Reconstructing the Geocentric System of Proto-Oceanic

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A comparison of the absolute coordinates used in space reference by sixteen Austronesian languages makes it possible to propose a hypothesis regarding the geocentric system of Proto-Oceanic: on land, one up–down axis defined by the declivity of the ground; at sea, a second up–down axis motivated by the prevailing trade winds. After reconstructing the system of Proto-Oceanic, we model the principal paths of evolution that derived from it historically and led to the diverse systems attested in modern Oceanic languages.

1. INTRODUCTION. In the last decade, several theoretical and typological studies have improved our understanding of how languages encode space reference. In particular, the research conducted by the Cognitive Anthropology Research Group at Nijmegen's Max Planck Institute of Psycholinguistics (Brown and Levinson 1992, 1993; Levinson 1992, 1996a,b,c; Haviland 1993) has attracted the attention of linguists to the diversity of space-encoding strategies attested among the languages of the world, specifically in language families that until then had been hardly explored—for example, in Mayan and Australian Aboriginal languages. In parallel with these typological studies, an increasing number of Oceanic and Austronesian languages have been investigated with regard to these space issues (see Bowden 1992; Senft ed. 1997, forthcoming; Bennardo 2002).

These explorations of Oceanic space systems have essentially been conducted in a synchronic perspective, often with the aim to describe the internal consistency of one particular language at a time; incidentally, this was precisely our own motivation when we first undertook the description of space directionals in Mwotlap, a language of northern Vanuatu (François 2003). Today, even if the majority of Oceanic languages remain unexplored on these matters, the quantity and quality of existing information already seem sufficient for us to formulate synchronic generalizations across Oceanic languages—as a follow-up to Senft (1997) or Palmer (2002a)—and to suggest historical hypotheses about the space reference system of their common ancestor. It is therefore the aim of this paper to reconstruct the geocentric system of Proto-Oceanic (POc).[1]

1. As we were writing a case study of space directionals in Mwotlap (François 2003), the attempt to compare Mwotlap with other Oceanic languages eventually led us to devote a full article to this matter. We are grateful to Françoise Ozanne-Rivierre, Malcolm Ross, Byron Bender, and two anonymous readers for commenting on earlier drafts of this paper.

After outlining briefly the general properties of a geocentric system (section 2), we begin our investigation with a synchronic comparison of geocentric systems in a sample of sixteen modern Austronesian—mainly Oceanic—languages (section 3). Later sections are dedicated to a tentative reconstruction of the system at POc-level (section 4) and the historical scenarios that most probably led from POc to the present (section 5).

2. GENERAL PROPERTIES OF OCEANIC GEOCENTRIC SYSTEMS

2.1 A TYPOLOGICAL LOOK AT SPACE REFERENCE SYSTEMS. Referring linguistically to space essentially consists in using words to help the addressee mentally construct a vector. This vector may be of two kinds. In some cases, it stands for the itinerary actually followed by a theme in motion, like in *They were climbing* UP *the tree*; *Your dog's* FOLLOWING *my car*; *She'll* COME *tonight*. In other cases, the vector represents a mental path, usually the one that links the speaker to a theme, regardless of whether or not the latter is in motion: *They were singing* UP *in the tree*; *Your dog's* BEHIND *my car*; *She'll be sitting right* HERE.

In either case, whether the reference is dynamic or static, the principles are basically the same: the speech context must display certain bearings, easily identifiable for both the speaker and the addressee, accessible to their senses or memory, to form the geometrical basis for the construction of the vector. These bearings may be of any kind: the closest hill, a moving dog, a motionless sofa; most of them will be unique to a specific context, and thus expressed by proper place names, or by lexical material (like Eng. *beach*). But some landmarks are so frequent in speech that they eventually grammaticalize: a typical example is when the location of the speaker becomes morphologized into deictic markers, for example, demonstratives (*this*), adverbs (*here*), directionals (*hither*), or even verbs (*come*). Other examples are possible and indeed widespread, such as when the difference in vertical height is the source for such common morphemes as *up* and *down*; or when certain body parts (e.g., the face, the backside, the right and left hands) end up morphologized into spatial markers, through processes of metaphor or metonymy (Svorou 1994).

It would certainly form the basis for rich cross-linguistic research to study which landmarks are most often grammaticalized among human languages: some could probably claim the status of typological universals, like the reference to the speech coordinates (deixis), or the use of the vertical axis, as we have just suggested. On the contrary, certain types of strategy that were once taken for granted as being universal have recently been found to be absent from certain language families: to take a crucial example, the use of the right/left contrast for space-referring purposes appears to be unknown in Tenejapa (Brown and Levinson 1992), in Guugu Yimidhirr (Haviland 1993), as well as—closer to us—in most Oceanic languages (Senft ed. 1997).

Likewise, it is common in many languages, including those of Europe, to encode certain horizontal vectors by resorting to an implicit projection of the human body onto certain objects, whether these anthropomorphical coordinates are centered in the object itself—for example, *the ball is* TO THE LEFT *of the car*, where the car is intrinsically oriented—or emanate from an observer's viewpoint—for example, *the ball is* TO

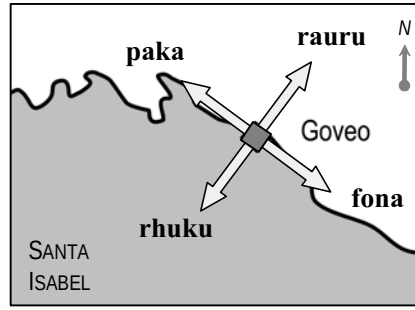
THE LEFT of the post, where the post is only oriented relatively to a facing observer. But however widespread they are, these two encoding strategies—named respectively "intrinsic" and "relative" frames of reference by Levinson (1996a)—appear to be hardly used in several language families, including the major part of Oceania (Senft 1997, Palmer 2002a). Instead, these languages make systematic use of a different linguistic device: an "absolute" frame of reference, based on geocentric coordinates.

2.2 OCEANIC GEOCENTRIC SYSTEMS. Indeed, among the diverse types of landmarks that are known to grammaticalize across languages, one deserves special attention in the framework of this paper. Many space-referring systems are built upon certain outstanding natural and geographical spots, like the sea, a mountain, a river, the sun, the wind, and so on. In some cases, the relationship to a specific landscape's topography is still precise and obvious, as in contrasts such as *upriver–downriver*; but many languages have also developed more abstract systems of reference, whose physical motivation has been blurred through time—as is the case with our cardinal points north-east-south-west, which were historically based on the rising and setting of the sun (Palmer 2002a:116, after Buck 1949). Whatever the case, these geographically based strategies will be here designated by the technical term "geocentric." Such a system can be found in Guugu Yimidhirr (Haviland 1993), in Tzeltal (Levinson and Brown 1993), and Tzotzil (de León 1994).

As far as modern Oceanic languages are concerned, the most common situation is a morphological set of verbs or directional particles that define four orthogonal directions, hence dividing the horizontal plane into four quadrants. In a way, these four-term sets are similar to the four cardinal points we know in Europe and elsewhere, yet two important differences must be underlined. First, in European languages, the geocentric system is mainly restricted to long-distance vectors (e.g., *the southern sea*, but ?*the southern chair*), whereas Oceanic languages commonly resort to geocentric reference for all degrees of distance, from the largest to the smallest: virtually, this is how they encode any horizontal vector. Second, the four-term systems used in Oceania seldom match exactly the four cardinal directions of our European compass north-east-south-west (Codrington 1885:165), and sometimes appear to be drastically pivoted from these. In the latter case, it is a matter of debate whether their historical motivation is also the path of the sun, or another parameter (see 3.3.3).

Other differences will appear soon, but these two already suffice to give a first approximation of how Oceanic geocentric systems work. A typical example of such a system is provided in figure 1. It represents the four directions used for spatial reference in Kokota, a language spoken on Santa Isabel in the Solomons; more precisely, it illustrates how the system works in the northern-coast village of Goveo (Palmer 2002a:137). Kokota illustrates the typical situation we have described for Oceanic languages: a set of four directionals defines four absolute directions, thus dividing the horizontal plane into four quadrants. The latter commonly serve to locate people or things in space, whether they are static or dynamic, and whatever the scale: for example, 'we're going in the *fona*-direction to her village', or 'my cookhouse is on the *rauru*-side of your house' (Palmer 2002a:154), and so on.

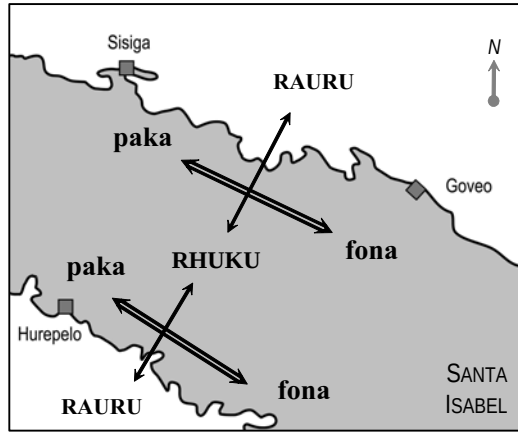
FIGURE 1. THE FOUR DIRECTIONS OF THE NORTHERN KOKOTA SYSTEM



Compared with our cardinal compass points, the whole structure is rotated by several degrees. To be precise, it is impossible to say in which direction this rotation takes place: this could only make sense if we knew which of the four directions is supposed to match, say, our 'north'. The comparison between Oceanic geocentric systems and European compass points must be made with precaution.

2.3 LAND/SEA VS. CARDINAL AXIS. Now, what seems to be a straightforward situation appears to become more and more complex as one changes the scale of observation from one village to a whole island, from one island to a group of islands, and from one language to another. At first sight, the two orthogonal axes of figure 1 resemble each other in form and in function. Yet, if compared with a standard European-like cardinal system, a paradox appears as one moves to another village speaking the same language. If we cross the island of Santa Isabel and go from Goveo on the northern coast, to Hurepelo on the southern coast, we realize the *rauru–rhuku* axis has been reversed in cardinal terms, while the *paka–fona* remains identical (Palmer 2002a:137). This situation is illustrated in figure 2.

FIGURE 2. THE TWO AXES OF KOKOTA: ONE FIXED, ONE VARIABLE



The language of Mwotlap shows exactly the same configuration (François 2003:417): one direction (*hay*, cf. Kok *rhuku*) points toward the watershed of the territory, while its opposite (*yow*, cf. Kok *rauru*) designates either side of the island; conversely, a second pair of directionals (*hag–hōw*) appears to be insensitive to the topography of the island, with *hag* roughly pointing ENE, and *hōw* WSW. Structurally speaking, the geocentric systems of these two languages are perfectly identical; the only difference is that the one used on the island of Mwotlap appears to be pivoted by about 50° counterclockwise when compared with Kokota (but see 3.4.1). Certain non-Oceanic languages, like Balinese, show a similar system (Adelaar 1997:57).

The situation in Kokota and Mwotlap will help us set forth the basic principles of our cross-Oceanic study. If we take, say, the system of figure 1, the two geocentric axes can be said to form a balanced system, at least when considered within a particular setting; yet figure 2 shows these two axes to be established along totally different principles. One pair of directionals contrasts 'inland' (Kok. *rhuku*, Mwt. *hay*) with 'seaward' (Kok. *rauru*, Mwt. *yow*), and is thus tightly bound to the perceptible declivity of the landscape; its orientation, in cardinal terms, necessarily varies according to which side of the island one is on, and to the general orientation of the shoreline. On the contrary, the second pair of directionals appears to be essentially fixed in compass terms—at least within one language community—and does not depend on any feature of the local topography: for example, in Kokota, *fona* will always indicate the southeastern quadrant, and *paka* the northwestern. To be precise, only the latter pair of directionals can be said to define a "cardinal axis" in the strict sense of the word—because the land-sea contrast cannot be assigned any regular direction in compass terms. From now on, any pair of directionals sharing the properties of *paka–fona* in Kokota (i.e., relative fixedness in compass terms) will be designated as the cardinal axis of the system.

The situation we have just described for Kokota and Mwotlap is encountered in most modern Oceanic languages: on the one hand, a *land-sea axis* whose cardinal position varies according to the orientation of the shore; on the other hand, a *cardinal axis* that is essentially fixed in compass terms. It is the purpose of this paper to discuss the precise nature and motivation of these two axes in Oceania, and to propose hypotheses regarding their historical development.

3. AN OVERVIEW OF MODERN OCEANIC SYSTEMS

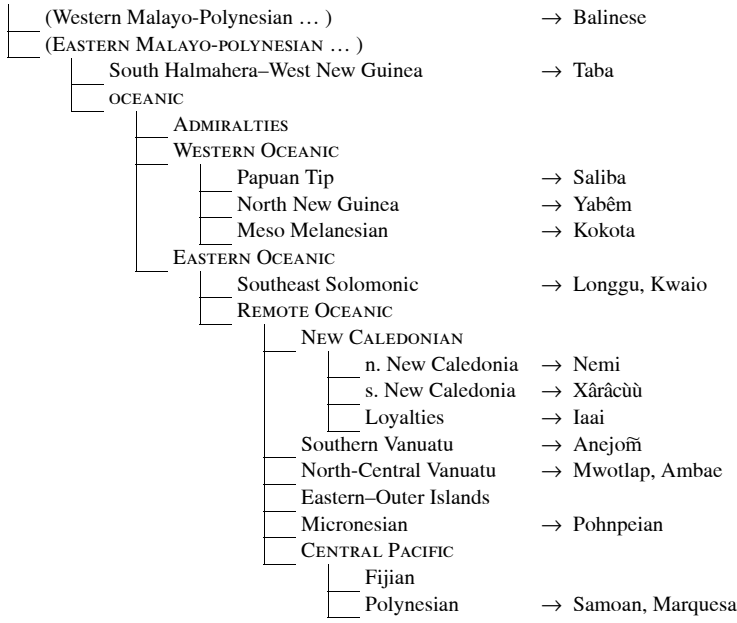
3.1 OUR LANGUAGE SAMPLE. In order to conduct our cross-linguistic comparison, we have selected a sample of sixteen Austronesian languages. Obviously, the first requirement in establishing this sample was that a reliable description for each language's space reference system—albeit brief—should be available. A second principle, in order to get a representative picture of the Oceanic family, has been to select languages as diverse as possible, both on geographic and on genetic grounds, so that all important groups and subgroups of Oceanic are represented. Also, two non-Oceanic languages have been added to the list, for the sake of external comparison: Balinese, which is quite remote from Oceanic in the Austronesian family tree; and Taba, a lan-

guage that is conversely very close, and should help assess the degree of innovation—or lack thereof—of Proto-Oceanic on the issue of geocentric reference.

We list here these sixteen languages in geographical order, roughly from West to East, with the indication of their country of location, followed by a tag for their genetic subgrouping:[2] *non-Oceanic*: Balinese (Indonesia, WMP); Taba (Indonesia, SHWNG); *Oceanic*: Saliba (Papua New Guinea, PT); Yabêm (PNG, NNG); Kokota (Solomon Is., MM); Kwaio and Longgu (Solomon Is., SES); Mwotlap and Northeast Ambae (Vanuatu, NCV); Anejom̃ (Vanuatu, SV); Nemi, Xârâcùù, and Iaai (New Caledonia, NC); Pohnpeian (Micronesia, MIC); Samoan and Marquesan (Polynesia, CP).

Figure 3 presents a genetic tree of the Oceanic family, locating each language of the sample in its own subgroup (after Ross, Pawley, and Osmond 1998); it does not detail the stages above Oceanic, nor those below Central Pacific. Throughout this cross-linguistic presentation, we examine data that are detailed in our bibliographical references; our sources are listed in the appendix. We have compiled the main information in a comparative chart (table 1), to which we regularly refer in the following pages. (Square brackets enclose our personal comments or additions, as compared with the corresponding bibliographical reference.) Sections 3.2 to 3.4 comment on the data and on the varied issues presented in table 1.

FIGURE 3. THE LANGUAGES IN OUR SAMPLE, ORGANIZED GENETICALLY



2. Our abbreviations for language subgroups follow the usages on this matter: WMP (Western Malayo-Polynesian), SHWNG (South Halmahera North New Guinea), PT (Papuan Tip), NNG (North-New Guinea), MM (Meso-Melanesian), SES (South-East Solomonic), NCV (North-Central Vanuatu), SV (South Vanuatu), LOY (Loyalty Is.); NC (New Caledonian), MIC (Micronesian), PN (Central Pacific: Polynesian).

3.2 THE LAND/SEA AXIS. As one could expect, the sixteen languages of the sample show both similarities and differences. First and foremost, it is important to note that all of them possess some kind of absolute reference system to which they ordinarily resort for the encoding of horizontal vectors. This geocentric system always combines with at least one pair of directionals for the vertical axis (*up–down*).

One important characteristic shared by all the languages of the sample—and probably by all Oceanic languages—is that one axis of the system is defined by a contrast between *inland* and *seaward*. This land/sea axis is orthogonal to the shoreline, and thus essentially varies with the orientation of the latter, as was illustrated in figure 2. The

TABLE 1. THE GEOCENTRIC DIRECTIONAL SYSTEM IN SIXTEEN AUSTRONESIAN LANGUAGES: LAND/SEA AXIS, CARDINAL AXIS, TRAVERSE AXIS

	LAND-SEA AXIS	ETY-MOL-OGY	CARDINAL AXIS	ETY-MOL-OGY	ORIEN-TATION	MOTI-VATION	CALS†	UTLS‡
Balinese WMP	*-aja* ~ *-lod*	land ~ sea	*-auh* ~ *-aŋin*	(?) ~ wind	→ east	monsoon	+	–
Taba SHWNG	*le* ~ *la*	land ~ sea	*ya* ~ *po*	up ~ down	→ south [-east]	?	–	*no*
Saliba PT	*sae* ~ *dobi*	up ~ down	*sae* ~ *dobi*	up ~ down	→ east	sun [?]	–	*lao*
Yabêm NNG	*-sô* ~ *-sa*	in ~ out	*-pi* ~ *-sêp*	up ~ down	→ west	[*sun]	+	–
Kokota MM	*rhuku* ~ *rauru*	(?) ~ (?)	*fona* ~ *paka*	(?) ~ (?)	→ [south-] east	sun [?]	+	–
Longgu SES	*longa* ~ *asi*	[bush] ~ sea	*ala'a* ~ *toli*	[up ~ down]	→ [south-] east	sun [?]	+	–
Kwaio SES	*fataia* ~ *asi*	bush ~ sea	*'ala'a* ~ *'aisifo*	up ~ down	→ south- east	?	+	*?*
Mwotlap NCV	*hay* ~ *yow*	in ~ out	*hag* ~ *hōw*	up ~ down	→ south- east	wind	+	–
Ambae NCV	*hage* ~ *hivo*	up ~ down	*hage* ~ *hivo*	up ~ down	→ south- east	wind	–	*vano*
Anejom̃ SV	*-pahai* ~ *-p̃ok*	(?) ~ (?)	*-jai* ~ *-se(h)*	up ~ down	→ south- east	?	+	–
Xârâcùù NC	*axwè* ~ *anä*	up ~ down	*axwè* ~ *anä*	up ~ down	→ south- east	wind	–	*akwèè*
Nemi NC	*-da* ~ *-dic*	up ~ down	*-da* ~ *-dic*	up ~ down	→ south- east	wind	–	*-en*
Iaai LOY	*-iö* ~ *-ü*	[up ~ down]	*-iö* ~ *-ü*	[up ~ down]	→ east	sun [?]	–	*-lee*
Pohnpeian MIC	*-long* ~ *-ei*	bush ~ sea	*-dak* ~ *-di*	up ~ down	→ (wind- ward)	wind	?	?
Samoan PN	*i uta* ~ *i tai*	bush ~ sea	*i sasa'e* ~ *i sisifo*	up ~ down	→ east	?	?	?
Marquesan PN	*'i uta* ~ *'i tai*	bush ~ sea	*'i 'uka* ~ *'i 'a'o*	up ~ down	→ east	wind	–	*'i kō*

† CALS = Cardinal Axis used on Local Scale.
‡ UTLS = Undifferentiated Traverse axis used on Local (and navigational?) Scale.

reason for privileging the shoreline as a central landmark is easily accounted for by the ecological context in which Oceanic populations live: most of them dwell in coastal villages on scattered smallish islands, and literally live off the sea. Incidentally, this spectacular deterministic correlation between cultural ecology and language structures is in itself worthy of acknowledgment.

However, languages differ as to how this land/sea axis is lexified (see table 1):

- Kokota and Anejom̃ use terms whose etymology is not given in the data, or which seem to have no meaning in the language other than this directional reference;
- locative phrases, often originating in noun phrases such as *(to) bush ~ land* vs. *(to) sea*, are apparently used in Balinese, Taba, Kwaio, Longgu, Pohnpeian, Samoan, and Marquesan;
- *up* vs. *down* are used in Saliba, Ambae, Xârâcùù, Nemi, and Iaai;
- *in* vs. *out* are used in Yabêm and Mwotlap, and outside our sample, in Mangap-Mbula (Bugenhagen 1995:378).

The reason for the last two cases is easy to understand. In languages like Saliba, the movement of going toward the shore/sea is essentially perceived as a downward motion (which it obviously is, even if the slope is sometimes very gentle). In languages like Mwotlap, the same movement is perceived as an outward motion, as if the island were perceived as a containing figure, the outside of which would be the surrounding sea (François 2003:425).

In Longgu, the *seaward* direction is reportedly bounded by the shore (Palmer 2002a:123, after Hill 1997:116). But in other languages such as Mwotlap, this directional can extend far out to sea and point to the deep ocean; symmetrically, the *inland* direction commonly designates the island for somebody who is at sea. Therefore, in New Caledonian languages (Ozanne-Rivierre 1997), it is common for people at sea to say 'Let's paddle *up* (toward the shore)' or 'Let's paddle *down* (further toward the deep sea)', even if, of course, no vertical motion is involved.

3.3 THE CARDINAL AXIS. In all Oceanic languages, the above mentioned land/sea axis is crossed by a second axis that is orthogonal to it, and hence necessarily parallel to the shoreline; the nature of this cross axis is diverse, and will be examined in 3.4. But before this, let us provisionally change the scale of observation, and switch from the narrow context of a village/a valley/a small island—that is, the "local scale"—to the context of seafaring and inter-island distances—what can be called the "navigational scale" (Palmer 2002a:131).

Even when they seem to follow an isolated way of life that is apparently confined to a village or a small area, Oceanic populations always preserve some sort of trade and cultural relations with each other, both from one valley to another across large islands (e.g., New Caledonia's mainland), and from one island to another across the Pacific ocean. Referring to space in this broader context cannot be done along the same principles as in the local scale—if only because the land/sea axis becomes irrelevant whenever a ship at sea temporarily loses sight of any land.

As far as this navigational scale is concerned, Oceanic systems turn out to be remarkably consistent. They all make use of a single unbounded axis, relatively

fixed in cardinal terms, which we call the cardinal axis. As it consists of one pair of directionals X–Y, the axis used on the navigational scale essentially amounts to dividing the world not into four quarters, but into two halves: starting from any point in space, the cardinal axis will make it possible to define one side as the 'X side', the other side as the 'Y side'.

This cardinal axis X–Y, which is found throughout Oceania in various forms, raises three questions. First, are Oceanic languages also consistent in the way the axis is being lexified? Second, can we define its orientation in cardinal terms? Third, what is the historical motivation of this axis?

3.3.1 How is the cardinal axis lexified? If we bring together the information that is scattered among the different language descriptions, we discover a spectacular case of convergence: every language in Oceania makes use of a cardinal axis in the navigational scale, and this axis is everywhere encoded by a pair of vertical directionals meaning *up* and *down*. In our sample, this is true of virtually all languages: Taba, Saliba, Yabêm, Longgu, Kwaio, Mwotlap, Ambae, Anejom̃, Xârâcùù, Nemi, Iaai, Pohnpeian, Samoan, Marquesan. The relevant forms are listed in the third column of table 1. Incidentally, this use of *up–down* for this cardinal axis causes homophony with the land–sea subsystem (3.2) in several languages (Saliba, Ambae, Xârâcùù, Nemi, Iaai).

To be true, there are a few reasons why this remarkable cross-Oceanic consistency may have been obscured. First, the modern forms for *up–down* are not cognate throughout the family, as several languages have gone through processes of lexical innovation; yet, for most of them, any change in the vertical directionals has been transferred to the cardinal axis, so that the perfect match between both dimensions is preserved language-internally. Second, for certain languages, only the pair of forms X–Y is cited in our sources, with no clear mention of their homophony with the vertical directionals. This can happen either because the description is not detailed enough, or because local evolutions have eventually obscured the etymology of these words—in the latter case, the vertical and the cardinal axis will have lexically diverged through time. But even when this happens, it is sometimes possible to trace back the original meaning of X–Y as being *up–down*: for instance, our discussion in the appendix will suggest that this was indeed true for the two forms of Iaai *iö–ü*, although their vertical meaning has now been taken over by other morphemes; see also the discussion on Longgu *ala'a–toli*. Only two cases remain to be clarified: first, our documentation says nothing about the etymology of the Kokota terms *paka–fona* (figure 1), although we suspect them to be connected respectively with 'down' and 'up'; the other case is external to Oceanic, and concerns Balinese: the form *-aŋin* is cognate with the root for 'wind', not 'up'. But this does not affect the general observation that all known Oceanic languages make use, on the navigational scale, of a cardinal axis coded *up–down*.

In certain languages (e.g., Ambae, Saliba, Iaai), this single cardinal axis is also reported to be orthogonally crossed by a traverse axis, the two sides of which are not differentiated. This traverse, which can be glossed *across*, serves to encode those directions that are neither clearly *up* nor *down* in the cardinal system (see figure 4).

Other languages lack this cross axis on the navigational scale (e.g., Mwotlap, Nemi); on the issue of traverse axes, see 3.4.2.

3.3.2 How is the cardinal axis oriented? Also remarkable is how consistently this *up–down* axis is oriented throughout Oceania. Roughly speaking, *up* almost systematically points southeast, while its counterpart *down* designates the northwestern half of space.

This NW/SE orientation is explicitly established in the description of Kwaio, Mwotlap,[3] Ambae, Anejom̃, Xârâcùù, and Nemi. In several cases, although the empirical data—often supported by geographical maps—do show this NW/SE orientation, the describer still chooses to gloss the axis with the terms "east" and "west." Such a translation seems to be adopted essentially for the sake of reading convenience, and also because a comparison is often implicitly presupposed with European-like systems, in which the sun plays the major part (see 3.3.3). This distortion of the empirical facts, which can eventually mislead the analysis, is sometimes obvious in the way the data are presented, as in the case of Kokota: "*paka* = west (i.e., toward sunset), *fona* = east (i.e., toward sunrise). The east–west axis runs northwest–southeast somewhat less than 45° off cardinal east–west" (Palmer 2002a:153).

In this instance, the 45° rotation of the so-called "east–west" axis is assigned to the physical orientation of the shoreline of Santa Isabel, which indeed happens to be oriented NW/SE. However, in the present stage of our investigation, as we do not wish to take any interpretation for granted, we prefer to stick to the observable data, and gloss these two directionals respectively *paka* 'northwest' and *fona* 'southeast' (see figure 2). Incidentally, this is also what the same author chooses to do elsewhere (Palmer 2002b:517).

A similar discussion is required for Longgu, where the gloss "east–west" apparently stands for what is in fact southeast/northwest (see the appendix), and the map provided for Taba's navigational scale (Bowden 1997:264) also suggests the same SE/NW orientation, even if it is not explicitly described this way. Otherwise, certain systems do appear to be oriented more clearly eastward. This is true for Balinese, Saliba, Iaai, Samoan, and Marquesan. The data for Pohnpeian give no other orientation for *-dak* ('up') than 'windward', and we are not sure to what cardinal direction this should correspond. Finally, the strangest exception is that of Yabêm, which apparently uses 'up' (*-pi*) to encode for due west. For all these specific discussions, see the appendix.

To sum up, our Oceanic sample shows eight cardinal axes to be oriented due southeast, four to be eastward, one westward; the southeastern pattern is clearly predominant. The orientation of each cardinal axis (taking the *up*-term as the reference) appears in the column headed by "ORIENTATION" in table 1.

3.3.3 Historical motivation for the cardinal axis. The question of what motivates this up–down axis is a controversial matter. The descriptions of Saliba, Kokota, Longgu, and Iaai propose to draw a relation with the path of the sun. Indeed, the words *(go) up* and *(go) down* are regularly used in sentences having the sun as their subject,

3. That Mwotlap's cardinal axis is oriented southeast seems in contradiction with what we said in 2.3 ("land/sea vs. cardinal axis"), when we briefly compared it with Kokota. This paradox, which is due to the difference between scales, will be explained in 3.4.1 (see also François 2003).

and meaning respectively (sun)rise and (sun)set; it sounds logical to infer from this an equation *up* = East and *down* = West (Osmond 2000:22)—see the etymology of Latin *oriens* < *oriri* 'rise' and *occidens* < *occidere* 'fall down'. Furthermore, this path-of-the-sun hypothesis is sometimes proposed by the informants themselves (Hill 1997:106).

Despite its intuitive appeal, we are not totally convinced by this interpretation; we have already discussed it in detail in François (2003), and will just summarize our argument here. For a language to use the same term for 'go up' and '(sun)rise' is no surprise, and would be expected. But what does seem hard to understand, is how a language could possibly say *I am going up(ward)* when what is meant would be 'I am going toward the place where the sun regularly goes up'; the semantic likeliness of such a shortcut would be questionable, as going eastward wouldn't really give anybody the feeling of ascending. Another argument against the sun hypothesis is the diversity of the actual directions that are attested for this up–down axis, both across languages (see 3.3.2) and within a single language (François 2003 for Mwotlap): how could the sunrise possibly provide the motivation for a cardinal axis that is most often oriented due southeast, sometimes due south, sometimes southwest or even due west?

An alternate hypothesis would propose to see a link between the up–down axis and the path of the prevailing winds. Indeed, in the southern hemisphere where most Oceanic languages are spoken, the trade winds generally blow from southeast toward the equator most of the year. The knowledge and mastery of these meteorological phenomena notoriously played a crucial role in the history of the Austronesian sailors who peopled the Pacific Ocean (Lewis 1972, Irwin 1992, Osmond 2000). For such a salient feature of the environment to have become systematized in their navigational system is not that surprising—even if, once again, the interplay between historical culture and linguistic structures indeed deserves admiration.

Following this hypothesis, the vertical direction *(go) up* in Oceanic languages would receive a secondary meaning 'against the wind', while its counterpart *(go) down* would be used to mean 'following the wind'. This makes sense if one considers that a ship sailing into the wind may give its crew the feeling of walking 'up' a steep slope, whereas a ship that is being pushed astern somehow makes people feel they're sliding 'down' a slope (Françoise Ozanne-Rivierre, pers. com.). Incidentally, English makes the same metaphor when it contrasts *upwind* with *downwind*; this alone should confirm the semantic likeliness of our interpretation.

The trade-wind hypothesis has been proposed by several scholars to account for the up–down axis in several Oceanic languages, for example, Lavondès (1983) for Marquesan; Ozanne-Rivierre (1997:85, 1999:86) for several languages of Polynesia and of New Caledonia;[4] Hyslop (2001:216) for Northeast Ambae; François (2003:433) for Mwotlap. In fact, the importance of the winds for navigational and space-referring purposes is acknowledged even by those authors who otherwise resort to the sun when accounting for the up–down axis (Ross 1995; Osmond 2000). We will come back to this issue in our section about Proto-Oceanic (4.2).

4. Drehu makes use of two cardinal axes: it seems to have innovated a cardinal axis based on the sun, in combination with the first wind-based axis (Moyse-Faurie 1983:79; Ozanne-Rivierre 1997:92).

3.3.4 Summary. To recapitulate this section, we have shown that Oceanic languages typically encode long-distance relations—either across a large island, or across the sea—by resorting to a single cardinal axis; it is always lexified *up–down*, with the direction *up* pointing generally east or southeast. The geographical orientation of this axis (NW→SE), as well as the use of a vertical metaphor, is probably best accounted for if the trade winds are seen as the source of this cardinal axis: hence, the most accurate gloss for *up* vs. *down* here is 'upwind' vs. 'downwind'. Finally, some languages add to this cardinal axis an undifferentiated traverse glossed *across*. Figure 4 illustrates the navigational-scale system characteristic of modern Oceanic languages.

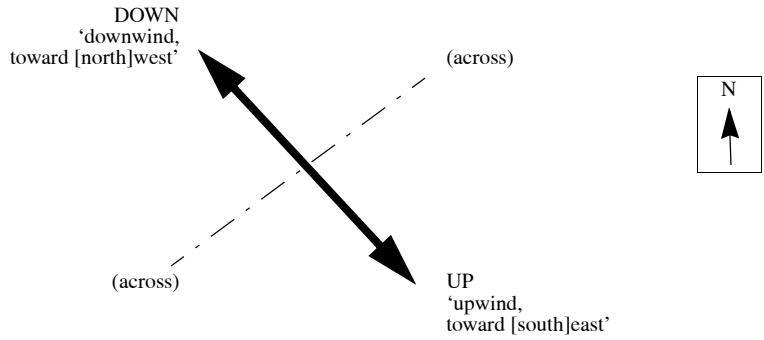
3.4 AN AXIS PARALLEL TO THE SHORELINE? So far, we have been able to observe remarkable consistency between the geocentric systems of modern Oceanic languages, in two respects: first, they all employ a land/sea axis on the local scale; second, they all employ a wind-based cardinal axis on the navigational scale. Obviously, these two spectacular cases of convergence will be of great help in our attempt to reconstruct the system of Proto-Oceanic (section 4).

If we now come back to the local scale, we can observe a third similarity between all languages: that is, the existence of a secondary axis orthogonal to the land/sea axis on land. Its function is to help construct those space vectors that belong neither to the *seaward*, nor to the *inland* quadrant; and because this cross axis is perpendicular to the land/sea axis (which itself is orthogonal to the coast), it necessarily runs parallel to the shoreline.

Now, the languages of our sample appear less unanimous if we pay attention to the detail of that secondary axis on land. Basically, all languages fall into one of two utterly different systems: either the axis parallel to the shore coincides with the cardinal axis; or it is an undifferentiated traverse.

3.4.1 The cardinal axis on land. On the face of it, the first configuration is not difficult to present, because it simply consists in combining the two axes we have just examined. On the local scale, the land/sea axis (3.2) is crossed by an *up–down* cardinal axis (3.3), which is the same as the one that is employed on the navigational scale.

FIGURE 4. A TYPICAL NAVIGATIONAL-SCALE SYSTEM IN OCEANIA: ONE CARDINAL AXIS CODED UP–DOWN AND ORIENTED [SOUTH]EAST



An illustration of such a system was already presented in 2.3: in Kokota, the cardinal axis running from NW (*paka*) to SE (*fona*) is ordinarily used as much on land as at sea, and combines with the land/sea axis (*rhuku–rauru*) so as to form a balanced, four-quadrant system of absolute reference (figure 2). In our sample, the other languages that exemplify this pattern are Balinese, Yabêm, Longgu, Kwaio, Mwotlap, and Anejom̃; they are indicated by a '+' sign in the penultimate column of table 1, under the mention CALS. (*Cardinal Axis used on Local Scale*).

Despite its relative simplicity, this type of geocentric system raises a real problem, which the reader will probably have thought of already. How can we possibly claim that one and the same axis is both "parallel to the shore" and is a "cardinal axis," which normally means fixed in space? The case of Kokota (figure 2) is somewhat an ideal case, as the shoreline is oriented NW–SE on both sides of Santa Isabel, hence matching exactly the (probable) orientation of the cardinal axis used at sea.[5] But what happens if the shoreline is oriented in a direction that is different from the language's cardinal axis?

This type of conflict is probably better exemplified by the case of Mwotlap (François 2003:429), because the island of Mwotlap—also known as Motalava—is geographically oriented WSW–ENE. In order to find out the proper orientation of the cardinal axis in this language, one needs first to ignore the context of any specific landscape, and observe how the language behaves on the navigational scale, as this is the only instance where no shoreline imposes its own orientation; it then becomes clear that the prototypical value of *hag* 'up' in Mwotlap is due southeast—which (on that scale) implies the whole southeastern half of space. But as one narrows down the observation to the local scale of Mwotlap Island, one realizes that the very same *up* direction is not pointing southeast any more, but east-northeast. The cardinal axis has thus been rotated up to 80° counterclockwise from its prototypical value, so as to follow closely the direction of the principal shoreline. However remote it is from due southeast, the ENE direction nonetheless still belongs geometrically to the southeastern hemisphere, which is enough to encode it as 'up'.

In summary, whenever the cardinal axis must be used on land, it has to undergo an adaptive process so as to become parallel to the shoreline; yet its orientation on land cannot be pivoted more than 90° from its navigational value, so as to preserve the consistency of the overall system. At least, this is how Mwotlap—and probably other similar Oceanic systems—could solve the paradox we were mentioning above, that of an axis being both "fixed in space" (within 90° on each side!) and bound to the shore's orientation.

To summarize, the languages that employ the cardinal axis on land make it necessary to distinguish between two scales:

5. Strangely, this convergence between a language's cardinal axis (due to the path of the trade winds blowing NW–SE) and the predominant orientation of its island (due to geological activity) is frequent throughout island Melanesia. This coincidence concerns the islands of Bougainville, Choiseul, Santa Isabel, Guadalcanal, Malaita, San Cristobal (Solomon Is.), Espiritu Santo, Maewo, Pentecost, Malekula (Vanuatu), as well as New Caledonia's Mainland, and so on. Such landscape configurations may make it less likely for the fieldworker to observe the kind of adaptive processes we were confronted with in the case of Mwotlap.

- on the NAVIGATIONAL scale, the cardinal axis is the only one relevant—except for a neutral traverse which is sometimes derived from it (figure 4). Being free from any other constraint, this axis directly points toward the system's cardinal *up* (i.e., *upwind*), dividing space into two halves;
- on the LOCAL scale, the same cardinal axis combines with the land/sea axis, so as to divide space into four balanced quadrants. Although this cardinal axis on land continues to roughly designate the same region as it does at sea, it is subject to a rotation within 90° in order to meet the main orientation of the shoreline.

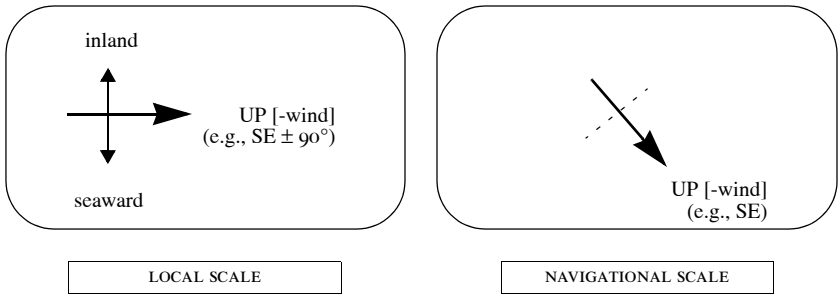
The resulting twofold system is represented in figure 5. Initials SE represent Southeast; the *down* direction is not mentioned, as it is simply symmetrical to *up*.

3.4.2 The undifferentiated traverse axis. Despite being well attested, the system illustrated in figure 5 is not the only one in Oceania; all the remaining languages in our sample belong to a second type, structurally quite different. Although these languages do possess a full *up–down* cardinal axis just like others, they restrict its use to the navigational scale, that is, across valleys or across the sea. As far as the local scale is concerned, for example, within a village or a valley, this cardinal axis is irrelevant; instead, what crosses orthogonally the land/sea axis is a "traverse axis" that runs parallel to the shore. And contrary to the cardinal axis, this traverse does not distinguish between its two sides, hence its name of *undifferentiated* (or *unoriented*) traverse axis.

If we take the example of Marquesan, we thus observe a land/sea axis that explicitly makes the difference between *'i tai* 'to the sea' and *'i uta* 'to the bush'; and a secondary traverse characterized by a single directional *'i kō* on each side. The latter form is sometimes glossed 'across', and must be understood 'on a direction parallel to the shore'. Structurally speaking, this form is ambiguous, as it does not distinguish between the two sides of the shore; in a way, it can be said to simply obey a negative definition, that is, 'neither seaward nor landward'.

Evidently, this type of traverse is exclusively defined by its relation to the axis to which it is orthogonal (in this case, the land/sea axis); geometrically speaking, the former is therefore necessarily derived from the latter (Palmer 2002a:130). A corollary of this point is that traverse axes have no reality of their own outside the local-scale system, and therefore they do not require the same adaptive type of mechanism as we saw in the case of the cardinal axis (3.4.1).

FIGURE 5. SOME MODERN SYSTEMS USE THE CARDINAL AXIS BOTH ON NAVIGATIONAL AND ON LOCAL SCALES



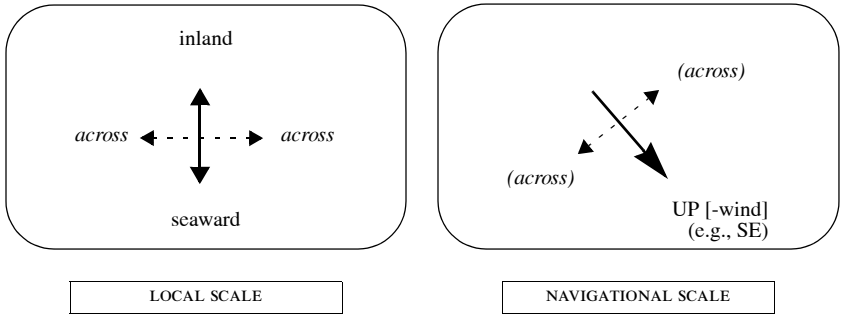
This system is attested throughout our sample: in Taba, Saliba, Ambae, Xârâcùù, Nemi, Iaai, Marquesan—see also Mosel (1982) for Tolai (New Britain), and Palmer (2002a:132) for a general presentation of traverse axes.[6] In table 1, these languages are indicated negatively in the penultimate column, because they do not make use of the cardinal axis on land (CALS)—and positively in the last one (UTLS: 'Undifferentiated Traverse used on Local Scale'). In this case, the form of the directional is given.

When a language possesses the same sort of undifferentiated traverse on its navigational scale (see 3.3.1), it lexifies it the same way as on the local scale—for example, *lao* in Saliba, *vano* in Ambae, *-lee* in Iaai. In Marquesan, although the directional *'i kō* is restricted to the local scale, the verb *taha* 'walk, pass by' can be used on any of the two scales: besides designating a direction parallel to the shore on the local scale, it also regularly points to the north-south axis, that is, directions that are neither eastward (*hiti* 'go up') nor westward (*heke* 'go down').

Figure 6 illustrates the systems characterized by an undifferentiated traverse axis on land. The distinction between the two scales appears to be here even more necessary than in figure 5 above.

3.4.3 A note on circular systems. To be precise, a third configuration is also attested, but has only been described, to our knowledge, for three Austronesian languages: Manam (Lichtenberk 1983: 572), Boumaa Fijian (Dixon 1988:88), and the "intermediate-scale orientation" of Makian Taba (Bowden 1997:262). These systems possess a differentiated axis X-Y, but instead of designating a portion of space that would be fixed in compass terms—as is the case for cardinal axes—each form encodes a direction parallel to the coast around a small island, either clockwise or counterclockwise. The three languages cited lexify these "circular directionals" using terms borrowed from the vertical axis, but they are not consistent with each other: Manam *raŋe* and Boumaa *ca'e* conflate 'up' and 'clockwise', whereas the Taba root *ya* covers both 'up' and 'anti-clockwise'.

FIGURE 6. SOME MODERN SYSTEMS USE AN UNDIFFERENTIATED AXIS ON THE LOCAL (AND SOMETIMES THE NAVIGATIONAL) SCALE



6. A linguistic survey we conducted in the Banks group (northern Vanuatu) in 2003 has shown us that the four languages of Vanua-Lava possess the same system as Mwotlap, whereas the five languages of Gaua, together with Mwerlap and Mota, follow the traverse-axis system (François, pers. data).

This contradiction between languages, as well as the paucity of attested cases, makes it probable that these three circular systems have arisen separately, possibly after the *up–down* cardinal axis on one side of an island was eventually extrapolated to its other side. Despite the intrinsical interest of these clockwise systems for typological research (Palmer 2002a:138), it is not likely that they reflect the characteristics of their common ancestor, being instead the result of parallel—and partly diverging—innovations. This is why they were not included in table 1, and are only mentioned here for the sake of comprehensiveness.

3.5 CONCLUSION. Based on the linguistic information listed in table 1, the last section has presented the two principal types of geocentric system that are attested among modern Oceanic languages; they are illustrated by figures 5 and 6. Their main difference lies in the nature of the axis that is used on the local scale, orthogonally to the land/sea axis and hence parallel to the shoreline. In addition to this central parameter, other characteristics were seen to differ from language to language, such as (1) the way the land/sea contrast is being lexified, (2) the existence of a traverse axis on the navigational scale, and (3) the precise orientation of the cardinal axis in compass terms.

But if we set aside these small differences, what dominates the whole picture is probably the profound homogeneity of all Oceanic languages on the topic of geocentric space reference. This relative unity is a strong encouragement toward reconstructing the system of the common ancestor of this family.

4. THE GEOCENTRIC SYSTEM OF PROTO-OCEANIC. We try here to formulate a unified historical hypothesis about the organization of absolute space reference in Proto-Oceanic. Obviously, some features were inherited from even earlier stages (see Blust 1997 for PMP, and the data from Balinese and Taba in table 1); but we will leave this question aside, and concentrate on the stage of POc. Also, we shall not be concerned with the reconstruction of new lexical forms, but rather with the mechanics of a system; as far as the lexical and syntactic reconstructions are concerned, we will generally refer to Ross (1995; 2004), and other references therein.

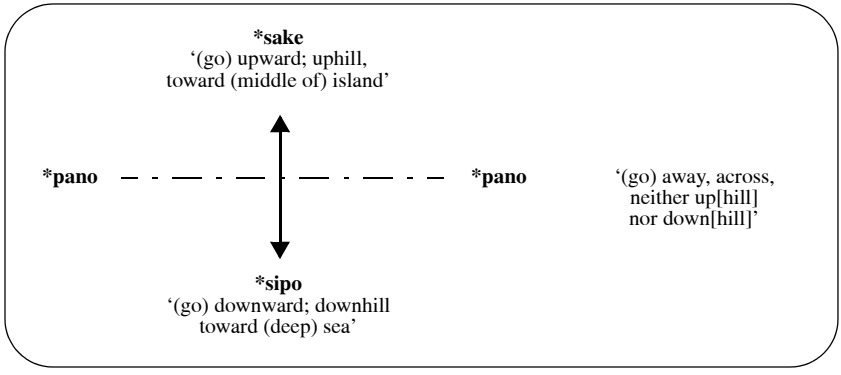
4.1 PROTO-OCEANIC ON LAND. A first reasonable hypothesis is to attribute to POc the features that are common to all Oceanic languages, according to our sample. One can therefore take it for granted that Proto-Oceanic made an extensive use of absolute spatial reference in order to code horizontal relations.

If POc speakers were talking on dry land, or with reference to a specific island, they employed an axis perpendicular to the coast, running from the watershed, or (what was conventionally considered as) the middle of the island, down toward the shore, and probably even toward the deep ocean. Concerning the question of how this axis was lexified (3.2), observation of the modern data shows two patterns to be widespread across the family: one resorts to vertical 'up' vs. 'down', the other uses forms that were originally nouns or locative nouns, such as 'bush' or 'sea'. In actual fact, it is not indispensable to choose between these two hypotheses for POc, as they are compatible with each other. The land/sea axis was most probably referred to

using the two verbs for vertical axis: *sake 'go upward' and *sipo 'go downward'; and these verbs would be often reinforced by prepositional phrases like *sake i qutan 'go up to the bush' and *sipo i laur 'go down to the shore' or *sipo i tasik 'go down to the sea' (Ross 2004). It is probable, though still unsure, that the two verbs could also be employed by people on a boat, with reference to a nearby shore, with the meanings *sake 'sail/paddle toward the island' and *sipo 'sail/paddle away from the island, toward the deep sea'.

Getting back on land, the land/sea axis we have just defined was obviously crossed by an orthogonal axis, parallel to the shore; the question arises whether the latter was an "undifferentiated traverse," or was oriented on each side. This is not an easy question in terms of the comparative method, as both schemes are well represented in all subgroups of the family. All things considered, several arguments tend toward the first possibility, namely, that POc made use of an undifferentiated traverse on the local scale. Indeed, in modern languages, every time the axis parallel to the shore is oriented, it coincides with the cardinal axis used on the navigational scale. In other words, the system with only two axes (land/sea + cardinal: see figure 5) always results from the simplification of a more complex system based on three axes (land/sea + traverse + cardinal: see figure 6), once the local traverse has been lost (5.4). Furthermore, the traverse axes attested throughout the different subgroups of Oceanic often share the same etymological meaning, that of a neutral verb of movement 'go (neither up nor down)': Saliba *lao*, Ambae *vano*, Nemi *-en,* and so forth. Two of these forms, *vano* and probably *-en* (< Nemi *hen* 'go'), come from POc *pano, which is precisely reconstructed by Ross as the third term in a triplet *sake : *sipo : *pano: "It seems that *pano ('go away [from speaker], depart') was also used as a geographic direction verb meaning 'move in a transverse direction, move across the valley'. In this sense it contrasted with 'go up, go inland' and 'go down, go seaward'. The two different uses of *pano are reconstructable for POc" (Ross 2004:302). Although other candidates are also conceivable (e.g., POc *lako 'go' > Saliba *lao*), we follow Ross and consider the most probable reconstruction for the traverse axis to be *pano. The system we propose for POc local-scale reference is represented in figure 7.

FIGURE 7. THE LOCAL-SCALE SYSTEM OF PROTO-OCEANIC: A SINGLE LAND-SEA AXIS, COMBINED WITH A NEUTRAL TRAVERSE



As far as local-scale reference is concerned, POc thus behaved exactly like modern Saliba, Ambae, Nemi, Xârâcùù, and Marquesan. In other words, these languages can be said to be conservative in this domain, whereas other languages have gone through later innovations (see section 5, "A functionally based hypothesis for later innovations").

4.2 PROTO-OCEANIC AT SEA. At sea, when no island was visible or relevant, the speakers of POc could obviously not use the land/sea axis, let alone the traverse axis derived from it. In order to locate themselves in space, they could only refer to natural phenomena. Now, except for Drehu—and possibly Iaai—which seem to have innovated a sun-based axis (Ozanne-Rivierre 1997:90), we are not aware of any Oceanic language in which the rising and setting of the sun is demonstrably the source of the geocentric system of reference. The fact that the cardinal axis of certain languages happens to point toward cardinal east does not necessarily imply that it is ultimately motivated by the sun (Palmer 2002a:117); it can perfectly well be a coincidence due, for example, to the physical orientation of a shoreline.

The languages we have examined overwhelmingly suggest the existence of only one cardinal axis in POc, motivated by the direction of the prevailing winds. Just like most modern Oceanic languages, their common ancestor Proto-Oceanic was spoken in the southern hemisphere, probably in the Bismarck archipelago (Ross 1995; Ross, Pawley, and Osmond 1998); in this region, too, the prevailing trade winds blow from southeast, and unless further technical investigation contradicts this hypothesis, we will take it that the compass orientation of the cardinal axis was essentially from northwest to southeast. Furthermore, it is not difficult to infer from 3.3 that this axis was lexified as 'up'–'down' in POc, using the same lexemes as for the land/sea axis: *sake 'in the southeast direction', *sipo 'in the northwest direction'. As we saw earlier, the resort to the vertical axis reflects the same metaphor as English *upwind* vs. *downwind*.

In an article entitled "Proto-Oceanic terms for meteorological phenomena," Malcolm Ross (1995) reviews in detail the mechanisms of winds in the Pacific, and their linguistic counterpart. The PMP terms *timuR 'east/south-east monsoon' and *habaRat 'west/northwest monsoon', which were used to form the cardinal axis in PMP (Blust 1997; Adelaar 1997), had changed their meaning in POc: no direction was entailed any more in POc *timu(R) 'wind bringing light rain'; and *apaRat 'wet season when northwesterlies blow and sea is rough' has ended up designating a season rather than a wind. As for the winds themselves, Ross (1995:282) reconstructs the following terms for POc: *tokalau(r) 'northwest storm wind (?)'; *karak(a) '(strong?) southeast trade'; *m[u,i]ri ~ *marau 'southeast trade wind'; *aqura 'wind, particularly southeast trade'.

Later, Ross has this to say about winds and cardinal directions: "Modern uses of wind terms suggest strongly that they also served as directional terms in POc. Modern usage and modern reflexes also indicate that each term referred to a rough quadrant rather than a point. … [T]raditional cardinal directions are likely to be somewhat variable. The term for 'southeast trade wind' applied to approximately the southern quadrant, the term for 'northwest storm wind' to the northern. What of the eastern and western quadrants? These seem to have been described in POc (and in many non-Oceanic Austronesian languages) as 'the place of the sun's rising' and

'the place of the sun's setting'. As a result, reflexes of POc *sake 'rise' and *sipo 'set' often occur as a part of terms for east and west. … [I]t is not clear whether *sake and *sipo alone meant 'east' and 'west' in POc" (Ross 1995:285–86).

In other words, Ross suggests a system like the one in figure 8 (we use points for the sake of simplicity, but the author mentions rough quadrants). His proposal must be acknowledged as being the first consistent hypothesis regarding the cardinal system of Proto-Oceanic. In doing so, the author himself is aware that the analogy across language families must be handled carefully, and that POc probably had its own peculiarities: for example, he notes that each POc directional "referred to a rough quadrant rather than a point," as opposed to the western compass. Nonetheless, the pattern he proposes still betrays some degree of analogy with the absolute systems widespread in Europe and in Asia: firstly, because it possesses four balanced terms; secondly, because it is based partly on the path of the sun. This implicit analogy probably explains why Ross feels it necessary to rotate the terms for 'northwest' and 'southeast' so as to form a north–south axis.

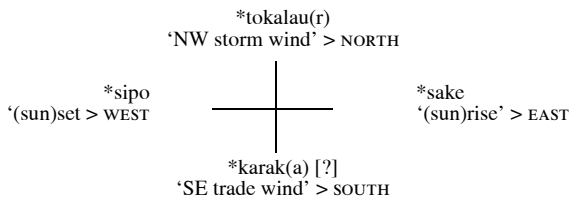
The hypothesis we would like to set forth here is somewhat more extreme in suggesting drastic differences between Proto-Oceanic and other language families. If we follow the reasoning begun in section 3, it is probable that the cardinal system of POc consisted of only one axis running from northwest to southeast, and lexified respectively as *sipo 'down' vs. *sake 'up'. This axis was motivated by the prevailing winds, which blow from northwest and—especially—from southeast. In other terms, far from being orthogonal to the wind-based axis as in figure 8, the *up–down* pair of directionals precisely coincided with it. Incidentally, this situation is preserved in Mwotlap, where *togle* < *tokalau(r) designates the northwest wind, while *hōw* < *sipo refers to the corresponding northwest direction. Both terms can be combined together, proving they have the same cardinal reference:

(1) Ne-leñ ni-tiglō me HŌW lo-TOGLE.
ART-wind AOR-appear hither down LOC-northwesterly
'The wind started to blow from down there, from northwest.'

As far as the navigational scale is concerned, Proto-Oceanic thus essentially divided space in two halves, rather than in four quadrants. The system we reconstruct is illustrated in figure 9, which can be compared with figure 4.

A final point of debate would be whether Proto-Oceanic possessed a traverse axis on the navigational scale. As we have seen, certain modern languages have one, others don't (see 3.3.1). Our idea is the following: if it is true that the cardinal axis was lexified

FIGURE 8. THE CARDINAL SYSTEM OF POC ACCORDING TO ROSS (1995)



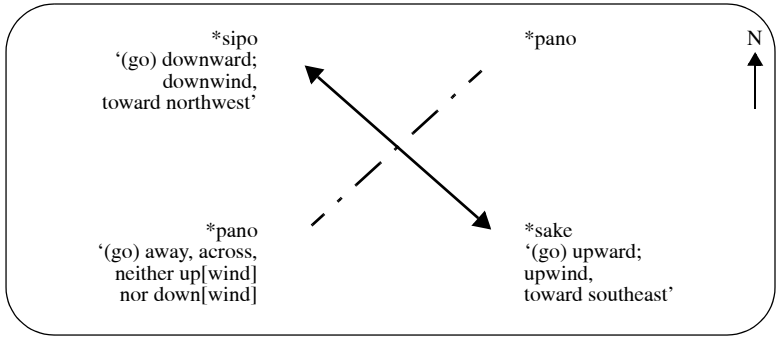
the same way as the local scale (*sake–*sipo), then this exact parallelism would have made it natural for speakers to also make use of a cross-axis in their navigational subsystem whenever they would need it, in order to designate those directions that were 'neither upwind nor downwind'. In that event, the relevant directional verb would have been the same as on the local scale (3.4.2), *pano.

5. A FUNCTIONALLY BASED HYPOTHESIS FOR LATER INNOVATIONS. The geocentric system we have reconstructed for Proto-Oceanic consists of two separate contexts. Both of them employ the three directionals defined on the vertical axis (*sake 'up', *sipo 'down', *pano 'across; neither up nor down'), but redefine them so as to encode vectors on the horizontal plane:

- in the "local context" of a village, a valley, or a small island, the vertical axis is mapped onto the topography: *sake 'uphill, inland'; *sipo 'downhill, seaward'; *pano 'across, parallel to the shore' (figure 7);
- in the context of seafaring, or inter-island communication, the vertical axis coincides with the direction of the main winds: *sake 'upwind, southeast'; *sipo 'downwind, northwest'; *pano 'across, either northeast or southwest' (figure 9).

5.1 WHEN THE SCALES INTERFERE WITH EACH OTHER. Obviously, in the POc system as we reconstruct it, the same radicals represented different directions, which sometimes happened to be identical (e.g., when the hinterland was located southeast: *sake), but could perfectly clash with each other (e.g., when going seaward *sipo was going southeast *sake). This situation is not unknown in some modern languages that have retained the system of Proto-Oceanic. See what Anna Margetts says about Saliba: "The coordinates of the two scales can overlap to any degree and assign the directional terms to the same as well as to different or even opposite directions, depending on the orientation of the shore line. This is to say that there is no necessary or even typical alignment between hill-ward and east, and between sea-ward and west. This can lead to confusion and sometimes require negotiating on which scale a term is used" (Margetts 1999:123).

FIGURE 9. THE NAVIGATIONAL-SCALE SYSTEM OF PROTO-OCEANIC: A SINGLE (NW-SE) CARDINAL AXIS, AND PERHAPS A TRAVERSE

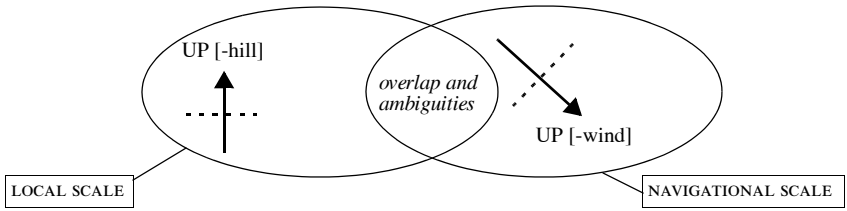


In theory, the two subsystems of orientation are used in distinct contexts, and there should be no confusion between directions on the two scales. However, it is not difficult to imagine ambiguous situations, where both the navigational and the land system would become equally relevant. The subsystems could mainly interfere in two ways: (1) *the land coordinates become salient while at sea*: whenever a ship would come closer to a specific island, the speakers tended to resort not only to the navigational system, but also to the land/sea axis, as if they were already thinking in the context of land; (2) *the sea coordinates become salient while on land*: whenever the speakers on land would mention locations on other islands, or remote places within their own (large?) island, they tended to resort not only to the local-scale system, but also to the navigational one, as if they were thinking in the context of seafaring.

Despite their difference, these two pragmatic situations had the same effect upon space reference: the overlapping of the local-scale and the navigational-scale subsystems, in a way that regularly "require[d] negotiating on which scale a term [was] used" (Margetts 1999:123). For example, suppose speakers A and B are paddling toward an island: if A employs the directional term *sake (e.g., 'You should paddle a bit more upward'), it will be ambiguous whether the system of reference is the navigational scale—hence *sake 'Paddle a bit more upwind, toward southeast'—or the land/sea axis—hence *sake 'Paddle a bit more uphill, closer to the shore'. If B doesn't get the point, A will have to disambiguate his sentence, by adding more information (e.g., deictic: 'upward this way'; or lexical: 'upward toward land'; and so on). If such interfering contexts are frequent in daily life, the ambiguity of directional terms may bring about unsuccessful or laborious speech interactions, which is always a strong pressure toward language change.

Of course, speakers can manage to "get by" in the same way across generations, as is precisely witnessed in modern Saliba. If they did, they preserved the original version of the Proto-Oceanic geocentric system—that is, two distinct subsystems, with a gray zone at their intersection (see figure 10). Although this system can perfectly be perpetuated across centuries, several of its features still may cause ambiguity and indecision. First, in the gray zone between scales, the relationship between both axes is unsteady. Second, the two axes are lexified in the same way, which results in a disturbing homophony. Third, the traverse axis on both scales has the disadvantage of being undifferentiated on its sides, and this again typically brings about situations of misunderstanding.

FIGURE 10. STAGE 1 OF OCEANIC EVOLUTION (PROTO-OCEANIC): TWO OVERLAPPING SCALES, EACH HAVING ONE UP–DOWN AXIS PLUS A TRAVERSE



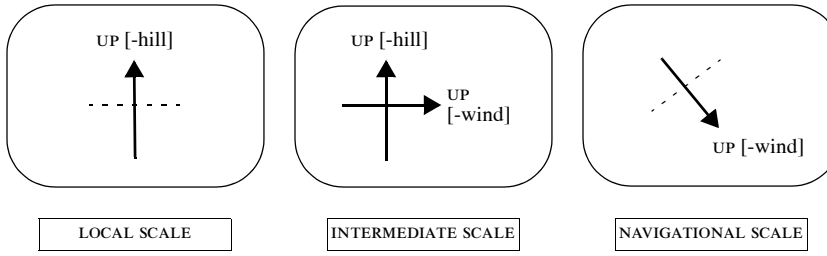
All these functional shortcomings began to be progressively compensated for by innovating strategies across the daughter languages of Proto-Oceanic, whether in earlier or later stages in the family's history. The remainder of this paper consists in reconstructing the principal steps of this evolution, following their most probable chronology. In doing so, we will make sure that the geocentric system reconstructed at each stage is still witnessed in one modern language at least, and also that it constitutes a plausible historical answer to the functional constraints that weigh on this type of space reference.

5.2 THE EMERGENCE OF A HYBRID SUBSYSTEM. A first step in the alteration of the directional system was probably the emergence of an intermediate scale, resulting from the hybridization of the local and the navigational scales.

Certain modern languages—for example, Northeast Ambae—are very close to the system of stage I above, except for one property: although their local- and navigational-scale subsytems are identical to figure 10, they regularly allow the two up–down axes (land/sea axis + wind-based cardinal axis) to be employed simultaneously on land. This new combination takes place precisely in the contexts where the stage I system was irresolute, in that gray zone between land and sea. This new subsystem, which can be called *intermediate scale*, corresponds to those situations where the places referred to are still located on land—hence the use of the land/sea axis—but are so remote that the local scale must give way to a novel subsystem that borrows the cardinal axis from the navigational scale.

Therefore, the first important innovation that has to be reconstructed for Oceanic languages is the creation of an intermediate scale employing simultaneously the two up–down axes on dry land (Ozanne-Rivierre 1997:88). This scale typically corresponds to coastal contexts, while the local scale is associated with inland areas, and the navigational scale with deep sea. This stage II is represented in figure 11. Of course, this hybrid subsystem did not eliminate the ambiguities we mentioned earlier, as it still made use of two up–down axes. But in comparison with the somewhat wavering system of stage I, the creation of an intermediate scale had the positive effect of stabilizing the relationship between the two up–down axes: by defining a balanced set of four equal quadrants, this new system probably helped improve the pragmatic and cognitive tasks of information processing in the relevant contexts.

FIGURE 11. STAGE II OF OCEANIC EVOLUTION: EMERGENCE OF AN INTERMEDIATE SCALE COMBINING TWO UP–DOWN AXES



This combination of the land/sea and the cardinal axes presents a corollary that remarkably distinguishes stage II from stage I. Because the two axes could only constitute a consistent system if they crossed each other at right angles, the cardinal axis often had to be pivoted in order to follow closely the shape of the coast. This is why the direction coded *up(-wind)* in the intermediate scale sometimes turns out to be quite different from the one at sea, as we saw in 3.4.1.

Finally, it is possible that the development of stage II was favored by certain geographic situations, such as a long, outspread island characterized by a high number of small communities. For example, it is the system still attested in most modern languages of the New Caledonian Mainland—Xârâcùù (Moyse-Faurie 1995), Cèmuhî (Rivierre 1980:123; Ozanne-Rivierre 1997:87), Nemi (Ozanne-Rivierre 1999), Nyelâyu (Ozanne-Rivierre 1998), Nêlêmwa (Bril, forthcoming)—probably because the speakers there are constantly referring not only to their own village or valley (*local scale*), but also to the neighboring communities scattered along the coast of the same island (intermediate scale). Further research is needed to determine what precise conditions could—and historically did—motivate this sort of innovation; if some determinism can be hypothesized, then this could provide the historical linguist with an important clue, say, in order to locate the homeland of protolanguages.

5.3 RELEXIFICATION OF THE LAND/SEA AXIS. Despite its advantages, this first innovation did not solve the problem of the homophony between directionals (5.1). The next stage in the evolution of geocentric reference precisely consisted in the lexical differentiation between the two axes of the intermediate scale.

Now, if we refer back to table 1, we observe that the axis that has always been preserved as *up–down* is the cardinal axis. When a relexification has occurred, it always concerns the land/sea axis. It seems possible to propose a hypothesis to account for this strong tendency. In a system of stage II, two speakers would "negotiate" the meaning of a word like *up* by providing more lexical or grammatical information: *up there ~ up toward the shore ~ up toward the hill,* and so forth. It was easy to increase the precision of a sentence when the *up–down* axis corresponded to the land/sea axis, because this context is associated with several elements that are cognitively salient and highly lexicalized, like the shore, the bush, the island, the mountain, the sea, and so on; consequently, there were plenty of alternative ways to lexify this land/sea axis, as is witnessed by modern languages. On the contrary, users of a stage II language would certainly have been embarrassed if they were to find another expression for the cardinal axis: the prevailing winds, although being certainly the source of the POc system, are cognitively not as salient as a visible island can be; and it is not even sure that all speakers were equally able to motivate this up-down axis in relation with the winds: nowadays, too, informants can explain the land/sea axis much more easily than the cardinal axis. This is probably why the axis that always preserved the terms *up* and *down* is paradoxically the one in which this vertical metaphor is less obvious, that is, the cardinal one.

A good example of such a system is found in Makian Taba. Bowden (1997) is indeed one of the only authors who explicitly distinguishes not two, but three scales for the observation of geocentric space reference: "small-scale orientation" on one end,

"worldwide orientation" on the other, and "intermediate-scale orientation" in between; according to us, these three subsystems are well illustrated by figure 12. Yet to be precise, two remarks must be made concerning this language. First, the up–down axis used on the island of Makian has now lost its connection with the cardinal axis used at sea, as it has become a circular system, with *up* (originally 'upwind') eventually changing into counter-clockwise (see 3.4.3). Secondly, Taba cannot be said to have historically evolved from POc, because, of course, it is not an Oceanic language (see figure 3). But it remains possible to suggest that the common ancestor of POc and of SHWNG (i.e., Eastern Malayo-Polynesian) possessed a stage I type of system, which POc retained for some time, whereas Taba progressively evolved toward stage III—arguably via stage II—to say nothing of later innovations such as the circular axis. In other words, even if Taba cannot be listed among the descendants of POc, it does provide a good illustration of the kind of innovations that are logically possible after stages I and II, and that have evidently occurred elsewhere in the Pacific. Such issues remain open to discussion and further investigation.

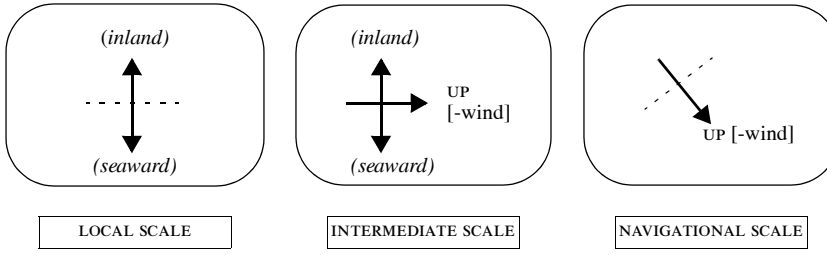
As far as Oceanic languages are concerned, stage III is still represented by certain Polynesian languages such as modern Marquesan. And even if this is not made clear in table 1, Iaai also seems to be concerned by this evolution. Indeed, although this language still marginally employs the up–down contrast for both axes (see the appendix), it has been increasingly dedicating specific words to the land/sea axis, namely *hoot* 'on dry land' vs. *hnyi-köiö* 'at sea' (Ozanne-Rivierre 1997:90; forthcoming): according to our interpretation, Iaai is thus presently in the process of shifting from stage II to stage III.

Generally speaking, the lexical implementation of the land/sea axis is diverse among Oceanic languages: some employ former locative nouns (e.g., *bush* vs. *sea*), others resort to an *in* vs. *out* contrast, and so on (3.2). This tends to strongly confirm that stage III corresponds to later and/or parallel innovations across the Pacific.

5.4 THE HYBRID SUBSYSTEM GENERALIZED ON LAND. The next step in the evolution of geocentric reference was demonstrably the disappearance of the traverse axis on the local scale, and its replacement by the cardinal axis everywhere on land.

In a stage III type of system, the inhabitants of an island refer to directions parallel to the shore by employing two distinct devices: on the one hand, they use an undif-

FIGURE 12. STAGE III OF OCEANIC EVOLUTION: RELEXIFICATION OF THE LAND-SEA AXIS

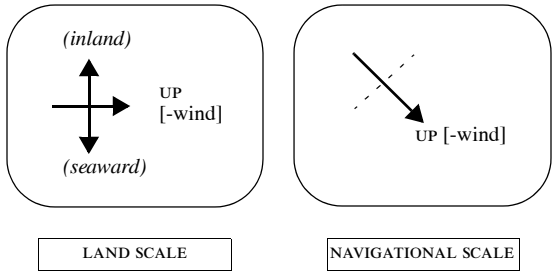


ferentiated traverse as long as they remain in their familiar village or area (local scale); but on the other hand, they are accustomed to locating neighboring spots along the same coast, by means of a cardinal axis oriented up–down (intermediate scale). By allowing more precision, the latter increases the probability for successful speech acts. It is therefore not difficult to imagine how strongly Oceanic languages have tended to generalize the two-axis subsystem of stage III (intermediate scale) on all areas where it was possible.

Our evidence shows that many languages have gone through this process of merging the local with the intermediate scale, thus defining a single subsystem on land (we can now speak of a land scale). In doing so, they in fact did no more than extrapolate the cardinal axis—already used for remote reference on land—to their very close setting, including for short distances of yards or inches. This innovation had the direct consequence of rendering the traverse axis redundant and useless. Indeed, in all languages corresponding to stage IV, the term for 'across, neither inland nor seaward' was completely swept out of the system used on land.[7] This spectacular phenomenon is obvious from the two far-right columns of table 1: whenever the cardinal axis is allowed on the local scale, the undifferentiated traverse is absent from the language (see 3.4). Moreover, and somewhat paradoxically, this sudden disappearance of the traverse axis on land was often followed by its fading at sea.

Figure 13 represents this new stage of Oceanic evolution. In our Oceanic corpus, the geocentric system of stage IV is witnessed by Yabêm, Kokota, Longgu, Kwaio, Mwotlap, and Anejom̃: these are exactly the languages we had listed in 3.4.1. Such a coincidence must not be taken for granted, as it provides one important piece of information: as far as we know, no Oceanic language is attested in which the local scale would be a combination of two up–down axes. In other terms, whenever the land/sea axis is lexified *up–down*, it combines with a traverse; whenever the cardinal axis is compatible with the local scale, it combines with a land/sea axis that is not lexified *up–down*. According to us, this sort of unpredictable correlation can only be formulated in

FIGURE 13. STAGE IV OF OCEANIC EVOLUTION: MERGER OF LOCAL AND INTERMEDIATE SCALES INTO A SINGLE LAND SCALE



7. In Mwotlap the directional *van* (< *pano) has survived, but has changed its meaning into that of a personal directional 'toward a specific participant (excluding speaker)' (François 2003:412). It has more or less replaced the former directional *atu, which is still attested in the neighboring languages of Vanua-Lava and Gaua.

terms of relative chronology of innovations: in this case, the relexification of the land/sea axis (stage II → stage III) must historically have occurred prior to the merger of local and intermediate scales (stage III → stage IV). This type of empirical evidence tends to confirm the chronological scenario we reconstruct for the Oceanic family.

5.5 SYNTHESIS: INNOVATING SPACE REFERENCE. Of course, further innovations have been attested locally: Manam and Boumaa Fijian have developed a circular system (3.4.3); Drehu has created a second cardinal axis (Ozanne-Rivierre 1997:90); Tokelauan has adapted the land/sea axis to the unusual shape of atolls (Palmer 2002a:140); and so on. However, we shall end here our historical reconstructions, as they already make it possible to account for the essential part of geocentric systems attested throughout Oceania.

We have thus tentatively reconstructed four distinct stages in the evolution of the geocentric system of Proto-Oceanic; they are summarized in table 2. It is assumed that POc itself corresponded to stage I, while all other stages should correspond to later innovations of Oceanic languages. For each stage, the right column of table 2 cites at least one modern language as a contemporary witness. Simple though it may be, this table covers most of the diversity attested throughout Oceania. For example, despite being impressive at first sight, the differences between the modern systems of Saliba and Longgu are easily understood when one realizes that Saliba has preserved the stage I system of POc, whereas Longgu has apparently innovated as far as stage IV.

Ideally, the set of innovations defined here could also be used as a diagnosis for subgrouping within the Oceanic family, in a way very similar to phonetic innovations. For example, if all languages in a given subgroup belong to stage III or IV, it is likely that their protolanguage belonged itself to stage III, and so on. Needless to say, such fine-grained historical hypotheses would need infinitely more data in each subgroup than are currently available. Also, it may be necessary to underline the fact that, much more than phonological innovations, a linguistic change on such a topic as geocentric space reference is typically the sort of innovation that may be induced by situations of cultural contact and areal convergence rather than strict genetic inheritance. Prudence would therefore certainly be required when manipulating these reconstructions for subgrouping purposes.

TABLE 2. THE FOUR DIACHRONIC STAGES OF GEOCENTRIC REFERENCE IN OCEANIA

<table>
<tr><th></th><th>LOCAL SCALE
(valley, village)</th><th>INTERMEDIATE SCALE
(land-sea interface)</th><th>NAVIGATIONAL SCALE
(sea + inter-island)</th><th>MODERN WITNESSES</th></tr>
<tr><td>STAGE I</td><td>UP[hill] + traverse</td><td>(unsystematic)</td><td>UP[wind] (+ traverse)</td><td>Saliba</td></tr>
<tr><td>STAGE II</td><td>UP[hill] + traverse</td><td>UP[hill] + UP[wind]</td><td>UP[wind] (+ traverse)</td><td>Ambae</td></tr>
<tr><td>STAGE III</td><td>inland + traverse</td><td>inland + UP[wind]</td><td>UP[wind] (+ traverse)</td><td>Marquesan</td></tr>
<tr><td>STAGE IV</td><td colspan="2">inland + UP[wind]</td><td>UP[wind] (+ traverse)</td><td>Longgu</td></tr>
</table>

6. CONCLUSION. The reconstruction we have proposed is still tentative, and has no other aim than to foster discussion. On the basis of the empirical observation available to us, we have hypothesized a plausible geocentric system for Proto-Oceanic, as well as a probable chronological scenario for its evolution across its daughter languages.

Being empirical, our hypotheses still have to be challenged and amended by further research. So far, only a small number of modern Oceanic languages have benefited from a detailed description of their geocentric system, and it is to be expected that the future empirical observations will reserve some surprises. New data can help improve either our reconstruction of the very POc system, or at least our claims about its later developments. For example, suppose a language is found in which the smaller scale combines two up–down axes, then the relative chronology between stages II, III, and IV will have to be amended (see 5.4). Conversely, if the remaining languages of Oceania confirm our first impressions, then it is hoped that some historical reconstruction may be achieved, similar to the one we have been suggesting in this paper.

APPENDIX

This appendix aims at discussing briefly the geocentric directional systems of those modern Austronesian languages that we included in our comparative sample (section 3)—at least when our own interpretation differs from our bibliographical source.

When they are not indicated in the text, our references are: Adelaar (1997) for Balinese; Bowden (1997) for Taba; Margetts (1999:123) for Saliba; Streicher (1982) for Yabêm; Palmer (2002a,b) for Kokota; Hill (1997) for Longgu; François (2003) for Mwotlap; Hyslop (2001) for Northeast Ambae; Lynch (2000) for Anejom̃; Ozanne-Rivierre (1997; 1999) for Nemi; Ozanne-Rivierre (1997; forthcoming) for Iaai; Moyse-Faurie (1995), Moyse-Faurie and Néchérö-Jorédié (1986) for Xârâcùù; Rehg (1981:288) for Pohnpeian; Churchward (1951:58), and Mosel and Hovdhaugen (1992:95) for Samoan; Lavondès (1983) for Marquesan.

Taba. Bowden (1997) makes a distinction between three scales of reference. In table 1, we only consider his "small-scale orientation" (a land/sea axis + a traverse) and his "world-wide orientation" (a cardinal axis). We do not include the "intermediate-scale orientation" of Makian Taba—a circular system—because it probably results from a local innovation: see the discussions in 3.4.3 and 5.3.

Yabêm. Although Yabêm is classic in using a cardinal axis lexified up–down, it is more remarkable in orienting it in the opposite direction when compared to other Oceanic languages: *up* apparently points west instead of expected (south)east. A first explanation would tentatively suggest that the strongest winds in this area (southeastern tip of the Huon peninsula) are not the southeast trade winds, but the northwest monsoons (see Ross 1995:269). Alternatively, it may be necessary to take into account the very shape of the Huon peninsula: indeed, to follow the shore "upward" from Yabêm to Lae indeed means to go west (Streicher 1982); but this portion of land is just a short break along a coastline whose main orientation is southeast (from Madang to Yabêm, from Lae to Morobe). More needs to be known about space reference in this area. But whatever the answer to these questions, this "up = west" axis in Yabêm is strong evidence against the path-of-the-sun hypothesis: winds can be found to change directions much more easily than the sun.

Longgu. Hill (1997) glosses the pair of directionals *ala'a–toli* as 'east'–'west', which is consistent with the interpretation she proposes in connection with the sun. However, her maps show an axis running from southeast to northwest—and even south to north in some places.

As for the etymology, we propose for *ala'a–toli* as 'up'–'down'; it is supported by neighboring Kwaio *'a-la'a* 'up, upward; south-east' and *'ai-sifo* ~ *'ai-tori* 'down, downward; north-west', from *tori* 'fall' (Keesing 1997:135). This is why we would tentatively question the path-of-the-sun hypothesis (3.3.3), even when it is proposed by native speakers: there is every likelihood that the up–down system of Longgu is similar to that of other Oceanic languages.

Kokota. The reasoning for Kokota is detailed in 3.3.2.

Iaai. To be precise, modern Iaai uses two forms for the vertical axis (*dhöö* 'up, above' / *jii* 'down, below'), which are distinct from the directionals involved in geocentric reference. In order to account for the polysemy of *iö* ('inland, on high ground; east; up') and of *ü* ('toward the sea; west; down'), Ozanne-Rivierre (forthcoming) tentatively resorts to the particular topography of the island of Uvea, which "slopes from east to west": according to her, the term 'east' would have extended its meaning to 'inland', and then to 'up'. But, one could object, the same polysemies are attested in other languages (e.g., Nemi, Ambae), although their landscapes are not geographically oriented like Uvea. We would propose another interpretation. The original pair of morphemes for the vertical axis was *iö* 'up' – *ü* 'down', which inherited the polysemy of 'up' and 'down' in POc (see section 4). More recently, Iaai began to develop the use of two morphemes *dhöö–jii* (perhaps two adverbs 'above'–'below'?) to code for the strictly vertical meanings 'up'–'down', thus competing with the old forms *iö–ü*; the latter, however, have survived in non-vertical usages of the 'up'–'down' contrast (land/sea axis; cardinal axis), and the competition is still going on today.

As far as the motivation of the cardinal axis is concerned (wind vs. sun), Ozanne-Rivierre (forthcoming) claims that *iö* and *ü* refer to a sun-based east–west axis, by citing texts where *iö* 'east' is associated with the sun's rising, and *ü* 'west' with its setting. However, even if the system has been recently reinterpreted with reference to the sun, it remains possible that these two directions originated in a distinct landmark (e.g., a wind) in a way that happened to coincide with an east–west axis (Palmer 2002a:117). And, in fact, the colexification of 'east'–'west' with 'up'–'down' suggests that Iaai ultimately behaves just like other languages conservative of the POc system, and that the wind hypothesis may be the right one (3.3.3).

Pohnpeian. Rehg (1981: 288) cites two forms *-di* 'downward; leeward' and *-da(k)* 'upward; windward', putting them in contrast with a land/sea axis. However, we have no indication on the absolute orientation these two directionals may have.

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