visiting Goveo, must reconfigure their system of linguistic spatial reference, along with representations accessed by other modalities. Doing this is not without problems, initially causing confusion and constant attention to the physical phenomena. However, the fact that it can be done at all, and routinely if need be, demonstrates that for every individual, linguistic spatial reference is sensitive to perceptually accessed and conceptually mediated phenomena.

## 9  Conclusion

It was argued in §8 that the evidence presented throughout this paper demonstrates that systems of linguistic absolute spatial reference are sensitive to phenomena accessed through perceptual modalities, via some conceptual structure or processes (which therefore must pre-exist the linguistic system).

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[43] See for example Landau (1996) and Mandler (1996). Bowerman (1996), however, presents experimental evidence which she argues demonstrates that while various spatial concepts develop before language, this basic pre-linguistic spatial knowledge requires input from language to coalesce into a conceptual structure.

[44] Though language does not constitute the only cultural input, *viz* Levinson's reference to the role of gesture in this.

As the title of this chapter suggests, I am inclined to view absolute spatial reference as a domain in which non-linguistic phenomena determine linguistic structure. However, whether or not the arguments regarding direction of input presented in §8 are accepted, I propose that certain phenomena in the physical world are perceptually highly salient to humans, to the extent that cultures and languages select one or more of these phenomena and construct a grammaticalised referential system motivated by it/them. I propose that linguistic absolute spatial reference has an exceptionally close relationship with these physical world phenomena accessed through a perceptual modality, presumably with an intervening conceptual structure or domain of interaction, and that consequently linguistic absolute reference constitutes an exceptionally, perhaps uniquely, revealing domain for the investigation of human spatial cognition and the nature of the relationship between language and conceptual and perceptual modalities. It is clear that this investigation requires detailed analyses of the systems of spatial reference in languages that are both genetically diverse and spoken in diverse topographic and geographic environments. I propose that this investigation can most profitably proceed with carefully targeted research comparing systems found in closely related languages spoken in very different environments, and in unrelated languages spoken in very similar environments. Finally, I propose that the absence of prior inhabitants makes remote Oceania a unique laboratory for the investigation of the restructuring of systems of spatial reference in new environments, and of the cognitive consequences of those restructurings.

## Appendix 1: Kokota absolute spatial reference data

Kokota has four absolute directional terms in the non-vertical domain:

(1)  *paka*   west (i.e. towards sunset)   ⎫ The east–west axis runs northwest–southeast
     *fona*   east (i.e. towards sunrise)  ⎭ somewhat less than 45° off cardinal east–west

     *rhuku*  landward

     *rauru*  seaward

All are unique directionals and are members of a closed class of local nouns. They may function to indicate location:

(2)  a. *Gita-palu-ña     ne    au      fa-ḡonu,       da-la*
        weINC-two-IMM   RL    exist   CS-be.insensible   weINC-go

        *au-gu          rhuku.*
        exist-PROG     landward
        'We are living wrong, because we are living on the shore side [i.e. in the bush].'[45]

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[45] These examples are presented in the local orthography. Each letter has the expected IPA value except that *g* represents the voiced velar fricative, *ḡ* the voiced velar plosive, and *ñ* the voiced velar nasal. Sonorants followed immediately by *h* represent voiceless counterparts to the corresponding voiced sonorant. Abbreviations used are:
3 – third person subject, CNT – contrastive, CS – causative, EXC – exclusive, FOC – focus, IMM – immediate aspect, INC – inclusive, PL – plural, PN – personal name, PNLOC – location name, PRF – perfective aspect, PROG – progressive aspect, RL – realis, SG – singular.

b. *Gau  ade  paka,  fafra    mai   gau.*
youPL here  west   be.quick come  youPL
'You all here in the west, come quickly.'

c. *Ana  rauru     bo.*
that  landward  CNT
'It (is on the) seaward (side of the house).'
[Response to the question 'Where is your cookhouse?']

The directionals may also indicate direction of motion:

(3) a. *Gai    lao   fona Buala.*
weEXC  go    east PNLOC
'We're going east to Buala.'

b. *Mai  paka, mai  fona.*
come  west  come  east
'Come westward, come eastward.'
[Speaker is calling people from all parts of the village, located in a strip along the coast on the *paka-fona* axis.]

c. *Kamo     rauru    bo  s-ago.*
go.across  seaward  CNT  FOC-youSG
'Paddle-turn seaward, you.'
[Instruction to paddle so that a canoe which is moving westward will change course and be moving directly out to sea.]

The terms may also be used to indicate the location of motion, rather than its direction:

(4)  *Bili  n-e-ke   mai  rauru   bo,  ago    ne-ke  lao  rhuku  bo.*
PN   RL-3-PRF come  seaward  CNT  youSG  RL-PRF  go   landward  CNT
'Billy came on the sea side, you went on the land side.'

In example (4) my informant James explains how Billy and I missed each other. I went to Billy's house from James' house, which faces seaward, by exiting on the seaward side but going around the back (the landward side) of the house and passed along the back (the landward side) of the row of other houses to Billy's house. At the same time Billy went from his house along the front (seaward side) of the row of houses to James' house. Note that in this example the directionals do not indicate the direction of the motion, but the location in the village, i.e. the side of the row of houses, where the motion took place. Both Billy's coming and my going took place parallel to the coast, along the *paka-fona* axis, not along the *rhuku-rauru* axis.

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