Which Sounds Change: Descent and Borrowing in the Skou Family[1]

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The process of establishing genetic relationships in the endeavor of historical linguistics is complicated by the fact that some, if not most, languages show no inclination to "behave themselves" by reflecting only material inherited from their protolanguage. Borrowing at many levels is rife in many languages, particularly when geographic separation is slight, and when social contact is frequent. When both language-internal change and language-external change happen during the same time frame, sorting out relations can be complicated. In this article I show that not all sounds behave equally with respect to areal spread. This is presented through a study of sound changes in the Skou languages of New Guinea, and a survey of other reports of diffusing behavior from elsewhere. Recognizing and working with these differences can allow us to sort out relative chronologies and thus historical relations in even complex scenarios of borrowing and change.

1. INTRODUCTION. This article presents historical argumentation for a small family of languages spoken in the center of the north coast of New Guinea. In addition to presenting some primary data for a family that has previously been underdescribed, even from a New Guinea perspective, it also attempts to highlight the methodological issues of using the comparative method in a New Guinea context, issues that were raised by Foley (1986) (see 1.1). Unlike Foley's case study of Lower Sepik languages, the languages of the Skou family are spoken in a small and geographically accessible region, and so show a lot more cross-influence than do Foley's group; this could be expected to represent a more complicated picture. This is in fact the case. Accordingly, this article shows in practice the tangle of dialect-like diffusion mixed with genetic inheritance that characterizes most contiguous language families in New Guinea, and establishes a set of principles for operating in this jungle.

1.1 THEORETICAL GOALS. Sorting a set of isoglosses into those representing diffusion and those representing inheritance is not a new issue in historical lin-

1. Thanks are due to members of an audience at the 2001 meeting of the Australian Linguistics Society, and to the insightful comments made by two anonymous reviewers, which both improved and clarified the exposition. Special thanks are given to Doug Marmion for generously sharing his Wutung data with me.

Oceanic Linguistics, Volume 41, no. 1 (June 2002)

guistics, and has been the subject of much discussion in the literature since the Family tree (*Stammbaum*) and Wave model (*Wellentheorie*) models were proposed in the nineteenth century (Schleicher 1860, Schmidt 1872). While much work has shown that these two models are not in fact mutually exclusive (e.g., Labov 1981, Ross 1988, 1997a), there is still a gulf between them conceptually. It is clear that there are procedural gains to be had with either of these models, but the question of how to sort the data into different sets, one set for analysis by cladistic techniques, one for analysis by diffusion, is not clear.

In common with the more familiar European situation, New Guinea presents similar challenges for cladistic or diffusional analysis. With New Guinea historical linguistics, however, the issues occur on a greater scale. Both socially and geographically, New Guinea is a milieu that lends itself to more intense contact with more diverse neighbors than the large nation-states that characterize Europe, for almost all societies in the region are small scale. To quote Foley (1986:208, 209): "Borrowing has occurred on a massive scale in most European languages, but by a judicious blend of the use of the comparative method and the sifting of written documents, the sorting of cognates from borrowings has been largely accomplished. With Papuan languages, we face a much more daunting assignment. Papuan language families are small and are generally spoken in small areas. The languages are usually contiguous, and have been so for millennia. … Papuan languages normally exhibit a pattern of enormous cross-influence in all areas; so in no sense can the assumption that the daughter languages develop independently be taken as viable in this context."

In this article, I show how we can, through the careful use of existing methodologies, sort out the inherited, taxon-defining changes from the diffusing—and thus network-defining—changes in the one family, namely, that which contains Skou and the languages of the West Vanimo coast. The smaller Skou family is a convenient point for starting to examine the competing roles of inheritance and diffusion in a non-Austronesian language family of New Guinea. The points in favor of studying the Skou family as a controlled genetic unit in a New Guinea context are: (1) the family is relatively close-knit, roughly on the order of divergence exhibited by Germanic (see remarks in Foley 1986:213);[2] (2) the family is typologically very different from other linguistic groups near it, allowing us to sort out, relatively simply, loans and other otherwise problematic material; (3) it is part of a larger genetic unit, the Skou-Serra-Piore group within the Macro-Skou family, but for which clear grounds for separation can be posited. This allows for external checking of features in the languages to see if they are more likely to be retentions or innovations; and (4) it has for the most part diverged by a series of population moves and displacements, the history of which is recoverable from oral traditions in the area.

2. As a rough guide, the following language comparisons hold: Skou may be thought of as being represented by Danish, with its extensive phonological changes, and quite distinct from the remaining Eastern Skou languages, which are roughly equivalent to Western Germanic. Leitre is represented by phonologically conservative English, Wutung and Sangke are dialects of Southern German (say, High German and Swiss German), and the Vanimo varieties are Dutch and Low German. Lexicostatistics yield a roughly similar comparison. The analogy should not be pushed too far.

The Skou family thus represents a small enough unit to identify correspondences without too much difficulty, and one that can be externally defined as a delimitable unit of study. Compared to other linguistic families in New Guinea that have been subject to comparative work, it is much more compact geographically, and the languages are more similar (comparing the Skou case to projects such as Foley 1986 on Lower Sepik; Foley 2000 on Sepik-Ramu; Pawley 1995, 1997, 1998, 2001 on Trans–New Guinea; Voorhoeve 2000, 2001 on Awyu-Dumut; Ross's 2001 study on East Papuan languages is an exploration into more varied languages spoken over a more geographically diffuse area). The Skou languages and their region are well suited to the study of diffusion for the following reasons: (1) the languages are spoken along a stretch of coast that is (with the historically recent exception of Leitre, and the partly inland Sangke/Nyao) contiguous; (2) the geographic expanse is mainly one-dimensional: steep hills and antagonistic neighbors have limited the interior expansion of the languages, thus simplifying a description of contact; only Sangke is based in an inland location, and even then is "between" Skou and Wutung, both in terms of geographic distance and historical contact; (3) the current position of the languages reflects their relative historical movement, because the time-depth involved is relatively short; and (4) extensive trade and cultural interaction within the group, as well as a perceived "uniqueness," have led to a social atmosphere that fosters diffusion of linguistic features. We thus have a group of languages that on the one hand are of a suitable size for exploratory historical work, and on the other hand pose interesting yet manageable problems in terms of diffusion.

What diffuses in language contact situations?[3] Although it is commonly admitted that borrowing can extend to all levels of the lexicon, given the right time and sociolinguistic context, various writers have various theories about structural borrowing. To quote from one textbook, "When one dialect of a language exerts influence on another, various linguistic features, such as the pronunciation of a phoneme, a morphological or syntactic pattern, or the meaning of a word, may be borrowed" (Jeffers and Lehiste 1984:154).

This is in keeping with Sapir's view that, discussing morphological borrowing, "they are but superficial additions on the morphological kernel of the language" (Sapir 1921:206, quoted in Harris and Campbell 1995:121). Thomason and Kaufmann (1988:14) are more forthright in their claim that "any linguistic feature can be transferred from any language to any other language." Teeter (quoted in Lass 1997: 189) emphatically states the opposite to this position: "Words may be borrowed, structures no." Harris and Campbell (1995: chap. 6) and Lass (1997: chap. 4, especially 4.3) present a broad review of the literature on "borrowability," with Harris and Campbell showing a particular reference to morphosyntax.

Ross (1988: 12) presents the chart in figure 1 that shows the grade of likelihood of borrowing, from the most to the least borrowable. Other writers offer different views on the scale of borrowability. To mention just one other, with a significantly different order to Ross's, we can turn to Thomason and Kaufmann (1988: 74–76). They list lexical and structural elements as separate scales, but with the implica-

3. As for *how* it diffuses, see Ross (1997a).

tion that both lexical and structural material will be borrowed. They have the scale of borrowability given in figure 2.

In this study, we examine structural borrowing in the realm of phonology, specifically the phoneme arrangements in the different languages. There has undoubtedly been borrowing in the lexicon,[4] evidenced by the frequency of synonyms for many common nouns in at least Skou, and rationalized by the presence of hidden and common languages in many communities. Typologically the languages are remarkably similar, and show no evidence for anything other than retentions from their ancestral language. There is little bound morphology, most of it showing quite regular correspondences, given the observations we can make about the reflexes of protoforms in nonbound lexical sets (though see the discussion in 3.1.1, 4, and 5.4).

With respect to phonological borrowing, here we are not in general talking about simply borrowing new phonemes into an otherwise undisturbed phonemic system, but of borrowing phonological changes that rearrange the phoneme system. That is, we are examining the sort of borrowing that is seen in the change of *r > *ʀ* that is found in a large contiguous belt of western Europe, innovated as a language-internal change in French, and subsequently spread to German and southern Dutch. In Dutch, for instance, the native *r* has been replaced in Belgium and (Netherlands) Brabant with a *ʀ*, even in native words (which have not been conceivably borrowed from French, such as *groot* 'large'). This sort of borrowing probably begins with some lexical diffusion, but then the speakers borrow the sound change as well as the exemplars of that sound change. Additionally, this type of borrowing is most likely to occur not in a sequential relationship, with the

FIGURE 1. ROSS'S SCALE OF BORROWABILITY

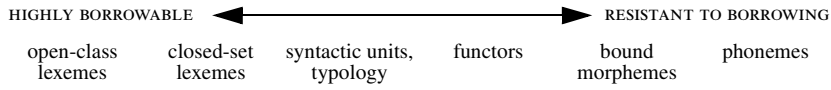
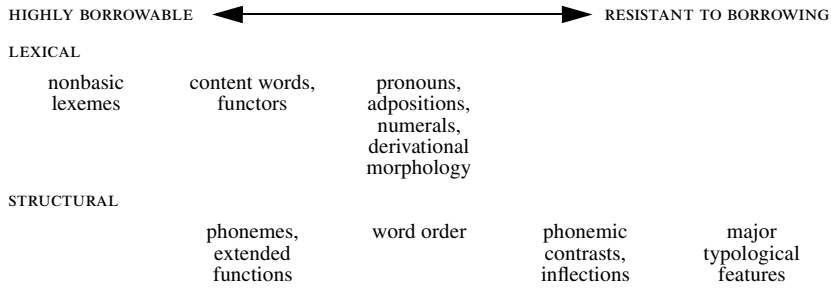


FIGURE 2. THOMASON AND KAUFMANN'S SCALE OF BORROWABILITY (ADAPTED)



4. Most likely the initiator of a structural borrowing.

change running to completion in one variety and only then being taken up by a neighbor. Rather, it is more likely that this sort of borrowing sees the onset of the sound change in one variety, which is taken up at a later time by the second variety, with a degree of overlap, as in figure 3, which plots the change *x > y in two languages; the greater the number of ys, the greater the spread of the change.

This model is necessary to allow the speakers of variety B to determine the conversions applying from the original form to the new form: at time VI, for instance, at which point the sound change has run to completion in language A, speakers of language B would have no evidence that y in the speech of community A is related in any way to x in their own speech. At time III, however, when there is still substantial variation between x and y in language A, speakers of language B can determine the correspondence sets applicable between x and y, and at time IV begin to emulate this variation.[5] At time V, language A has seen *x > y run to completion, but language B is only at the beginnings of the course of this change, which achieves completion in language B only at time VII.

Note that figure 3 intentionally does not show the spread of *x > y as following the same path in language B as in language A. This is deliberate; there is plenty of evidence to suggest that, although alternations in the pronunciation of individual lexical items (perhaps in certain definable contexts) is necessary in a model of structural borrowing, after the sound change has become established in the language it is not a requirement that language B slavishly follow the spread of the change (through the lexicon, through the speaker-base, in different environments, or in frequency of application) in the same manner as was found in language A. Indeed, it may be the case that, as mentioned for the French-to-German spread of *r > ʀ cited earlier, the application of *x > y in language B proceeds into areas of the lexicon for which there is no equivalent in language A—there may be no cognate for a certain form, for instance, in language A, but the sound change ends up applying there in language B anyway.[6]

FIGURE 3. A MODEL OF SOUND CHANGE SPREAD: *X > Y IN TWO VARIETIES

Time:	I	II	III	IV	V	VI	VII
Language A	*xxxx*	*xxxy*	*xxyy*	*xyyy*	*yyyy*	*yyyy*	*yyyy*
Language B	*xxxx*	*xxxx*	*xxxx*	*xxxy*	*yxxy*	*yyxy*	*yyyy*

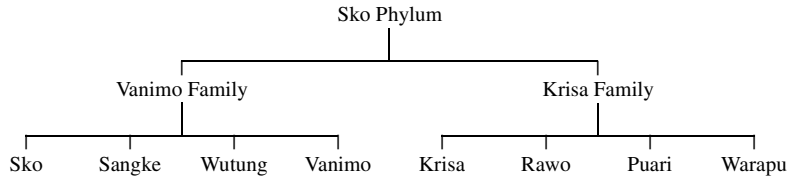
5. Probably initially through suballophonic acoustic variation, later through allophonic or free variation. See Ohala (1989) for discussion of some probable mechanisms initiating sound change.
6. Grace (1996) discusses a situation in southeastern New Caledonia in which the types of sound correspondences and the social situation that prevailed there before colonial times make it likely that the same type of sound-change borrowing as is described here also occurred. While Grace concludes (1996:175) that "it was ultimately impossible to decide exactly which correspondences should be accepted as regular and which should not," I offer a more optimistic view on the historical interpretation of the Skou diffusion area. Given the more complex segmental phonologies of the languages that Grace is describing, it would be a more daunting task to apply the principles that we eventually arrive at here to those languages.

Lass (1997:189) revels in the complexities and disagreements regarding borrowability of structure and lexicon that have been proposed in the literature, noting that these problems should act as "a spur to the development of better heuristics and sharper arguments." It is with the hope of providing some heuristics that might be useful in a wider context that I present this discussion of the historical phonology of the Skou languages.

1.2 THE SKOU LANGUAGES. The languages under discussion represent a subset of the languages described in earlier work on Papuan languages (specifically Wurm 1975, Wurm and Hattori 1981, Silzer and Heikkinen-Clouse 1991) as members of the "Sko Phylum." This group, as first proposed by Laycock (1973a), is composed of the languages shown in figure 4; those that are included in the current study are those belonging to the Vanimo family. In the light of more recent research, Laycock's groupings appear to be accurate in terms of the inclusiveness of their languages (all the languages he lists *are* related), but not in terms of their internal arrangement.

Published work on the structure of the languages in this proposed genetic group is scant. Laycock (1975) summarizes the work to that date on the languages of the phylum, and little needs to be added now. In summary, Cowan (1952a) published some short notes on the Skou language, and both Cowan (1952b, 1957) and Galis (1955) mention Skou and Sangke in comparative perspective. Capell (1962) was the first to recognize the grouping indicated above as the Vanimo family. Voorhoeve (1971) published a short but insightful account of some salient features of Skou grammar and phonology. Laycock (1975) has brief notes on the pronominal and verbal system of Vanimo (Lido variety), and Ross (1980) provided the first longer work that dealt with a language of the Skou family, also Vanimo (Waromo variety). The only work to appear in print on any languages of the putative Krisa family appeared in Laycock (1973b), which offers comments on a Warapu wordlist, occasionally comparing this language with other languages in the Krisa family. Materials on all of these languages are present in manuscript form at the Department of Linguistics, University of Sydney (for example, Donohue 2001, San Roque 2001).

FIGURE 4. THE SKO LANGUAGES†



† After Laycock 1973a, 1975, Voorhoeve 1975. This arrangement does not reflect the author's analysis.

This study will reconstruct aspects of the languages listed as belonging to the Vanimo family, which I term the (smaller) Skou family.[7] The data used has been collected by the author over a lengthy period of contact with Skou speakers (1998 to the present day), and extensive contact with speakers of the other languages in Papua New Guinea. The languages included in this study, along with their locations and alternative names, are given in table 1.

In a broader perspective, the Skou languages are related to the other languages listed by Laycock in figure 1, though with a different arrangement to that proposed by him; Rawo and Puari, along with the then-unknown Womo, Sumararu, and Mori, are all in the Serra family, and Warapu (Barapu) and three other languages are in the Piore River family. Krisa represents a first-order split in the family (see figure 5).

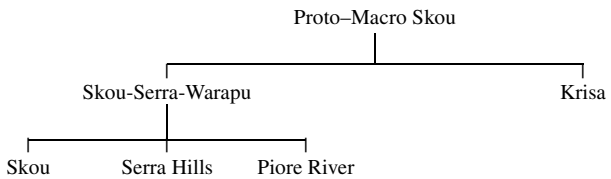
I argue here only for the lower-level Skou family, with occasional reference to features found outside this level when relevant to an argument for retention or innovation. The arrangement of the Skou languages that seems to reflect the historical picture most closely is explained in 3.2.7.

2. PHONOLOGICAL EVIDENCE. Both subgrouping and the setting up of diffusional boundaries proceed from recognizing sound correspondences and reconstruction, and in this section I present the sound correspondences that allow us to proceed with these endeavors. First, however, I briefly examine the phonological parameters of modern Skou languages.

TABLE 1. LANGUAGE NAMES AND LOCATIONS

NAMES USED HERE	EARLIER WORKS	PRESENT LOCATION
Skou	Sko, Skou, Səkou, Tumawo	Skou-Yambe, Skou-Mabo, and Skou-Sai; Papua (Indonesia)
Sangke, Nyao	Sangke, Nyao	Nyao; PNG
Wutung	Wutung	Wutung; PNG
Dumo	Vanimo	Yako, Waromo; PNG
Dusur	Vanimo, Dusø	Lido, Vanimo headland; PNG
Leitre	Leitre	Leitre; PNG

FIGURE 5. RELATIONSHIPS IN THE MACRO-SKOU FAMILY



7. The spelling "Skou" reflects the pronunciation of the language name in Papua (formerly Irian Jaya) and the speakers' preference. Laycock's Sko Phylum will be referred to here as the Macro-Skou family.

2.1 PROTO-SKOU AND MODERN SKOU LANGUAGES. Phonotactically, all the Skou languages share a simple syllable structure. The lack of variation in this template is indicative of a recent split of the family.

$$\sigma \rightarrow O \quad \begin{matrix} \text{tone} \\ | \\ V \\ | \\ \text{nasalization} \end{matrix}$$

The rhyme is in all cases simple: no language allows for glides or codas in the syllable. Vowels are complex, minimally seven (Skou and Leitre), but with eight contrasts preserved in the West Coast. The only segmental complications found involve complex onsets. Onsets are simple in Skou and Leitre, and may be complex for the West Coast languages. Where complex onsets are allowed, the sequences *p/b/m/k/ʔ/h* + *l/r* and *k/ ʔ/h* + *w/y* are always among the possibilities.

2.1.1 Segmental phonology. The segmental inventory given in figure 6 is reconstructable for Proto-Skou. The *w* cannot be reconstructed with great certainty and is probably not part of the system. The sound represented by *ɵ* is, in most of the languages that reflect it, variable between [ɵ], [ɨ], [ø], and sometimes even [ʉ] (in Dusur and Nyao). In Skou the reflex of this sound is more front that in the eastern languages: *ɵ* varies between [ø] and [ʏ].

In addition to these consonants and vowels, there was a highly circumscribed range of initial clusters that could begin a syllable: bilabials + *l,* voiceless (simple) stops + *l,* or *hy:*[8]

pl	tl	kl
bl		
ml		
fl	hy	

Some of the daughter languages, most notably Wutung, allow clusters in excess of this list, but in the main the list above is exhaustive or, for Leitre and Skou, which have eliminated all clusters, exceeds the modern possibilities.

FIGURE 6. PROTO-SKOU SEGMENTS

p	t		k	k^w		i	ʉ	u
b	d	j	g	g^w		e	ɵ	o
m	n		ŋ			ɛ		ɔ
f	s				h		a	
	l	y		(w)				

8. Additional clusters were possible as a result of subject prefixing on verbs, at some stage in the development of Proto-Skou. Many of these clusters are still found in the verbal paradigms of the modern languages.

2.1.2 Tone. Suprasegmentally, a three- or four-way contrast in pitch is present on monosyllables in all languages—High (H), Low (L), and Fall (HL)—so it seems reasonable to posit at least these tonal contrasts in the protolanguage.[9] Despite this, I do not refer to the tones of lexical items in most of what follows, for two reasons. Firstly, there are great complexities in correspondence sets of tones. There is a vast range of patterns, and the factors that influence tonal production are more complicated than those for segmental production. Secondly, the information of syllable pitch is not always available for a language (where I am using materials not collected by myself), or is less sure (where the materials were gathered on survey only). Finally, despite the three-way contrast on monosyllables, Skou at least of the Skou family shows a five-way contrast in tone at the word level (see Donohue 1997 for a discussion of the tone patterns found in New Guinea), with a partial collapse of distinctions in monosyllables.

The fact that all of the Skou languages have this collapsed system, with fewer than five contrastive pitch contours on monosyllables, suggests that this was a feature of Proto-Skou, and provides strong evidence for their genetic unity as a single protolanguage in the past. Until more is known about the details of the tone systems of each language, however, we cannot reconstruct the original tone system with any certainty. In some cases, where there is (near) uniform agreement about the pitch of a syllable, we can posit a tone in Proto-Skou, but for the present there are not enough regular and unambiguous cases to present a complete picture of the historical tonology of the languages.

2.1.3 Nasalization. The other suprasegmental feature, nasalization, presents a very different picture. In almost all cases nasalization of a syllable appears to be a very conservative feature, with universal nasalized reflexes of syllables that we can reconstruct as nasalized in Proto-Skou. There are only two complications to this picture: firstly, Skou, as opposed to the Eastern Skou languages,[10] allows a phonotactically greater distribution of contrastively nasalized syllables.

Vocalic as well as consonantal nasalization is contrastive in all the languages, but with different restrictions (Donohue and San Roque 2000). In summary, all the languages show a contrast between nonnasalized and nasalized vowels when there is no nasal onset. When there is a nasal stop onset, Skou maintains a contrast in nasality of the nucleus, but all the other languages show no contrast, realizing simply noncontrastive nasalization to varying degrees on the vowel. The contrastive phonetic patterns that have been observed in the different languages are presented in table 2.

It is possible that Proto-Skou showed the same kind of restrictions found in Eastern Skou, and that Skou developed contrasts in nasalization in syllables with

9. The contrast between low and the other two pitch contours is quite audible, but the high and falling tones are often very similar. For instance, while Skou in Mabo village contrasts a 44 and 42 pitch, Skou spoken half a kilometer away in Yambe typically realizes the same words with 34 and 43. See Donohue and Van Vugt (1992) for acoustic data on the tones of monosyllables in Dumo, which shows an extreme similarity between the "high" and "fall" pitches in that language.

10. I use the terms "Eastern Skou," "West Coast," "Border," and "Vanimo" to refer to subgroups within the Skou family, though the evidence and argumentation for these being valid genetic taxa is not presented until 5.2.

nasal onsets. It seems more likely, however, that there was a nasality contrast in Proto-Skou on all syllables regardless of their onset, and that the Eastern languages have lost the contrast following nasal stops. This would be an expected result given pressure from the phonetic nasalization that is inevitable on vowels following nasal consonants, creating a diminished distinction in this environment; this very process is observed synchronically in all the Eastern Skou languages except Dusur, in verbal paradigms, illustrated here with data from Leitre.

Leitre verbs have the typical syllable structure of the language, (C)V(T)(±N), showing a contrast in nasalization. Complicating this, however, pronominal inflection may add a consonant to this syllable, which may be nasal. Compare the inflectional paradigms of the two verbs in table 3, belonging to different conjugation sets. Each cell represents an inflection for subject, shown with respect to the degree of nasalization present on the vowel. In both verbs we find weakly nasalized vowels in a syllable with a nasal onset (through either root consonant or prefix). With *ŋu,* which is underlyingly nasalized, the nonnasal onsets occur with strongly nasalized vowels; with *a* 'dig', which is not a nasal root, the inflections that do not bear a nasal onset are pure oral vowels.

These two different patterns of vocalic nasalization point to two separate underlying lexical patterns in the verbs, and both these verbs are typical in this respect of a great number of other verbs): (1) The verb 'boil' has contrastive nasalization, which

TABLE 2. PATTERNS OF NASALIZATION†

ONSET	C_N			C_{-N} / Ø		
NUCLEUS	ORAL	WEAK N	STRONG N	ORAL	WEAK N	STRONG N
SKOU	–	+	+	+	–	+
WUTUNG	–	+	–	+	–	+
DUMO	–	+	–	+	–	+
DUSUR	–	–	+	+	–	+
LEITRE	–	+	–	+	–	+

† Conventions: C_N: nasal consonant in onset: *m, n, ɲ,* or *ŋ;* C_{-N}: nonnasal stop onset; Ø: no onset; oral: nucleus with no nasality; weak N: nucleus with weak nasalization (as in English *can*); strong N: nucleus with strong nasalization (as in languages with contrastive nasalization, such as Québec French)

TABLE 3. LEITRE VERBS AND NASALIZATION

VERB (2PL FORM)		*ŋu* 'boil'			*a* 'dig'	
NASALIZATION:	ORAL	WEAK N	STRONG N	ORAL	WEAK N	STRONG N
1SG		ŋu		a		
2SG		mu			ma	
3SG.NF			kũ	ka		
3SG.F			bũ	g^wa		
1PL		nu			na	
2PL		ŋu		a		
3PL			dũ	ya		

is realized as full strong nasalization of the vowel following oral consonants, and as only weak nasalization following nasal consonants. The root is *ũ*, and the *ŋ* in 1SG and 2PL is a conjugation marker; (2) The verb 'open' is lexically specified with no nasalization, and acquires weak nasalization following nasal consonants. The root is *a*. Given the typological, phonetic, and synchronic data, I assume that Proto-Skou had contrastive nasalization on all syllables, and that the Eastern Skou languages have lost this contrast in syllables with nasal onsets.[11]

It should be noted that at least some instances of nasalization in (most of) the Skou languages can be attributed to the deletion of a final vowel in a $C_{-N}V_1C_NV_2$ root, with the nasal subsequently being realized only as nasalization on the vowel. Compare the status of the nasal in the correspondence sets of table 4, in which phonologically conservative Leitre alone preserves the original disyllabic root, as well as a monosyllable version, and the other languages show different degrees of vowel harmony applying to the first syllable, followed by disyllabic reduction. The original HL tone melody is preserved, being realized as an F tone on the languages that exhibit reduction. (This is some support for the notion that the tonal system of the Skou languages is, like Skou itself, a word-tone system [Donohue 1997], not a syllable-tone one).

We can assume that contrastive nasalization was a feature of Proto-Skou, and note that, given that the languages show a tendency to reduce CVNV roots to CṼ ones, it seems likely that this nasalization should be traceable to earlier nasal consonants in codas or in reduced syllables in an as yet unrecovered earlier protolanguage.

2.2 CONSONANT RECONSTRUCTIONS. In this section I present the correspondence sets that define the consonant system, showing the simplest correspondence sets first, with exemplification of each protophoneme's reflexes in the daughter languages, and then the more complicated correspondence sets with correspondingly more discussion.

The materials for Sangke are mostly taken from work published in the 1950s, whose phonological accuracy leaves a lot to be desired. It has been supplemented

TABLE 4. SYLLABLE REDUCTION AND THE DEVELOPMENT OF NASALIZATION

	*kɔni, HL	*k^wɔnu, HL
SKOU	kø̃	wũ
SANGKE	kr̃	(konghu)
WUTUNG	(ʔ)ũ	(ʔ)wũnɔ
DUMO	ʔũ	ʔβũ
DUSUR	hr̃	hβr̃
LEITRE	kɔni, kɔ̃	k^wɔnu, k^wɔ̃
ATTESTED:	'tooth'	'stone'

11. Evidence from higher order subgroups in languages related to Skou (such as I'saka/Krisa) point to this conclusion as well, but are not presented here.

with my own field notes on Nyao, which is in complete agreement with the Sangke data. When enclosed in parentheses, the material is taken from the early Sangke publications in its original typography. Otherwise, it represents modern Nyao.

2.2.1 Correspondences and reconstructions. Several of the segments reconstructed do not present any particular issues of methodology, and they are all discussed together here.

Examining the correspondence sets in these sections, we find the following sets recurring ("notes" refers to the location of further discussion about these changes, in addition to sections 3.2 and 3.3):

The *ɸ/p* alternation in Dumo reflects different environments: a *p* is preferred following nasalized vowels ([ʔlɨ̃mpa] 'ear', for *ʔlũɸa*) and preceding *l* ([pli] 'mountain', for *ɸli*), and in free variation elsewhere. The different languages generally reflect *g as either Ø or, in the west, as *h,* or, in the east, as *g*. There are very few instances of this protophoneme, and so no clear patterns can be described.

Some examples of correspondence sets establishing these cognates are given in tables 6–9. In all the tables, a dash ("—") represents the lack of information, and square brackets ("[ ]") are used to indicate a form that is not cognate. The symbols *tj, tʃ,* and *c* represent the same sound.

The phonemes *b, *d, *l, *gʷ, and *ŋ require more detailed explication, and so are dealt with separately in the sections that follow.

TABLE 5. CORRESPONDENCE SETS INVOLVING CONSONANTS

PROTO-SKOU	SKOU	SANGKE	WUTUNG	DUMO	DUSUR	LEITRE	NOTES
*p	p	p	p	b	b	b	3.1.1
*t	r	t	t	t	t	t	3.1.3; 3.1.6
*k	k	k	ʔ	ʔ	h	k	3.1.2
*kʷ	k / w	kʷ	ʔw	ʔw	hw	kw	
*b	b	p	(p), w / m	w / m	w / m	w / m	2.2.2; 3.1.1
*d	t	t	t	d	d	d	2.2.3; 3.1.3
*j	t	t	t	d	d	s	3.1.3
*g	h, Ø	h, x, Ø	h, Ø	Ø	g, Ø	g	2.2.5; 3.1.4
*gʷ	p	tʃ	tʃ	d/b/b	d/b/w	b/b/gʷ	2.2.6; 3.1.3
*m	m	m	m	m	m	m	
*n	n	n	n	n	n	n	
*ŋ	Ø / n / Ø	Ø / n / Ø	Ø / n / Ø	Ø / n / Ø	ŋ/n/[ŋ]	Ø / ɲ / [ŋ]	2.2.7; 3.1.5
*l	l	r / n	l / n	l	l	l / n	2.2.4; 3.1.6
*f	f	f	f	ɸ / p	p	p	3.1.1
*s	r / j	s	s	s	s	s	3.1.3; 3.1.6
*h	h	h	h	Ø	Ø	Ø	3.1.2

TABLE 6. SAMPLE CORRESPONDENCE SETS INVOLVING *p, *t, AND *k

	*p		*t		*k	
	*p[i/e]	*pu	*-ti	*gʷī-[tɔ/fa]	*kɔni	*naki
SKOU	pa	pu-	ri	pɛ̃rɔ	kə̃	nakɛ
SANGKE	(prefra)	sũ	ʔɛ-ri	(chèfá)	(ke)	nake
WUTUNG	pe	pu	hlehli	cifa	ʔũ	naʔi
DUMO	bi	bo	ti	bitɔ	ʔũ	naʔi
DUSUR	bi	bu	ti	bitɔ	hũ	nahi
LEITRE	bi	bu	ti	(bipa)	kɔni	nakɛ
ATTESTED:	‘house’	‘mammal’	‘tree’	‘lip’	‘tooth’	‘dog’

TABLE 7. SAMPLE CORRESPONDENCE SETS INVOLVING *kʷ, *j, AND *g

	*kʷ		*j		*g	
	*kʷɔnu		*jã	*jãtli	*g~~ʉ~~	*gɛli
SKOU	wũ		ta	tãli	h~~ʉ~~	ali
SANGKE	kʷɔ̃-hu		ta	tʃinu	hu	aki
WUTUNG	ʔwũ		tã	tãli	hu	aʔi
DUMO	ʔwũ		dã	dãli	wu	ɛli
DUSUR	hwũ		dã	dãli	wu	gɛli
LEITRE	kʷɔnu		sĩ	sĩte	gu	—
ATTESTED:	‘stone’		‘hair’	‘yellow’	‘stomach’	‘leech’

TABLE 8. SAMPLE CORRESPONDENCE SETS INVOLVING *m AND *n

	*m		*n	
	*mɵ	*mi	*nɔ	*no-(p)ɔ̃
SKOU	mø	mɛ	nɔ	nɔ̃pɔ̃
SANGKE	mu	(me)	(nokè)	nou
WUTUNG	mu	mɛ	nɔʔɛ	nɔu
DUMO	mu	mi	nu	nuɔ
DUSUR	mu	mi	nu	noɔ
LEITRE	mɔ	mi	nu	nuɔ
ATTESTED:	‘fish’	‘you’	‘hand’	‘four’

TABLE 9. SAMPLE CORRESPONDENCE SETS INVOLVING *f, *s, AND *h

	*f		*s		*h	
	*fã	*fɛ̃ / *fĩ	*s~~ʉ~~	*sa	*hɛ̃	*ha
SKOU	fã	fɛ̃	r~~ʉ~~	ja	hã	ha
SANGKE	pãxɛ̃	fĩ	(si)	[hukrɛ]	hɛ̃	ha
WUTUNG	fã	fĩ	si	sa	hɛ̃	ha
DUMO	ɸã	ɸɛ̃	si	sa	ɛ̃	a
DUSUR	pã	pɛ̃	si	sa	ɛ̃	a
LEITRE	pã	pĩ	si	sa	ɛ̃	a
ATTESTED:	‘wing’	‘bad’	‘cassowary’	‘wet’	‘coconut’	‘bag’

2.2.2 The protophoneme *b. Nyao and Wutung show evidence for a *b > p rule. The splits that Wutung, Dumo, Dusur, and Leitre exhibit in the reflexes of *b depend on whether the following vowel is plain or nasalized; when the vowel is plain, we find *w* reflexes of *b, and conversely when the vowel is nasalized *b is reflected as *m* (see table 12). This is simply a historical reflection of the rule, presumably operating in an ancestral language as well as the modern ones, that sees nasalization spread onto initial sonorants (examples given in 2.2.4). Competing with this is the *b > p rule in Nyao and Wutung. In other branches of the Macro-Skou family, similar nasal/nonnasal alternations are found, and in the (distantly) related language Krisa this process of nasal transference is still fully productive.

2.2.3 The protophoneme *d. The reconstruction of *d is not problematic, but it does deserve some explanation. In Wutung, the majority reflex of *d is *t,* with the only occurrence of *d* being in the 3PL pronoun, which, in the light of this change and other discrepancies between pronouns and free forms, probably indicates that the *d* in the pronominal form is a conservative feature. Following a nasalized syllable, however, *d is reflected as *n* in the Eastern Skou languages, and the nasalization on the vowel lost. In Skou, the nasalization remains on the vowel, and the *d is regularly devoiced. Some examples of these correspondences are shown in table 10. The developments leading to the modern forms of 'two' and 'three' in Dumo are given in table 11 (no claims are made about the relative chronology of the changes).

2.2.4 The protophoneme *l. The process of nasalizing an alveolar stop in a syllable with a nasalized nucleus is seen in both the diachronic and synchronic phonology of the lateral phoneme. The lateral *l is a frequent phoneme in clusters, more so than on its own. When it occurs as the sole element in the onset of a syllable, it shows a split in its reflexes: when the Proto-Skou syllable involved nasalization, the reflex in Leitre transfers the nasalization to the onset. In Wutung and Dusur the nasalization is transferred without the feature [lateral] being lost, resulting in a nasalized lateral sonorant. In both Dusur and Wutung, this sounds extremely much like a nasal, and Wutung, in fact, shows alternation between a nasalized lateral [l̃] and a nasal stop [n].[12] Because only written records are available for Sangke, the allophones cannot be determined.

In at least some cases, the full Wutung nasalization transfer is optional. There is a widespread tendency in Wutung, Dumo, and especially Dusur for nasalization to be realized on any onset sonorants; thus, *wɔ* 'wife' in Dusur is frequently realized as [βõ]. This alternation of nasality is especially obvious in verbal paradigms (see comments on the appearance of nasalization in some verbal paradigms in Ross 1980, which apply to the other Eastern Skou languages as well). This means that there is a general tendency for nasalization to spread onto all voiced nonobstruents in the syllable, in keeping with areal tendencies (Donohue and San Roque 2000). In Sangke/Nyao, we see the full operation of an *l > *r* change. This is also found idiolectally in Leitre, and to a reduced extent in Dumo.

12. This is also found to a lesser extent in Dumo.

2.2.5 The protophoneme *g. Reconstructions involving *g are scarce, and indeed the stop is only attested in Dusur and Leitre. We can distinguish two patterns for the appearance of *g,* depending on grammatical context. These are given in table 13.

An example of a nominal reflecting *g is given in table 12 (*gɛli 'leech'). In verbal paradigms, the combination of pre-Proto-Skou *ŋ- '1SG prefix' (see 2.2.7) with verbs with velar roots results in voiced velar stops in Dusur. Compare the partial

TABLE 10. CORRESPONDENCE SETS FOR *d

	FOLLOWING A NASALIZED SYLLABLE			ELSEWHERE			
	*hyɔmədũ	*h[ĩ/ɛ̃]dɔ)	*hɔ̃du	*klədɔ	*du	*dã	*dɛ
SKOU	hĩtũ	hɛ̃tɔ̃	hãtu	lutɔ	tu(tu)	tã	tɛ
SANGKE	hɲimu	hɲena	ɔtu	(retó)	tɔna	tĩ	(te)
WUTUNG	hɲɔmɔ	hɛnɔ	ɔtu	ləto	tɔ	tĩ	dɛ
DUMO	yumɔnu	ɛnu	ɔdu	ʔlɨ	du	dĩ	dɛ
DUSUR	yumonu	ɛ̃du	ɔdu	hlɨdu	du	dĩ	dɛ
LEITRE	yumɔnu	inɔ	ɔdu	lɔdu	du	dɛ̃	dikɔ
ATTESTED:	'two'	'three'	'sand'	'eye'	'white'	'bird'	'they'

TABLE 11. THE DEVELOPMENT OF 'TWO' AND 'THREE' IN DUMO

	*hyɔmədũ	*hɛ̃dũ
NASAL SPREAD	hyɔmɔnũ	hɛ̃nũ
NASAL LOSS	hyɔmɔnu	hɛnu
*h > Ø	yɔmɔnu	ɛnu
VOWEL HEIGHT	yumɔnu	—

TABLE 12. CORRESPONDENCE SETS FOR *b AND *l

	*b		*l	
	*ba	*b[ĩ/ɛ̃]	*gɛli	*lã-(lə)
SKOU	ba	bɛ̃rɔ	ali	lã
SANGKE	(ba)	miɛ-kɔ	[aki]	(nare)
WUTUNG	pa†	mi	[aʔi]	nãlə, lãlə, mãlø
DUMO	wa	myutə	ɛli	lã
DUSUR	wa	mihu	gɛli	lã (lã)
LEITRE	wa	mɛ	—	na
ATTESTED:	'person'	'tail'	'leech'	'mouth'

† *p* here; other correspondences with Skou show Skou *b:* Wutung *w,* such as *bã* : *wa* 'beach', *bi* : *wi* 'empty'.

TABLE 13. CORRESPONDENCE SETS INVOLVING *g

	SKOU	SANGKE	WUTUNG	DUMO	DUSUR	LEITRE
VERBAL PREFIX (1 SG)	—	—	—	—	g-	g-
NOUN	h, Ø	—	h, Ø	Ø	Ø	g

sets in table 14. We thus have, in Dusur, the loss of the sound in free nouns, but preserved in the more archaic verbal morphology. In Leitre, *g* is found in verbal paradigms, but is also still found in free nominals. The distribution of reflexes of *g is addressed in more detail in 3.1.4.

2.2.6 The protophoneme *g^{w}. Of all the reconstructed phonemes, *g^{w} is the most speculative: in no language is [g^{w}] attested in free nominals. The correspondence set supporting it is p:tʃ:tʃ:d:d:b in nouns, and p:tʃ:tʃ:b:b:b with the 3SG.F pronoun (with the languages in the order of table 16). From these sets we could construct a chain of development involving a velar linking *p* and *tʃ,* and through *tʃ* the *d* found in Dumo and Dusur.

The argument for the reconstruction of *g^{w} comes from the paradigms of verbal inflection. Verbs in Skou languages inflect for subject by consonantal prefix additional, and the identity of the prefix shows very close correlations with the corresponding free pronoun (as discussed in Ross 1980, summarized in Foley 1986:133–134). This is most obviously true for 2SG and 1PL, *m-* and *n-,* respectively, in all languages, which correspond in all cases to free pronouns beginning with *m-* and *n-*. For the 2PL, the free pronoun of which has no onset, there is no consonant in the inflectional system. The 3SG.NF form, *k-, has reflexes in *k-, ʔ-,* and *h-,* depending on the regular developments of *k in the particular language. The 3PL forms show regular developments from *d, corresponding to the free pronoun *dɛ, and alternative in *y,* representing an alternative conjugation present in Proto-Skou. With the 3SG.F forms, however, we find the matches shown in table 15.

Given the known tendencies of bound morphology to preserve more archaic stages of the history of a language, it seems reasonable to suppose that the *gw-* in Leitre, a language in which verbs are phonologically conservative (see table 38 on page 207), reflects the original state of both the bound and free pronouns. The p:tʃ:tʃ:b:b:b correspondence set for the free pronoun can then be assigned to *g^{w}, and two paths of development proposed: *g^{w} (> *b*) > *p,* and *g^{w} > **g > **j > *tʃ* (see 3.1.4). Assigning this set to *g^{w} also fills what would otherwise be a gap in the Proto-Skou consonant inventory (see figure 6 in 2.1.1). A second correspondence set that appears with open-class nouns, p:tʃ:tʃ:d:d:b, is also assigned to *g^{w} on the basis of complementary distribution, and the presence of the unusual *tʃ* in Wutung and Sangke. This one phoneme thus shows three different correspondence sets, as shown in table 16. Some lexemes involving this phoneme are shown in table 17. One lexical item, 'lip', shows *b* rather than *d* in Dumo and Dusur, the expected reflex for a pronoun. All other free lexical items show the expected *d.*

TABLE 14. REFLEXES OF *ka 'HIT', INFLECTED

VERBAL PREFIX		VERB ROOT	PROTO-SKOU	SKOU	NYAO	WUTUNG	DUMO	DUSUR	LEITRE
1SG	*ŋ-	*ka	*ŋka	ka	ka	ʔa	ʔa	ga	ga
2SG	*m-	*ka	*mka	ba	wa	ba	ba	ba	k^{w}a
3SG.NF	*k-	*ka	*ka	ka	ka	ʔa	ʔa	hya	sa
3SG.F	*g^{w}-	*ka	*k^{w}a	wa	k^{w}a	ʔ^{w}a	pa	pa	k^{w}a

2.2.7 The protophoneme *ŋ. There is little lexical evidence for an *ŋ in Proto-Skou. A similar argument to that used in the reconstruction of *g^{w} will be used here as well. There are some correspondence sets that reveal an *ŋ, such as 'mother' (the -nɛ and -mɛ are most likely fused 1SG or 2SG dative suffixes) given in table 18. The supporting evidence comes from verbal paradigms. Although the 1SG free pronoun in all Skou languages reflects *ni, the inflection on verbs tells another story (see table 19). While the free pronominal evidence points to an *n (with some doubt sown by the Leitre reflex), the bound morphology points to an *ŋ that has generally been lost. In the case of Skou, the putative *ŋ- has mainly been lost, with just two verbs preserving a consonant, either denasalized (with *-ã* 'eat') or develarized (with *ɔ̃-ɛ* 'refuse'). Just as there was some evidence for a *g^{w} based on the preservation of this form in conservative Leitre, so too can we find evidence for a *ŋ in Proto-Skou, or at least pre–Proto-Skou, based on the inflections found for 1SG on verbs. It means, of course, that any nonpronouns that show a consistent series of reflexes in *n in all the languages might well reflect an *ŋ. This would be reflected in the style shown in table 20.

TABLE 15. 3SG.F INFLECTION MATCHED WITH FREE PRONOUNS

	SKOU	SANGKE	WUTUNG	DUMO	DUSUR	LEITRE
FREE PRONOUN	pɛ	(tje), fɛ	tʃɛ	bɛ	bɛ	bi
3SG.F	p-	(tj-)	tʃ-	b-	w-	g^{w}-

TABLE 16. CORRESPONDENCE SETS ASSIGNED TO *g^{w}

	SKOU	SANGKE	WUTUNG	DUMO	DUSUR	LEITRE
BOUND PREFIX	p-	(tj-)	tʃ-	b-	w-	g^{w}-
FREE PRONOUN	p	(tj), f	tʃ	b	b	b
NOUN	p	(tj)	tʃ	d	d	b

TABLE 17. LEXEMES SHOWING REFLEXES OF *g^{w}

	*g^{w}a	*g^{w}ĩ-[tɔ/pa]	*g^{w}ã	*g^{w}a
SKOU	pa	pɛ̃rɔ	pã	palɛ
SANGKE	(tjà)	(chèfá)		(tja)
WUTUNG	tʃa	cifa	ca	tʃa
DUMO	da	bitɔ	dã	da
DUSUR	da	bitɔ	dã	da
LEITRE	ba	bipa	bɛ̃	ba
ATTESTED:	'water'	'lip'	'husband'	'pig'

TABLE 18. REFLEXES OF *ŋa[nɛ] 'MOTHER'

SKOU	NYAO	WUTUNG	DUMO	DUSUR	LEITRE
ani	ɛte	(ɛmɛ)	anɛ	ŋane	aɲa

TABLE 19. CORRESPONDENCE SETS ASSIGNED TO *ŋ

	SKOU	SANGKE	WUTUNG	DUMO	DUSUR	LEITRE
BOUND PREFIX	Ø-, k-, n-	Ø-	Ø-	Ø-	ŋ-	Ø-, ŋ-
FREE PRONOUN	n	(n)	n	n	n	ɲ
NOUN	Ø	Ø	Ø	Ø	ŋ	Ø (ɲ?)

In the absence of a more conservative bound form, the putative *ŋ is unreconstructable without external evidence. The fact that there are three times as many correspondence sets involving reconstructed *n as there are for the other nasal, *m, suggests that there are, in fact, many reflexes of pre-Proto-Skou *ŋ that have completely merged with *n as *n.*

2.3 VOWEL RECONSTRUCTIONS. Some unproblematic correspondence sets are found for vowels, but in addition to the cases summarized in table 21, there are many awkward correspondence sets, which probably reflect a long period of intense interaction and multiple reborrowings of words back and forth.

The split of *a in Leitre is conditioned by the preceding consonant: if the preceding consonant was the palatal *j, then a following *a is raised to *i,* prior to *j merging with *s as *s.* In all other cases, *a remains *a.* See table 22.

Some examples of correspondence sets establishing the other cognates presented above are given in table 23.

There is a consistent pattern in which mid open vowels lower to a in Skou following an *h or in a falling tone syllable. Examples of this are shown in table 24.

In addition to these regular sets, there are also a large number of less straightforward correspondence sets. These are attested in just a few items each, shown in table 25.

It cannot be known whether these are regularities at some level (the correspondences for 'me' involve a falling tone in all cases, for instance, and an originally high consonant [*ŋ]), or whether they involve irregular lexical developments in individual languages or protolanguages.

The phonemes *ɵ and *ʉ are dealt with separately in the following sections.

TABLE 20. ALTERNATIVE PUTATIVE REFLEXES OF PUTATIVE PRE–PROTO-SKOU *ŋ

PRE–PROTO-SKOU	SKOU	SANGKE	WUTUNG	DUMO	DUSUR	LEITRE
*ŋ	n	n	n	n	n	n

TABLE 21. CORRESPONDENCE SETS INVOLVING VOWELS

PROTO-SKOU	SKOU	SANGKE	WUTUNG	DUMO	DUSUR	LEITRE	NOTES
*i	i	i	i	i	i	i	
*e	ɛ	e	e	e	e	e	
*ɛ	ɛ	ɛ	ɛ	ɛ	ɛ	ɛ	
*a	a	a	a	a	a	a / i	
*ɔ	ɔ	ɔ	ɔ	ɔ	ɔ	ɔ	
*o	ɔ	o	u	o	o	u	
*u	u			u	u	u	
*ʉ	ʉ / ø	u / i	u / i	u / i	u / i	u / i	2.3.2
*ɵ	ø / u	[e]	u / ɵ	u / ɵ	u / ɵ	ɔ	2.3.1

TABLE 22. CORRESPONDENCE SETS FOR LEITRE *i* : *a* AND *a* : *a*

	*jã	*jã[t/l]i	*fã	*naki
SKOU	ta	tãli	fã	nakɛ
SANGKE	ta	tʃinu	(vaghi)	(naki)
WUTUNG	tã	tãli	fã	naʔi
DUMO	dã	dãli	ɸã	naʔi
DUSUR	dã	dãli	pã	nahi
LEITRE	sĩ	sĩte	pã	nakɛ
ATTESTED:	‘hair’	‘yellow’	‘wing’	‘dog’

TABLE 23. LEXEMES SHOWING REFLEXES OF *i, *e, *ɛ, *ɔ, *o, AND *u

	*i	*e	*ɛ	*ɔ	*o	*u
	*hyi	*e	*kɛ	*ɔ	*kɔni	*du
SKOU	hi	ɛ	kɛ	ɔ	kə̃	tutu
SANGKE	(hi)	e	(ke)	ɔ	(ke)	tɔ-na
WUTUNG	hɲdʒi	e	ʔɛ	o	ʔũ	to-
DUMO	yi	e	ʔɛ	ɔbibi	ʔũ	du
DUSUR	yi	e	hɛ	ɔbibi	hũ	du
LEITRE	yi	esã	kɛ	ɔ	kɔni	du
ATTESTED:	‘blood’	‘bone’	‘he’	‘lime’	‘tooth’	‘white’

TABLE 24. LEXEMES SHOWING SKOU a : EASTERN SKOU *ɛ, ɔ*

	*ɛ			*ɔ	
	*hɛ	*hɛ̃	*ɛ (F)	*hɔ	*fɔd[ɛ/i] (F, F)
SKOU	ha	hã	a	ha	fata
SANGKE	(è)	(hè)	(yi)	(hɔ-fa)	patʃa
WUTUNG	hɛ	hɛ̃	ɛ	ho	patʃa
DUMO	ɛ	ɛ̃	ɛ	ɔ	ɸɔdi
DUSUR	ɛ	ɛ̃	ɛ	ɔ	pɔdi
LEITRE	ɛ	ɛ̃	ɛ	ɔ	pɔdi
ATTESTED:	‘leaf’	‘coconut’	‘rope’	‘star’	‘all/many’

TABLE 25. IRREGULAR CORRESPONDENCE SETS FOR *i, *e, *ɛ, *ɔ, *o, AND *u

SKOU	SANGKE	WUTUNG	DUMO	DUSUR	LEITRE	IN:
ɛ	i	i	i	i	ɛ	‘dog, tail, breadfruit’
i	i	ɛ	ɛ	ɛ	i	‘me’
ɛ	i	i	ɛ	ɛ	ɛ	‘bad’
ɛ	e	ɛ	i	i	ɛ	‘you.SG’
ɛ	ɛ	ɛ	ɛ	ɛ	i	‘they, she, three’
ɔ	ɔ	ɔ	u	u	u	‘eye, had, seed’
a	e	i	i	i	ɛ	‘bird’

2.3.1 The protophoneme *ɵ. Proto-Skou *ɵ is consistently backed to ɔ in Leitre. In Skou it is raised and backed to *u* unless it is nasalized, either through vowel nasalization or following a nasal consonant. In these environments, it is fronted to ø. The West Coast languages raise and back the vowel to *u* in precisely these circumstances. These correspondences are given in table 26 and exemplified in table 27.

The Skou and West Coast changes (both involve *ɵ > *u,* albeit in different environments) involve different phonetic targets. The Skou change, in an oral-vowel environment, produces [u], whereas the West Coast change applies to nasalized environments, and so, by the phonological patterns of these languages, results in [ĩ] or simply a syllabic [ŋ], the former being close to the original *ɵ phoneme (given that the ɵ phoneme varies in realization in the West Coast from [ɵ] to [ɨ] and even [ʉ̟]). By these conventions, then, 'path' is realized as [lĩ̠ndi] in Dumo.

2.3.2 The protophoneme *ʉ̟. The correspondences involving *ʉ̟ are more involved. There are essentially three different sets of correspondences (shown in table 28), corresponding to three different environments.

The first of these sets involves correspondences following *s, which is treated as [+high] in the Proto-Skou system (as the voiceless counterpart of the palatal *j). The second set of correspondences follow [+back] consonants. The third set shows the lowering of *ũ̠ to õ in Skou and Leitre, and the subsequent merger of *ɵ with *ɔ in Leitre. Readers should keep in mind when examining the examples in table 29 that the usual allophone of *u* in these languages when nasalized is [ɨ̃]).

An interesting fact concerning the rounded central vowels is the complementarity of the appearance of [ø]/[ɵ] in Skou and West Coast languages. The ø of Skou is a reflex of both *ø and *ʉ̟, and the ɵ in West Coast languages reflects *ɵ. It is, however, precisely those environments that lower *ʉ̟ to ø in Skou that raise ɵ to *u* in West Coast. It also seems likely that *ɵ was preserved as such in Proto-Eastern Skou, only changing with the break into Leitre and West Coast.

2.4 COMPLEX ONSETS. In addition to these changes to individual phonemes, the complex clusters that were allowed in Proto-Skou show reflexes that are not predictable from the histories of the individual phonemes. The correspondence sets (summarized in table 31, with lexemes given in tables 32 and 33) show that there is considerable complexity in the reflexes of the clusters. In general, we can see that both Skou and Leitre simplify clusters, though in different directions. When a lateral is involved, Skou consistently preserves the liquid in a voiceless-stop cluster, where Leitre preserves the stop. The other bilabial clusters simplify to *p* in Skou, but, like the voiceless stop clusters, preserve the consonant (so, for example, *fl > *f, which later undergoes *f > *p*). The West Coast languages display their normal reflexes of *p, *k, *b, *m, and *f combined with the lateral.

TABLE 26. CORRESPONDENCE SETS ASSIGNED TO *ɵ

PROTO-SKOU	SKOU	WUTUNG	DUMO	DUSUR	LEITRE	
*ɵ	ø	u	u	u	ɔ	/ N
*ɵ	u	ɵ	ɵ	ɵ	ɔ	/ –N

TABLE 27. LEXEMES SHOWING REFLEXES OF *ɵ

	*mɵ	*lɵ̃[-di]	*kɵ
SKOU	mø	lø̃	ku
SANGKE	mu	hnu	(kuèkuè)
WUTUNG	mu	hnu-pɔ	ʔɵ
DUMO	mu	lū-di	ʔɨ
DUSUR	mu	lū-di	hɨ
LEITRE	mɔ	nɔ-di	kɔ
ATTESTED:	'fish'	'path'	'egg'

TABLE 28. CORRESPONDENCE SETS ASSIGNED TO *ʉ

PROTO-SKOU	SKOU	SANGKE	WUTUNG	DUMO	DUSUR	LEITRE	
*ʉ	u	i	i	i	i	i	/ s __
*ʉ	u	u	u	u	u	u	/ k, g, k^w, g^w __
*ʉ	ø	u	u	u	u	ɔ	/ N

TABLE 29. LEXEMES SHOWING REFLEXES OF *ʉ

	*sʉ	*gʉ	*klʉ̃(pa)
SKOU	rʉ	hʉ	lø
SANGKE	(si)	hu	(krire)
WUTUNG	si	hu	ʔlɨ̃
DUMO	si	wu	ʔlɨ̃pa
DUSUR	si	wu	hlɨ̃pa
LEITRE	si	gu	kɔ̃pa
ATTESTED:	'cassowary'	'stomach'	'ear'

TABLE 30. REFLEXES OF ROUNDED VOWELS IN SKOU AND WEST COAST

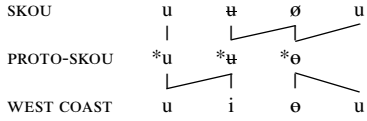


TABLE 31. CORRESPONDENCE SETS INVOLVING COMPLEX ONSETS

PROTO-SKOU	SKOU	SANGKE	WUTUNG	DUMO	DUSUR	LEITRE
*pl	p / l	f / pr	pl / hl	pl	pl	p
*tl	r / t	hr	hl / hn	t	t	t
*kl	l	kr	ʔl	ʔl	hl	k
*bl	p	l	—	—	bl	w
*ml	p	—	hl	ml	ml	m
*fl	p	fr / hr / hn	fl	pl	pl	p
*hy	h	h (s)	hɲ / hɲdʒ (s)	y	y	y

The *tl cluster shows considerable variation not predictable from the reflexes of *t or *l. The most extreme development of this is in Sangke and Wutung, which show *tl > *hl* (and subsequent **hl > *hr* in Sangke). The Cl > C simplification found elsewhere in Leitre is also found in Dumo and Dusur for *t.

It might be thought that the cluster shown as *hy in fact represents a high fricative, *ʃ. The treatment afforded to it by Skou and Leitre, which reduce C_1C_2 clusters to C_2 and C_1 respectively, suggests *hy. As can be seen, the reflexes are quite irregular. The change *hy > s in Wutung and Sangke probably reflects the endpoint of a series of changes following the path *hy > **hẙ > **hç > *ç* > *ʃ* > *s*. Note that this is also found in some verbal inflections in Leitre (see table 14, 3SG.NF).

2.5 PHONOLOGICAL DEVELOPMENTS IN THE INDIVIDUAL LANGUAGES. This section simply summarizes the phonological changes that have happened in each of the individual languages described in the previous sections, and presents the phonology of each language in its entirety.

2.5.1 Skou. Skou is characterized by the loss of voicing contrasts (only *p* and *b* show a contrast due to voicing), the loss of *s, merging with *t as *r* in most cases, and by having two contrastive nonnasal sonorants, *r* and *l*. This latter feature is the result of influence from the languages to the west, and is partly copied in Sangke. Cluster simplification is most advanced in Skou, with even the complex unit phonemes (*k*^{w} and *g*^{w}) being lost, even in verbal paradigms.

The vowel system preserves *ʉ, unique among the Skou languages, and fronts *ɵ to *ø,* maintaining the contrast between two nonback rounded vowels. On the other hand, it reduces the number of noncentral vowels to five.

TABLE 32. LEXEMES SHOWING REFLEXES OF CLUSTERS

	*pl *plɛ̃fli	*pl *plu	*tl *tlɛ̃k^{w}ɛ	*kl *klʉ̃(pa)	*bl *ʉbli	*ml *mlã
SKOU	lɛ̃fi	pu	røbi	lø	øpi	-pã
SANGKE	fɔ-ɲa	pru	nukɔ	(krire)	løpi	hɛ̃tɔ̃
WUTUNG	hlilaʔi	plu	hlūbɵ /hnūbo	ʔlɪ̄	(ʔai)	hlãpã
DUMO	plaɸɛ̃	plu	tū	ʔlɪ̄pa		mlã
DUSUR	plɛpli	—	tūhɵ	hlɪ̄pa	ible	mlã
LEITRE	pɛpɛ̃	pu	tūke	vkɔ̃pa	ibɛ	-ma
ATTESTED:	‘black’	‘marsupial’	‘head’	‘ear’	‘dry’	‘night’

TABLE 33. LEXEMES SHOWING REFLEXES OF *hy AND *fl

	*hy *hya	*hyi	*hyi	*hyɔmɔdu)	*fl *fli
SKOU	ha / ya	hø	hi	hɪ̃tū	fri
SANGKE	sa-ɔ	si	hyi	ɲimu	[feri]
WUTUNG	sa	si	hŋdʒi	hŋɔmɔ	fli
DUMO	ya	yi	yi	yumɔnu	ɸli
DUSUR	ya	yi	yi	yumonu	pli
LEITRE	ya	yi	yi	yumɔnu	pi
ATTESTED:	‘what/thing’	‘sago’	‘blood’	‘two’	‘mountain’

2.5.2 Sangke/Nyao. Sangke is a conservative language in terms of its consonantal system, being spared many of the innovations that arose in the east and spread as far as Wutung, and showing only the loss of voicing as a major factor to intrude on the consonants. The *l > *r* change is the most unusual change, along with *hy > *s*. The development of *j to *ʧ* and *b > *p* is a distinctive feature of Sangke and Wutung.

The vowel system is typical of the West Coast languages, and shows *ʉ merging with *ɵ, which splits depending on nasality. The peripheral vowels are all preserved as they were.

2.5.3 Wutung. The sound system of Wutung is essentially the same as that of Sangke, with the absence of the *l > *r* change, and the presence of some innovations borrowed from Vanimo: *k > *ʔ,* and *b > *w/m.* These, along with the loss of *g and *ŋ, have resulted in a language with no velar place of articulation. The subsequent changes that so remodeled the Vanimo and Leitre consonant systems did not apply to Wutung. There is some evidence for a separate prenasalized series: *mb, nd, ɲdʒ.*

The vocalic system is identical to Sangke, and so not elaborated on here other than to note that the high vowels often have off-glides, especially with falling tone: *i* is often realized as [iĕ], for instance. Some of the transcription of Sangke data suggests that this could be true for that language as well.

2.5.4 Dumo. Dumo shows the mixed influence of both eastern and western Skou, but with few innovations of its own. The consonants match those of Wutung, except for the absence of *ʧ* and *p.*

Again, the vowel system is identical to that of Sangke.

2.5.5 Dusur. The most notable difference between Dumo and Dusur is the presence of a velar place of articulation in Dusur, in the voiced series (stop and nasal). The voiced velar stop is present only in verbal inflection. The only other differences are the further development of the Dumo *ʔ* to become (and thus reintroduce) *h* in Dusur,[13] and the loss of *f in Dusur, replacing the voiceless bilabial stop.

The vowels are the standard West Coast system, though the *ɵ* has a more rounded range of allophones than it does in Wutung or Dumo.

2.5.6 Leitre. Leitre is radically different from the West Coast languages or Skou in terms of phonological organization. The loss of clusters and the preservation of the rounded velar series sets Leitre apart from the other languages. Furthermore, Leitre shows voicing contrasts in all places for which is has stops, most unusual in modern Skou languages (though g^w is preserved only in verbal inflections). The innovation of *j > *s* is a uniquely Leitre process.

The shift of *ɵ to *ɔ,* resulting in the only Skou language lacking central vowels, and the raising of *a to *i* following a palatal stop, leave a very different configuration in the vowel system.

13. Indicating that *h* is, in Lass's (1997) terms, a point-attractor for Dusur. Clearly it is not a universal sink, given that Dumo has not (yet?) repaired the loss of this sound, and that Leitre initiated the loss in the first place.

FIGURE 7. THE SKOU SEGMENTAL SYSTEM

p	t		k				i	ʉ	u
b		j ~ gʲ	g					ø	
m	n						ɛ		ɔ
f					h			a	
w	r l	y							

FIGURE 8. THE SANGKE/NYAO SEGMENTAL SYSTEM

p	t	tʃ	k	kʷ			i		u
	d						e	ɵ	o
m	n	ɲ					ɛ		ɔ
f	s				h ~ x			a	
w	r	y							

FIGURE 9. THE WUTUNG SEGMENTAL SYSTEM

p	t	tʃ			ʔ	ʔʷ	i		u
b	d						e	ɵ	o
m	n	ɲ					ɛ		ɔ
f	s				h			a	
w	l	y							

FIGURE 10. THE DUMO SEGMENTAL SYSTEM

	t				ʔ	ʔʷ	i		u
b	d						e	ɵ	o
m	n	ɲ					ɛ		ɔ
ɸ	s							a	
w	l	y							

FIGURE 11. THE DUSUR SEGMENTAL SYSTEM

p	t						i		u
b	d		(g)				e	ɵ	o
m	n	ɲ	ŋ				ɛ		ɔ
	s				h	hʷ		a	
w	l	y							

FIGURE 12. THE LEITRE SEGMENTAL SYSTEM

p	t		k	kʷ			i		u
b	d	j	g	gʷ			e		o
m	n	ɲ	ŋ	ŋʷ			ɛ		ɔ
f	s							a	
w	l	y							

Having categorized the sound correspondences, and summarized the resulting phonologies in each of the daughter languages of Proto-Skou, we can now move on to the problems associated with subgrouping these languages and the criteria that we can use to make the decisions methodologically more adequate.

3. SUBGROUPING THE LANGUAGES. In the previous section we saw reflexes in different correspondence sets between the languages, and made several reconstructions. We are now faced with the task of assigning them to subgrouping patterns. Immediately, it is apparent that the isoglosses defined by the different sound changes do not match up. To illustrate with just a small selection of the possible permutations, we can attempt to group the languages at the western and eastern ends of the chain. The groupings of tables 34 and 35 can be defined by phonological innovations. It is clear that, depending on the salience we ascribe to various regular changes, we can make many different groupings of contiguous languages. We can map the changes described in tables 34 and 35 in the ten subgrouping possibilities shown in figure 13.

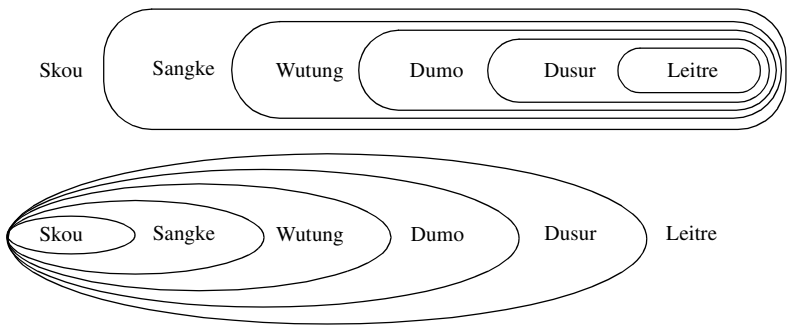
TABLE 34. POSSIBLE GROUPINGS INVOLVING SKOU

GROUP	DEFINING CHARACTERISTICS
Skou	*t, *s > r
Skou, Sangke	appearance of r
Skou, Sangke, Wutung	*d, *j > t
Skou, Sangke, Wutung, Dumo	*g > ʔ > h > Ø
Skou, Sangke, Wutung, Dumo, Dusur	VnV > V [+nasal]

TABLE 35. POSSIBLE GROUPINGS INVOLVING LEITRE

GROUP	DEFINING CHARACTERISTICS
Leitre	*j > s
Leitre, Dusur	*f > p
Leitre, Dusur, Dumo	*p > b, *h > Ø
Leitre, Dusur, Dumo, Wutung	*b > w / m
Leitre, Dusur, Dumo, Wutung, Sangke	*ʉ > i / u

FIGURE 13. SOME POSSIBLE PHONOLOGICALLY DEFINED SUBGROUPINGS



If we wished, we could also list features that link only the eastern and western languages: Skou and Leitre share the total reduction of clusters (though Skou shows *Cl > *l* where Leitre displays *Cl > C), and have bilabial reflexes of *g^w in common nouns: Skou reflects *p,* Leitre reflects *b.* This by no means exhausts the possible groupings. Rather, it simply serves to illustrate the problem, namely that, depending on the sound changes we select, there are a large number of plausible subgroupings in these six languages. Clearly, given that there is extensive and frequent contact between members of the different languages, we need to establish which phonologically defined groupings reflect shared innovations, and are thus genetic taxa, and which groupings reflect borrowing, and thus merely define linguistic areas.

We can start sorting this mass of conflicting data by determining which of the sound changes are relatively natural developments, and so more likely to be a borrowable change (and thus less likely to necessarily be group-determining changes). It is generally assumed that the lenition of stops > (voiced) > fricatives > glottal/zero is a more natural development than movement from right to left on this pathway (fortition), and a less strong indicator of genetic unity. Further, the loss of oral features is also less widely regarded as a group-identifying feature. The sound changes that are attested in the data from the Skou family and that fit into these categories are the following:

1. Lenition:
   *p > *b;* *t > *r;* *b > *w* / *m*
2. Change to [–oral] to Ø:
   *k > *ʔ* > Ø; *h > Ø; *ŋ* > Ø; *g* > *h* / Ø

Some changes are not in and of themselves "natural," but are natural in the context of other sound changes. For instance, given the loss of *b, the lenition of *p > *b* is simply filling in the gap in the phonemic system, and so, given a systemic tendency for voiced-voiceless contrast, can be taken as natural. Following this, the *f > *p* change makes systemic sense, as it fills the gap created by the missing voiceless stop.

The fact that the chain in table 36 is most fully developed in Dusur and Leitre suggests that it has its origins in one (or both) of these two languages. The spread of the initiatory change to neighboring languages created the same gaps in their phonological systems that was the impetus for the subsequent changes in the original language, and the source of the chaining phenomenon. This has led to the apparent spread, to varying degrees, of the drag chain to the immediately western languages. This particular sequence of changes is discussed in more detail in 3.1.1, followed by a discussion of two other drag chains that show evidence of "spreading." This leads to a set of procedures for discriminating taxon-defining and diffusional sound changes.

TABLE 36. THE DRAG CHANGE INITIATED BY THE LOSS OF *b

						Attested in:
			*b	>	*w* / *m*	Leitre, Dusur, Dumo, (Wutung)
		*p	>	*b*		Leitre, Dusur, Dumo
	*f	>	*p*			Leitre, Dusur

3.1 THE SPREAD OF SOUND CHANGE, AND ITS INTERACTION WITH GENETIC CHANGE. We can hypothesize that a systemic "urge" for symmetry drives drag chains; there is a typologically stable target that does not restrict developments, but does influence following changes.[14] In the previous section, we saw that the fullest development of the bilabial drag chain is seen in Dusur and Leitre; Dumo and Wutung show the first elements of the chain, but not the whole process. Positing a spread of the bilabial drag chain to differing degrees from Dusur/Leitre through Dumo to Wutung is thus an economical account of the appearance of this change in two varieties. The following sections document some examples of areally spreading sound changes and their interaction with, or impetus for, genetic, group-defining sound changes.

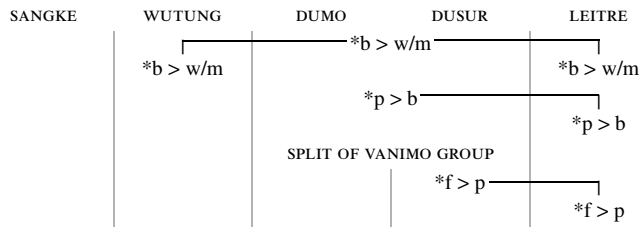
3.1.1 Bilabial: *b > *w/m,* *p > *b,* *f > *p*. The process of bilabial change in the Eastern Skou languages follows a simple drag chain, outlined in the previous section. This is the least complicated, or problematic, of the interactions outlined in this section, and so is presented first.

The change of *b to either *w* or *m* (depending on environment—see 2.2.2) started in pre-Vanimo. Following this, there are two developments: first, the original leniting sound change spreads to Leitre, and later (partly) to Wutung (but not Sangke, as the Border subgroup had already split by this time). Second, the gap in the phoneme inventory created by the loss of *b in pre-Vanimo was then filled, with *p acquiring voicing and becoming *b*. This change, too, spreads to Leitre. The final change is the *f > *p* change that came about in Dusur, after it has separated from Dumo, to fill the gap caused by the loss of *p, thus preserving a voiced-voiceless contrast in all places of articulation. This change also spreads east to Leitre, but does not go west at all.

The changes, and their relative chronologies, are shown in figure 14, which also summarizes the reflexes found for the different protophonemes in the modern languages. Sangke has been included simply to demonstrate the limits of the spread of *b > *w / m,* showing that the change cannot be ascribed to Proto–Eastern Skou.

Alternatively, it could be argued that the centre of innovation was Leitre; this scenario would see pre-Vanimo copying the sound changes from Leitre, and all of the sound changes being area-defining characteristics, rather than (in the case of the Vanimo group) serving to identify genetic taxa.

FIGURE 14. DEVELOPMENTS IN BILABIAL CONSONANTS



14. This "target" is by no means universal, even within the one language family, but rather is a target that can be selected by a language. It is hard to know whether or not this is epiphenomenal.

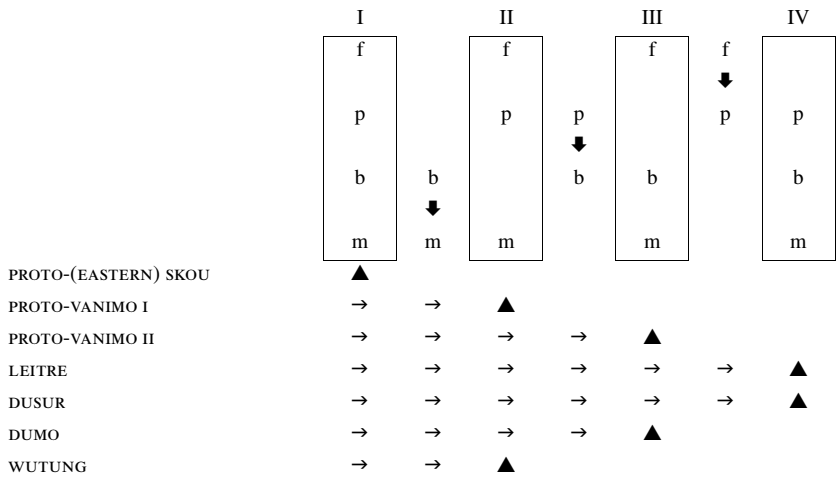
Evidence supporting the first analysis is the development of *w* as the 3SG.F prefix in Dusur (2.2.6, table 17). Given that resistance to phonological change increases on the cline noun > free pronoun > bound affix, the appearance of a lenited form in Dusur suggests that the drag chain described here has been operating in Dusur and its antecedents longer than in the other affected languages.

We can show the systemic drive for these changes in figure 15. An arrow in the row corresponding to the language name indicates that the sound change happened, but that the drag chain was not finished at this point; a triangle (▲) indicates the point at which the bilabial system in that language stabilized.

The operation of a drag chain operating in a constant direction, though to different degrees in different languages and language groups, is easily discernible in these developments.

3.1.2 Velar/Glottal: *k > *ʔ*, *h > ∅, *ʔ > *h*. The developments in nonoral stops are relatively unproblematic. Proto-Skou had only one nonoral consonant, *h, which was lost in an innovation in pre-Leitre. This sound change spread to proto-Vanimo, before the split into Dumo and Dusur, and served as the trigger for the development of another glottal consonant, *ʔ,* through the loss of *k. The velar/glottal change spread to Wutung, which had already separated from Sangke by this time, and after the split of Vanimo into Dusur and Dumo, Dusur reacquired an *h* through further lenition of the *ʔ*.[15]

FIGURE 15. THE BILABIAL PHONOLOGIES OVER TIME



15. It is the reinvention of the *h* in Dusur that suggests that the *h > ∅ change did not originate in the Vanimo group, but was later acquired by them. Leitre started this change, and has not developed further glottal consonants, whereas the Vanimo languages borrowed the change, but still showed tendencies towards nonoral consonants, evidenced by Dusur. This is a thin line of argumentation, but is the only means we have for suggesting a source for this sound change that is universal in both Leitre and the Vanimo group.

An alternative account for the data might see *h > Ø as a sound change that occurred at the Proto–Eastern Skou level, in the dialects that were to later become the easternmost member of the subgroup, *Leitre. Under this account the sound change spread through dialects that are ancestral to the West Coast languages only as far as the limits of Proto-Vanimo, which then started the loss of its voiceless velar stop.

The changes seen here are slightly more complicated than the bilabial case earlier, in that there are two different loci of spread, *h > Ø from pre-Leitre west, and the subsequent *k > ʔ from Vanimo west. The application of these changes to individual languages is shown in figure 17.

The drag chains are more complicated in terms of the interaction of diffusion and innovation in the glottalic case, because the loss of a glottal consonant in Vanimo spurred on the *k > ʔ change, which spread to Wutung despite Wutung's remaining unaffected by the initial *h > Ø change.

FIGURE 16. DEVELOPMENTS IN NONORAL CONSONANTS

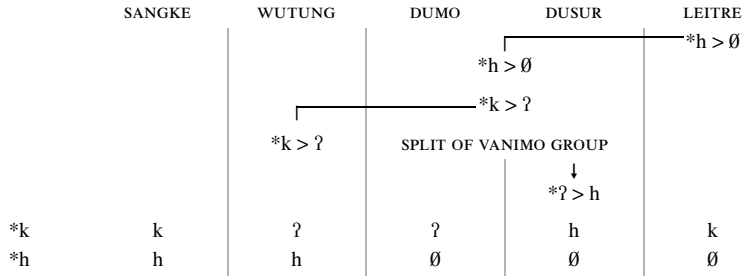
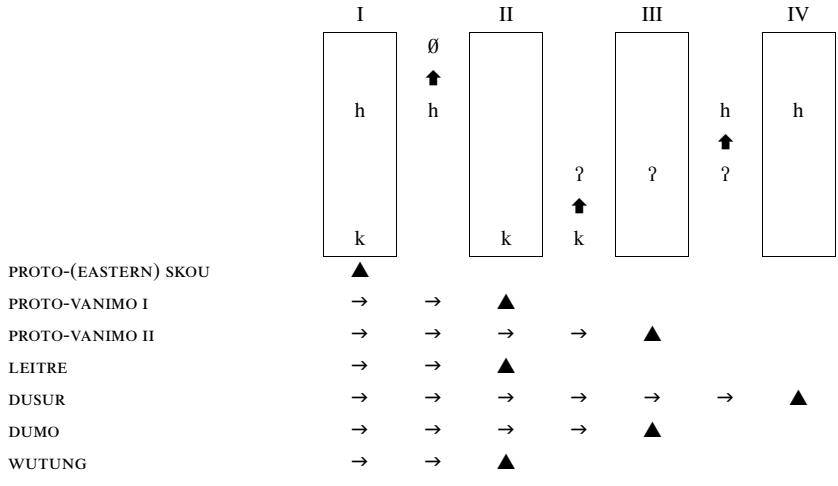


FIGURE 17. THE NONORAL PHONOLOGIES OVER TIME



3.1.3 Alveolar / palatal / labio-velar: *t > *r,* *d > *t,* *j > *d,* *s > *j,* *g^{w} > *tf,* and *g^{w} > *d.* This chain is a more complex interaction between innovations, spreads, and further innovations, primarily involving the alveolar and palatal positions in Skou and the West Coast languages, but also including the [+high, +back] stop *g^{w}. In addition to involving a larger number of places, this chain also requires us to posit different rates of diffusion for different sound changes in the one (dialectally or geographically differentiated) language community.

The phonemes that concern us in this chain are *t, *d, *s, *j, and *g^{w}. The first innovation was the development of an *r* phoneme in Skou; this is discussed in 3.1.5. Following this loss, there was a gap in the stop inventory. This was filled by an *s > *t* change (perhaps itself a result of areal pressure; Sentani, to the west, has also lost its *s*). Because the areal influences that started the *t > *r* change were still in place, these *s phonemes also became *r* in modern Skou. It is likely that the areal *t > *r* change was a gradual one, and as new words with *s changed to *t,* they remained with a stop pronunciation for a while before leniting further, preserving a small number of *t* phonemes in the language at any point in time.

Recall that *s, as in many Papuan languages, serves as the voiceless equivalent of *j in the inventory of phonemes in Proto-Skou. With the loss of the voiceless member of the palatal set, the load borne by the palatal place was now minimal: in addition to the loss of one of the stops, there was no corresponding nasal, unlike the other places. Eliminating this place as contrastive, we now see *j become alveolar, d. At this point the sound changes of Skou begin to be borrowed into Proto–West Coast, which existed as a dialect chain. The *j > *d* change was borrowed into the western end of the dialect chain.

The loss of the *j triggered a move to replace the palatals, and so *g^{w} shifted to become a palatal stop, **j.[16] This change spread through the Proto–West Coast community, and simplified to *tf* in Proto-Border. In the eastern varieties, however, those that became Proto-Vanimo, there was no shift to *tf,* but the *j > *d* change that was spreading eastwards from Skou arrived and converted those new *j* phonemes into *d.*

At some point around this time, the continuing lack of a voiceless alveolar stop in Skou motivated the shift of the voiced stop to become voiceless, *d > *t.* This change, too, spread to the east, but by this time the West Coast languages had split into (at least) two groups, and only the Border languages were affected by this shift. This is all summarized in figure 18. This figure does not illustrate the development of *g^{w} in Skou and Leitre, nor the later addition of a *j* phoneme ([ɟ ~ g^{j}]) in Skou through the shift of a few remaining *s consonants. The data discussed above and presented in figure 18 are repeated language by language in figure 19 (the presentation used in figures 15 and 17 breaks down for this data set). While not showing the relationships between the languages, it does serve to show how the application of the different sound changes in the different languages follows in all cases attempts to restore symmetry to the phonological system after the first disturbance.

16. The other high voiced stop, *g, had already been lost by this time; it is likely that the Proto–West Coast *g^{w} phoneme had first lost its rounding—see 5.1.4.

FIGURE 18. THE ALVEOLAR / PALATAL / VELAR CHAINS

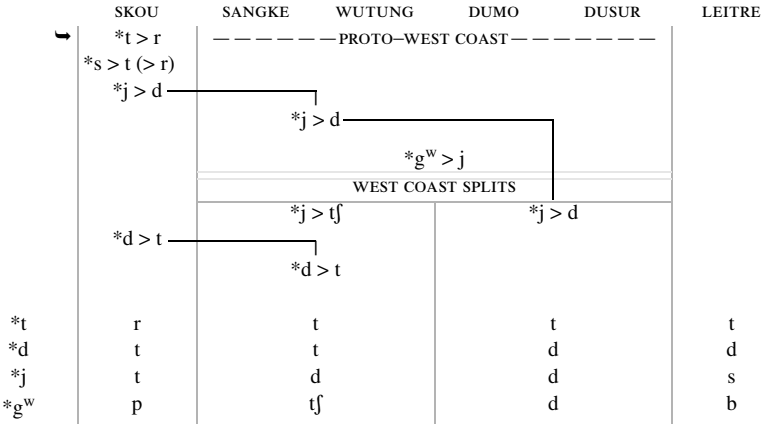
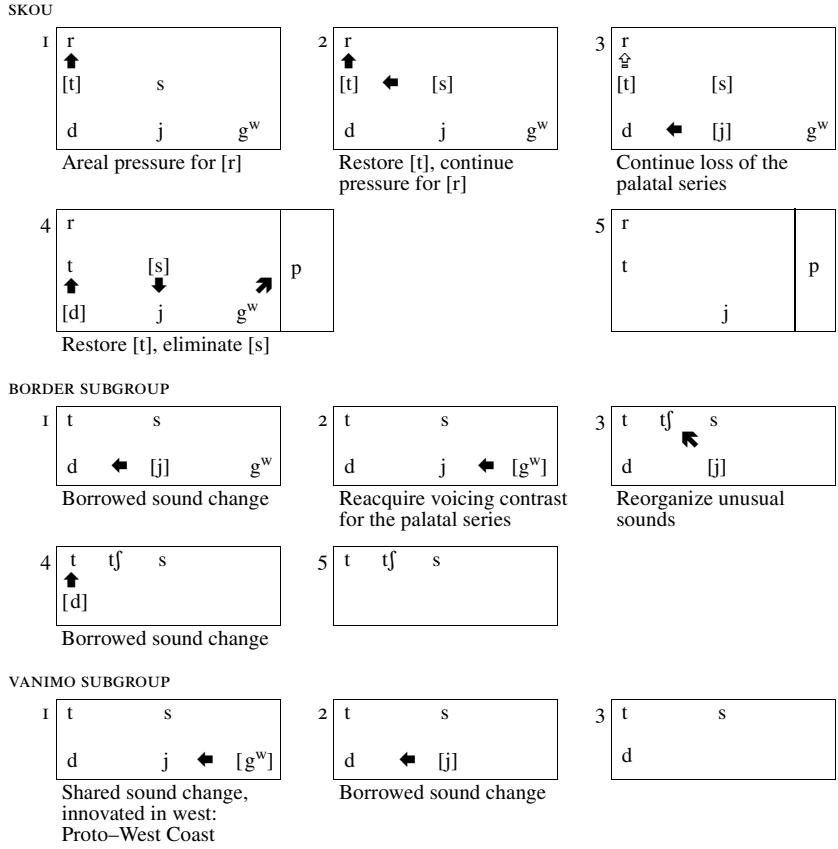


FIGURE 19. THE ALVEOLAR / PALATAL PARTS OF THE PHONOLOGIES OVER TIME



In addition to being focussed on Skou, it is also clear that the nature of the drag chain differs from village to village. In Skou, the chain is essentially an alveolar one, coopting the palatals to fill in. In the Border languages the focus is on preserving the (alveo-)palatal place, and in Vanimo the change serves to eliminate [+ high] consonants altogether.

3.1.4 Voiced velar: *g > h/Ø. Reflexes for *g have been seen in 2.2.5; essentially this change, like that of *ŋ, is most widespread in the west, and tapers out to the east, with Dusur and Leitre retaining these consonants to some degree.

The absence of *g* is a feature of the languages west of Skou, Elseng, Sentani, and Tobati, and so the areal influence of these languages can be assumed to be responsible for the loss of this phoneme in Skou, and the subsequent spread of this loss.

There is no direct evidence for any interaction with the *g > Ø change, though, as noted in 3.1.3, it is likely that this change preceded the *g^w > **j change in West Coast, because it is more likely that the velar stop would be appropriated when looking for a replacement for a voiced palatal stop. We can hypothesize the following developments:

I From a system with [g^w g j], *g is lost in Skou due to areal pressure from the west; this change spreads to Proto–West Coast.
II West Coast fills the missing voiced velar stop position by shifting *gw > **g.
III Skou shifts *j > d (see 3.1.3); this change spreads to the western communalects of Proto–West Coast.
IV **g > **j in Proto–West Coast, reestablishing the palatal series.
V The developments outlined in 3.1.3 take place.

The loss of *g, and subsequent reintroduction of the phoneme from *g^w, is partly attested in the retention of *g* in the verbal paradigms found in Dusur, which show retentions of this phoneme. The fact that Leitre preserves *g as g in all environments evidences this as a change that has not affected all of Eastern Skou.

Because not all the same changes have applied to all the languages, representing the phonological stages of this change is somewhat incomplete. Skou, for instance, does not finish at an endpoint shown in this table, as a result of other alveolar changes (3.1.3).

There is external evidence, based on reflexes of 'nose' in the languages of the Serra Hills and Piore River groups, for the *g^w > *g* change in the Skou languages. External evidence suggests that Proto-Skou 'nose' should be reconstructed as *na-g^wũ, given the reflexes in the eastern languages, and not *na-gũ, which is recoverable from the Skou languages.

3.1.5 Loss of *ŋ. With *ŋ we can see the loss strongest in the west (again, the languages to the west of Skou lack this phoneme), and some degree of retention in the east. Skou, the westernmost language, does retain some evidence of *ŋ as a verbal prefix, though, as outlined in 2.2.7, this is definitely a relic feature, witnessed by its infrequency and the total phonetic loss of the consonant.

3.1.6 Acquisition of *r*. The sound is not a phoneme common to the Skou languages: [r] is only found in Skou and Sangke. In Skou, [r] corresponds to Proto-Skou *t and *s, whereas in Sangke, all [r]s are derived from *l, which has been lost in this language.

Looking west, we find that [r] is the sole nonnasal sonorant in Tobati (Donohue 2002), Sentani (Hartzler 1976, Gregerson and Hartzler 1987), and Elseng (Donohue 1998). In 3.1.3 we saw that the acquisition of an *r* in Skou was a continuous process, with the *t > *r* change applying to some *s that had shifted to fill the gap left as *t was lost. Although the *t > *r* change did not spread to Sangke, the areal pressure to acquire an [r] was still there, and in Sangke this was realized by the shift of *l > *r*.

3.2 INHERITED SOUND CHANGES. Having discussed the sound changes that show evidence for being areal spreads, rather than changes that appear in more than one variety as a result of a shared history, we can discuss the changes that are not obviously due to spread, and so can perhaps be used as taxon-defining evidence.

Firstly, there are a number of changes that apply to only one communalect, and so are individual-identifying, and also not helpful for subgrouping. These are shown in table 37. It is perhaps significant that these changes almost entirely apply only to the westernmost and easternmost members of the family, suggesting that these varieties have had the longest period of independent development, and so suggesting a rough tree something like that shown in figure 21. While not inaccurate regarding overall similarities, we can significantly refine this model by adding more intermediate-level groupings, as described in the following sections.

FIGURE 20. THE VOICED VELAR PHONOLOGIES OVER TIME

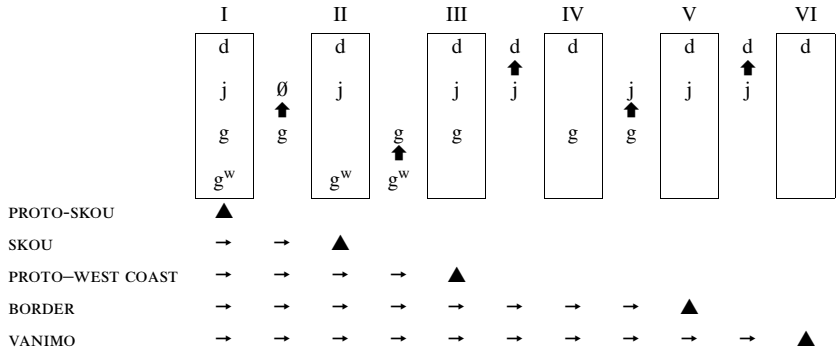


TABLE 37. SOUND CHANGES FOUND IN ONLY ONE LANGUAGE

CHANGE:	FOUND IN:	CHANGE:	FOUND IN:
*ʔ > h	Dusur	*ɛ, *ɔ > a /h, F	Skou
*a > i / j	Leitre	*g^w > p	Skou
*g^w > b	Leitre	*ɵ > u / -N	Skou
*j > s	Leitre	*s > r/j	Skou
*ɵ > ɔ	Leitre	$C_1C_2 > C_2$	Skou
$C_1C_2 > C_1$	Leitre	*ʉ > ø / N	Skou

3.2.1 Eastern Skou: *ʉ > *i, u, ə*, *d > *n* / N$_. In 2.3.2 we saw a complex series of changes involving the phoneme *ʉ, which is preserved only in Skou. In all the other languages it merges with the other high vowels, or the other central vowel.

This remarkable battery of changes is very unlikely to be spread as a whole, and so represents a significant ground for grouping Sangke, Wutung, Dumo, Dusur, and Leitre together as one group. This is further supported by the unusual change of *d > *n,* described in 2.2.3.[17]

3.2.2 West Coast: *g^w > *g*, *g > **j. Sections 2.2.6 and 3.1.3 have described the changes involved with *g^w. Although triggered by areal changes, the labiovelar changes clearly define a speech community that was dialectally differentiated, yet had a measure of unity. Crucially, it also excludes Leitre.

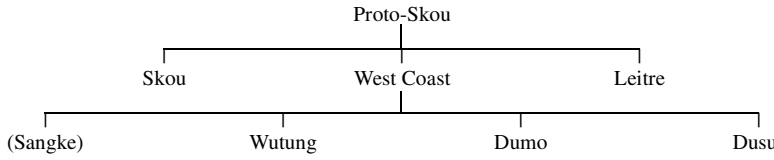
3.2.3 Border: **j > *tʃ*, *l > *n* / N, *tl > *hl*, *b > *p*. The changes that characterize the border languages have been described in 2.2.4 and 2.2.6, and have been analyzed diachronically in 3.1.3. While the *l > *n* / N change is also found in Leitre, the lack of any other congruence between the languages, and the geographic separation, make any link unlikely, especially given the tendency towards the spread of nasalization in the Macro-Skou languages.

3.2.4 Vanimo: *b > *w/m*, *p > *b*, *k > *ʔ*, *tl > *t*. The first two of these changes have been described in 2.2.2 and analyzed in terms of their later spread in 3.1.1 and 3.1.2. The loss of the lateral in the cluster *tl is perhaps a loan from Leitre, applying before the other cluster reductions because it involves alveolar dissimilations, but that is not something that can be checked.

3.2.5 Leitre. In addition to the features shown in table 38, Leitre is also characterized by the nasalization of laterals (2.2.6), which it shares with the Border languages, though this is parallel development rather than a shared innovation (strong nasalization of sonorants is also found in Dumo and Dusur—see 2.2.4). The *h > Ø change spread from Leitre to the Vanimo languages, but is nevertheless a part of the phonological definition of Leitre.

3.2.6 Skou. The spread of *d > *t* and *j > *d* from Skou to the east has been discussed in 3.1.3; these changes are only fully in place in the drag chain that started in Skou, and so can be used to define this linguistic branch.

FIGURE 21. PRELIMINARY TREE FOR THE SKOU LANGUAGES



17. The later *b > *w/m* is remniscent of this change. Nasal/Voiced stop cross-over is a feature of the Macro-Skou family, though these are the only remainders of what started as a system with no contrast between nasal and nonnasal stops (i.e., /d/ → [d ~ n ~ l ~ r]), as is still attested in Krisa (Donohue and San Roque 2000, San Roque 2001).

3.2.7 Summary of taxon-defining sound changes. Putting together the changes described in this section, we arrive at the genetic tree in figure 22. Because most of the nodes below the initial split are more likely to have been linkages rather than uniform languages (Ross 1988, 1997b), they are indicated with a double underscore. Their status as chains of communalects is evidenced by the patterns of diffusion we have seen through the daughters (for instance, *j > *d* in West Coast, and the gradual operation of the bilabial chain in Vanimo).

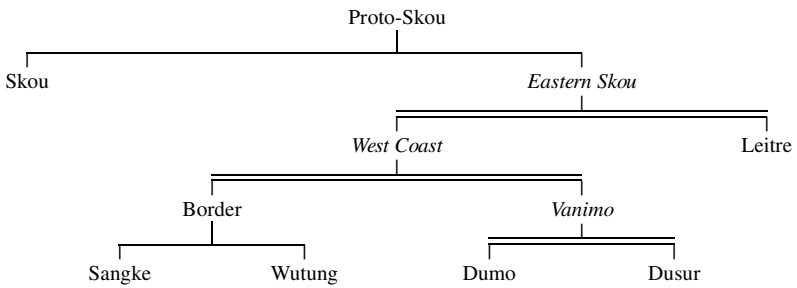
It is likely that the West Coast linkage actually represents a continuation of the Eastern Skou linkage after Leitre broke off from it, because all the characteristics that define this unit are found in Leitre, with the exception of *g^w > **g > **j, which is a change that (a) spread differentially through the linkage, and did not apply uniformly in time to the whole linguistic community, and (b) was triggered through contact with Skou to its west, and the changes that diffused from that language. Regardless of these caveats, the tree in figure 22 is defined with the taxa-defining changes described above, and summarized here:

Skou	*t > *r;* *d > *t;* *j > *d; *g^w > *p;* *s > *j,* **t; *fl, bl > *p;* *Cl > *l;* *ʉ > *ø* / N; *ɛ, *ɔ > *a;* *ɵ > *u* / -N
Eastern Skou	*d > *n* / N$_; *ʉ > *i, u, ɵ*
West Coast	*g^w > **g > **j
Leitre	*j > *s;* *h > Ø; *g^w > *b;* *l > *n* / N; *Cl > C; *ɵ > *ɔ;* *a > i/j _
Border	**j > *tʃ;* *l > *n* / N; *tl > *hl;* *b > *p*
Vanimo	*b > *w/m;* *p > *b;* *k > *ʔ;* *tl > *t*
Sangke	*l > *r*
Dusur	*ʔ > *h;* *f > *p*

Although we can justify the tree model of subgrouping with the sound changes described, and the procedure listed in this section for determining which sound changes count in which languages for subgrouping purposes, we have not given a full account of the contemporary distribution of these sound changes. For that we need a separate map.

3.3 SOUND-CHANGE SPREAD MAPPED ONTO THE TREE. Taking the tree we defined in 3.2, we can map the areally spreading changes on to it as seen in figure 23. This neglects the time dimension: the spread of, for instance, *g > Ø from

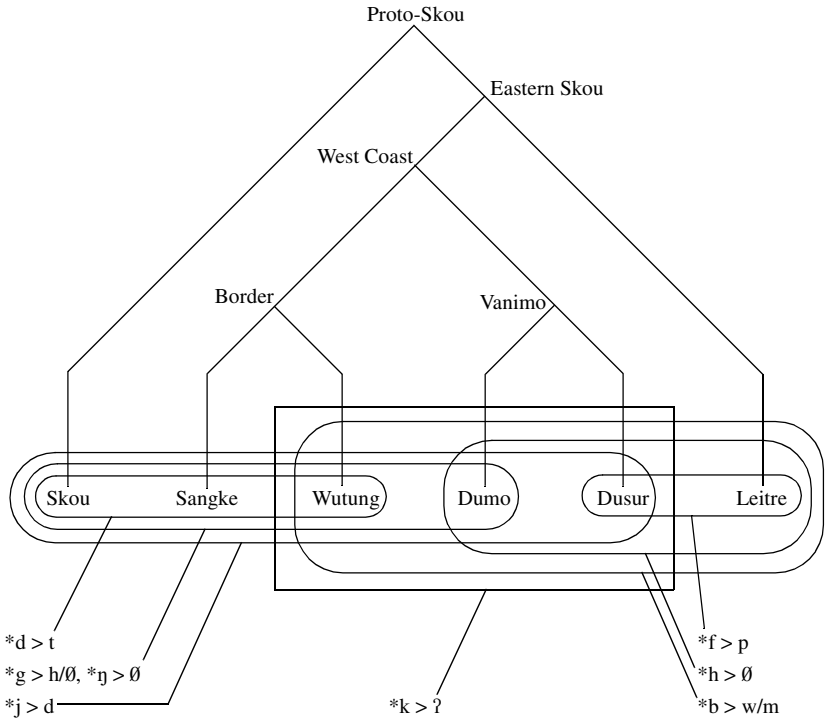
FIGURE 22. THE SKOU FAMILY



Skou to certain West Coast languages does not follow the application of all the inherited sound changes, but rather acts as the stimulus for some of them, as seen in the scenarios sketched in 3.1. A completely accurate diagram would show, in addition to the range of spread of each change, the period at which it spread. This would enable us to see that, for instance, *j > d spread eastwards to encounter Border before the subsequent response of (*g^w >) **g > **j, but only reached the Vanimo subgroup after this change had already applied. Despite these diachronic shortcomings, figure 23 allows us to gauge how the spread of sound change by contact has blurred the lines established by internal innovations. In the figure, I have simplified the conventions for indicating linkages for the sake of clarity.

4. MORPHOLOGICAL INNOVATIONS. The Skou languages are not very complex morphologically; apart from the subject prefixes on verbs, there is little in the way of inflectional morphology. All languages inflect for tense in the same way, by a combination of serial-verb constructions, reduplication, and low tone replacing lexical tone in past tense. All languages share the same word order restrictions. In only one area is there variation in comparable morphology: the indication of subject and object on the verb.

FIGURE 23. AREAL CHANGES APPLYING TO GENETIC BRANCHES



4.1 SUBJECT AGREEMENT PREFIXES. Subject is shown by a system of prefixes on the verb, which are in most cases partly or wholly fused with the consonant of the stem. The system of alternations is shown in table 38. In Wutung, Dumo, and Dusur, various clusters are created by the addition of these prefixes to consonant-initial verbs; there is some simplification, but a great degree of clustering is tolerated. In both Skou and Leitre, no clusters are allowed, and so the amount of phonological reduction is much greater.

In addition to the prefixes, Skou languages also show subject agreement through vowel modification. Essentially, plural subjects cause the vowel of some verbs to become more palatal (front, high), and feminine singular subjects can be associated with high back round vowels. In none of the languages is this regular, but rather is found as a relic feature in all of them to varying degrees. It appears to be most regularly found in Skou, though even there it is a minority pattern.

4.2 OBJECT MARKING. In all the Skou languages there is a system—though irregular and used infrequently—for marking some features of the object on some verbs in a manner reminiscent of the vowel suppletion that is found with some subjects. This can be found as a relic in all the languages, and so is not useful for subgrouping purposes.[18]

A more useful feature for subgrouping purposes is the use of suppletive forms of the verb 'hit' with different objects, the only systematic marking of object on the verb in these languages. Paradigms from some different Eastern Skou languages are shown in tables 39–41; the left column lists the features of the subject ('A'), and the top row the object ('O'). Table 39 makes it clear that different features of the object result in different verbal roots being used (unless regular correspondences can be found between the root forms listed above). Dusur and Leitre (tables 40 and 41) show related patterns of verbal suppletion, while Skou shows suppletion for feminine and plural only. Wutung is an intermediary between Skou and Eastern Skou. It has many of the essential features of the Eastern Skou suppletion, but appears to have lost some of the distinctions as well.

TABLE 38. UNDERLYING AGREEMENT PREFIXES IN SKOU FAMILY LANGUAGES

	SKOU	NYAO	WUTUNG	DUMO	DUSUR	LEITRE	PROTO-SKOU
1SG	Ø-, k-, n-	Ø-, k-	Ø-	Ø-	ŋ-	Ø-, ŋ-	* ŋ-
2SG	m-	m-	m-	m-	m-	m-	* m-
3SG.NF	k-	k-	ʔ-	ʔ-	h-	k-	* k-
F	p-	tʃ- / w-	tʃ-	b-	β-	g^w-	* g^w-
1PL	n-	n-	n-	n-	n-	n-	* n-
2PL	Ø-	Ø-	Ø-	Ø-	Ø-	Ø-	* Ø-
3PL	t- / y-	t- / y-	d- / y-	d- / y-	d- / y-	d- / y-	* d- / y-

18. Comparison with the Serra Hills and Piore River languages shows productive—and most likely cognate—object marking in most cases, and in Krisa we can see relic object marking very similar to that found in the Skou languages. This suggests that object marking was present in Proto–Macro Skou, and has since been lost in the branch of the family described here.

TABLE 39. DUMO

A\O	1SG	2SG	3SG.NF	3SG.F	1PL	2PL	3PL
1SG	—	ʔū	ʔa	lā	—	yi	yi
2SG	mle	—	ba	mlā	mlī	—	si
3SG.NF	ʔle	ʔū	ʔa	ʔlā	ʔlī	ʔyi	ʔyi
3SG.F	nɵ	nū	pa	nā	nī	si	si
1PL	—	nū	da	nā	—	ni	ni
2PL	le	—	ʔa	lā	lī	—	yi
3PL	ɲe	ɲū	ta	ɲā	ɲī	si	si
ROOT:	le	ū	ʔa	lā	lī	yi	yi

TABLE 40. SANGKE / NYAO

A\O	1SG	2SG	3SG.NF	3SG.F	1PL	2PL	3PL
1SG	—	pɵ̄	ka	na	—	tʃi	tʃʉ
2SG	mni	—	wa	mna	mrī	—	dʒi
3SG.NF	krī	kɵ̄	ka	ɲa	krī	si	si
3SG.F	ni	ɲɵ	$k^{w}a$	ɲa	hɲi	tʃɵ	tʃʉ
1PL	—	ɲɵ	da	ɲa	—	tʃi	dʒi
2PL	ni	—	ka	na	ni	—	ti
3PL	ɲi	ɲu	sa	ɲa	ɲi	ti	ti
ROOT:	le	ū	ʔa	lā	lī	yi	yi

TABLE 41. DUSUR

A\O	1SG	2SG	3SG.NF	3SG.F	1PL	2PL	3PL
1SG	—	ŋū	ga	lā	—	gɔ	yi
2SG	mlɛ̄	—	ba	mlā	mlī	—	si
3SG.NF	hlɛ̄	hū	hya	hlā	hlī	hɔ	hyi
3SG.F	nɛ	nū	pa	na	nī	bɨ	si
1PL	—	nū	da	na	—	dɔ	si
2PL	lɛ̄	—	ga	lā	lī	—	yi
3PL	ɲɛ	ɲū	ta	ɲā	ɲī	dɨ	si
ROOT:	lɛ̄	ū	ha	lā	lī	hɔ	yi

TABLE 42. LEITRE

A\O	1SG	2SG	3SG.NF	3SG.F	1PL	2PL	3PL
1SG	—	ŋɔ	ga	na	—	yi	yi
2SG	pī	—	$k^{w}a$	ma	si	—	si
3SG.NF	kī	kɔ̃	sa	kā	si	si	si
3SG.F	pī	$ŋ^{w}ɔ$	$k^{w}a$	ma	si	si	si
1PL	—	nɔ	ta	na	—	di	di
2PL	ɲi	—	ga	na	di	—	yi
3PL	ɲi	ɲɔ	sa	ɲa	di	yi	di
ROOT:	ɲī	ɔ̃	ka	ɲā	yi	yi	yi

TABLE 43. SKOU

A\O	1SG	2SG	3SG.NF	3SG.F	1PL	2PL	3PL
1SG	ka	ka	ka	lā	ji	ji	ji
2SG	ba	ba	ba	pā	ji	ji	ji
3SG.NF	ka	ka	ka	lā	ji	ji	ji
3SG.F	wa	wa	wa	wa	ji	ji	ji
1PL	ka	ka	ka	tā	ji	ji	ji
2PL	ka	ka	ka	lā	ji	ji	ji
3PL	ja	ja	ja	ja	ji	ji	ji
ROOT:	ka	ka	ka	lā	ji	ji	ji

TABLE 44. WUTUNG

A\O	1SG	2SG	3SG.NF	3SG.F	1PL	2PL	3PL
1SG	pū	pū	ʔā	lā	yi	yi	yi
2SG	mū	mū	ba	mā	yi	yi	yi
3SG.NF	ʔu	ʔu	ʔa	ʔla	yi	yi	yi
3SG.F	ɲu	ɲu	ʔwa	ɲa	yi	yi	yi
1PL	yi	yi	yi	yi	yi	yi	yi
2PL	yi	yi	yi	yi	yi	yi	yi
3PL	yi	yi	yi	yi	yi	yi	yi
ROOT:	pū	pū	ʔa	lā	yi	yi	yi

The forms of the verbs suggest the values given in table 45 (assuming that they were present in Proto-Skou, which does not appear to be the case). It is unlikely that all these distinctions were maintained in Proto-Skou, but a scenario for the development of object distinctions will be presented after a look at the commonalities between the systems. We can summarize the data as follows: (1) all languages have suppletive forms of the verb-marking features of the object; (2) all languages distinguish feminine objects and plural objects from the rest; and (3) if a language distinguishes more than one plural category, it will have a maximal range of singular object forms.

The major differences between different languages are: (1) in Wutung, the plural form of the verb is used for plural subject as well as plural object, and the 2SG form of the verb has been extended to cover 1SG as well; (2) Skou lacks forms for 1SG and 2SG; and (3) Dumo and Dusur distinguish more than one nonsingular form.

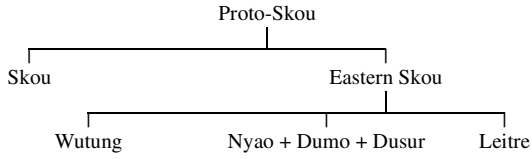
The history of object marking in the Skou languages is as follows: (1) Proto-Skou had a system almost identical to that seen in modern Skou, marking three distinctions in terms of features of objects coded on the verb, with the forms *ka, *lã, and *ji; Skou retained this system, and Eastern Skou innovated the forms lẽ and kõ for 1SG and 2SG object, respectively; (2) Leitre inherited this system, as did both subgroups of West Coast; (3) Wutung (but not Nyao) lost the distinction between 1SG and 2SG, and extended the PL.OBJ form to be a general PL form; further, this suppletive form came to be used even when an explicit object-marking verb root was available (possibly as a result of the inexplicitness that arose when the 1SG and 2SG forms merged); and (4) Dumo and Dusur extended the suppletive system to the first and second person plurals; they both innovated *lĩ '1PL' and *kɔ '2PL', with the latter being developed further in Dusur following their break-up.

This suggests the structure of figure 24 to represent the morphological groupings discovered by examining the suppletive morphology of the verbs of hitting. This division based on morphological grounds is in keeping with the divisions established by phonological comparison in the previous sections.

TABLE 45. SUPPLETIVE FORMS OF THE VERB 'HIT' (EXTRAPOLATED TO PROTO-SKOU)

'hit'	SG	PL
1	*lẽ	*lĩ
2	*kõ	*kɔ
3.NF	*ka	*yi
3.F	*lã	

FIGURE 24. MORPHOLOGICAL GROUPINGS BASED ON THE DEVELOPMENT OF SUPPLETIVE FORMS OF THE VERB 'HIT'



5. RELEVANCE TO SUBGROUPING METHODOLOGY. We have, in the previous sections, separated the sound changes that are characteristic of the different language varieties into those that are genetic changes, in that they identify a particular taxon or language, and those that are areally diffused changes (of course, an areal change must start somewhere, and in most cases we can also identify the language in which the change originated).

This simple division is complicated by considerations of scale: the *t > r change does, within the context of the Skou languages, help to define Skou as opposed to the Eastern Skou languages, though it is an areal feature of the genetically diverse and unrelated languages to the west of this family. In contrast, *p > b is not an areal feature of the languages to the east of the Skou family spread (indeed, the Serra Hills languages show *b > p), and so, as an innovation of a part of the Skou family, can be used unambiguously as a taxon-defining feature.

Categorizing the different changes in terms of whether they appear to have diffused beyond the point of their innovation or not, a not-random division of segment types emerges. This is shown in table 46, in which the left column shows sound changes and their historical sources, and the right column shows the spread that can be attributed to these changes.

TABLE 46. GENETIC VERSUS AREAL SOUND CHANGES

	GENETIC ORIGIN		AREAL SPREAD
*j > d	Skou	*j > d	> Sangke, > Wutung, > Dumo, > Dusur
*g > h > Ø	Skou	*g > h > Ø	> Sangke, > Wutung, > Dumo
*b > w/m	Vanimo	*b > w/m	> Leitre, > Wutung
*p > b	Vanimo	*p > b	> Leitre, > Wutung
*d > t	Skou	*d > t	> Sangke, > Wutung
*h > Ø	Leitre	*h > Ø	> Dusur, > Dumo
*k > ʔ	Vanimo	*k > ʔ	> Wutung
*f > p	Dusur	*f > p	> Leitre
*g^w > b	Leitre	*g^w > b	(> Vanimo)
*t > r	(Skou)	(*l > r)	> Sangke, (> Leitre, Dumo)
*g^w > p	Skou		
*g^w > *j	West Coast		
*l > n / N	Leitre, Border		
*b > p	Border		
*s > r/j	Skou		
*j > s	Leitre		
*ʉ > i/u	Eastern Skou		
*ɵ > u / N	West Coast		
*a > i / j	Leitre		
*ɵ > ɔ	Leitre		
*ɵ > u / -N	Skou		
*ʉ > **ɵ / N	Skou, Leitre		
*ɛ, *ɔ > a /h, F	Skou		
*ɵ > Ø	Skou		

What generalizations can we gather from this tabulation of sound changes? It appears that the changes that are first innovated in a language or protolanguage and then propagated to other languages irrespective of their affiliation, are those that involve consonants (particularly voiced consonants, and changes resulting in loss of oral features). None of the historical changes involving vowel quality can be shown to have its current spread as a result of diffusion. The inescapable conclusion is that, in some circumstances at least, vowel changes do not so readily spread into other languages as do consonantal changes.[19] One strong caveat that needs to be made at this point is the fact that, in most languages, the number of consonants exceeds that of vowels by three to one or more. This in itself would bias the number of borrowed changes in favor of consonants in most languages. In Proto-Skou and its daughter languages the ratio is only 2:1 in favor of the consonants, so this is not such a consideration: we still have 10 changes affecting consonants that spread, fully half the consonant inventory of Proto-Skou, compared to no attested spreads of vowel changes.

Although I have not yet studied this in depth, it seems reasonable that we would find greater stability of certain systems, especially those that are widely separated in phonetic space: *i ɛ a ɔ u,* and *i ə a u,* for instance, two widely attested Austronesian vowel systems, are often preserved intact and regular in modern languages. In other cases, the system has changed, but the changes are completely regular.

Here we examine the literature for cases of diffusion to see if it is the general case that consonants diffuse more readily (or at least more describably) than do vowels.

5.1 DIFFUSION IN THE LITERATURE. A short survey reveals the following examples in discussions of wave-like diffusion:

- The Rhenish fan, which plots the spread of the High German affricativization (*p/*t/*k > *pf ~ f / ts ~ s / x*) from the south to the north. Although all articulatory places show affricativization in the south, and none do so in the north, there is a clear gradual spread of this change from south to north, affecting different stops in different phonotactic environments at different times (see table 47). As can be seen in this table, the High German spirantization of

TABLE 47. THE RHENISH FAN

		'I'	'make'	'village'	'that'	'apple'	'pound'
Low	1	ik	maken	dorp	dat	appel	pund
German	2	ich	maken	dorp	dat	appel	pund
	3	ich	machen	dorp	dat	appel	pund
Middle	4	ich	machen	dorf	dat	appel	pund
German	5	ich	machen	dorf	das	appel	pund
	6	ich	machen	dorf	das	apfel	pund
High	7	ich	machen	dorf	das	apfel	pfund
German							

19. Empirical counterexamples to this absolute claim do exist: vowels can be borrowed, as Nothofer's documentation of the borrowing of schwa from Javanese into Sundanese attests (Nothofer 1973). It is unlikely, it would seem, to occur without consonant borrowing.

voiceless stops is completely regular in the south, but affects progressively fewer lexical items as one moves north, until one reaches that part of the Low German dialect area that is completely unaffected by the change.

- Crowley (1992:244–246) discusses diffusing sound changes in Paamese, and notes that the process of labiovelarization that applies in the north is gradual, giving table 48, which shows the labial/labio-velar differences in five words from six different communalects (arranged with northeast at the top, running to the south along the west coast of Paama).
- Sommerfelt (1962) describes the gradual loss (diffusing through time, the lexicon, and the speaker-base) of *χ* before *w* in Central Wales (Northern dialects preserve *χw,* and southern dialects have lost the *χ* entirely).
- Brøndum-Nielsen (1968) describes the spread of *w > *v* in varieties of Danish, following a clear diffusing pattern.
- Goossens (1969), plotting the appearance of [ʃ] in Limburg, shows that it is diffusing through different environments; Nielsen (1989:125) notes that this change "is clearly an innovation spreading from east to west."
- Upton, Sanderson, and Widdowson (1987) show only one clear example of a sound change spreading, that involving the voicing of initial fricatives in West Country English (in contrast, most isoglosses describing variation in vowel quality do not define diffusion centers).
- Krishnamurti (1978) describes the process of "apical replacement" in certain Dravidian languages. This change involves roots of the form *$(C_i)VC_jV$ to displace a noninitial apical (C_j in the above schema) to reform the root as **$(C_i)C_jV$-; thus, Proto-Dravidian *carac/*tarac 'snake' is reflected in Kui as *srās/srācu,* with the apical now in an initial cluster. This change started at a time when the affected languages were one speech community, and has affected different languages to different degrees. Krishnamurti shows that this change has applied most thoroughly to Kui (72% of the lexicon), to an intermediate degree in Kuvi, Pengo, and Manḍa (63%), but has only affected Gondi and Koṇḍa slightly (20%). He notes that "the areal diffusion of a sound change is interpreted here as the lexical spread of an inherited rule in genetically and geographically contiguous languages. The Dravidian data and analysis support the hypothesis that sound change spreads lexically, and that

TABLE 48. LABIALIZATION IN PAAMESE

	'he straightened it'	'left side'	'dust'	'married man'	'man'
F	m^{w}ai	m^{w}ail	m^{w}eas	am^{w}e	m^{w}eatin
E	mai	m^{w}ail	m^{w}eas	am^{w}e	m^{w}eatin
D	mai	mail	m^{w}eas	am^{w}e	m^{w}eatin
C	mai	mail	meas	am^{w}e	m^{w}eatin
B	mai	mail	meas	ame	m^{w}eatin
A	mai	mail	meas	ame	meatin

one group of exceptions to sound change represents items that are not yet affected by change at a given point in time"(18).

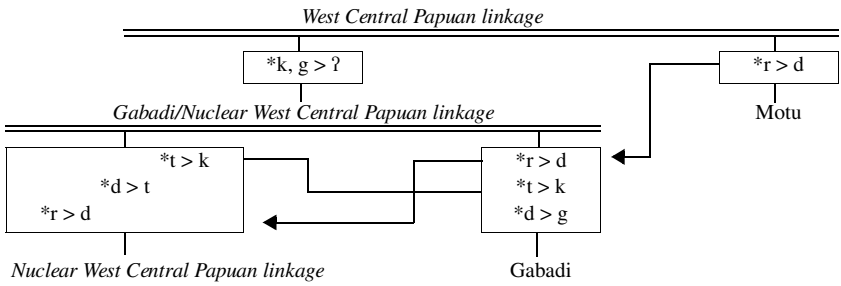
- Ross (1997b) describes sound changes in the West Central Papuan linkage, showing the irregular order of sound change in Gabadi. The sound changes in Gabadi do not follow the drag-chain pattern exhibited in the other languages that are its neighbors and genetic relatives. The changes in Gabardi are the result of these same changes diffusing from different directions. This may be diagrammed as figure 25 (adapted from Ross 1997b:154). The chain seen in the Nuclear West Central Papuan linkage follows from the earlier loss of velar stops, and proceeds in a chaining relationship, resulting in the shift of phonemic contrasts. In Gabadi, however, the earlier acquisition of the *r > *d* change from Motu disrupted this order, and, as a result of the analogic development of *d > *g,* resulted in the eventual sequence *r > *g.*
- Hinton (1991) discusses traits diffusing between the Takic Uto-Aztecan languages and the Yuman languages in the southern California region. Of the four Uto-Aztecan phonological traits in the region *(ɨ c ŋ h),* only the last two have diffused into Yuman. The Yuman traits found in Proto-Takic (but not Proto–Uto-Aztecan) are the presence of a *k/q* distinction, and the presence of *č* and *x.* Yuman traits in modern Takic languages include distinctions between *kʷ/qʷ, s/ṣ, r/l,* and the presence of *xʷ, ñ,* and *ly.*

As can be seen from the above sample, accounts of discussion focus heavily on consonants. Is it the case that vowels are more resistant to diffusion? A second literature survey on the behavior of vowels serves to answer this question.

5.2 VOWELS. There is considerable evidence in the literature that suggests that vowels are stable in diffusion zones: when diffusion takes place in an area, vowels do not so readily participate.

- Tagliavini's discussion of the reflexes of vowels in the modern Italian (and other Romance) varieties clearly points to them as taxon-defining changes (1969:237–240, 349–446) and not diffusing ones: the radically different vowel developments, in close geographic proximity to each other, do not show signs of diffusing. This is in contrast to, for instance, isoglosses for

FIGURE 25. BORROWED SOUND CHANGES IN WEST CENTRAL PAPUAN



consonants that do show evidence of diffusion (e.g., p. 405, discussing lenition in Southcentral Italian, and pp. 422–423, especially the different spreads shown by the *n > Ø and *nd > *n* changes in southwestern France).

- The diphthongization of [y] to [øɥ] in central and western Dutch (Kloeke 1950, Weijnen 1966, Donaldson 1983) shows a pattern of innovation in the center, with relic areas on the periphery and in pockets in Friesland; there is no clear pattern of diffusion.
- McMahon (1994:57), describing the findings and conclusions in Labov (1981), notes that "the Neogrammarian system accounted beautifully for some changes (involving, for instance, fronting, backing or rounding of vowels), while the diffusing model worked equally well for others (including lengthening and shortening changes). … Labov therefore accepts that there are two types of sound change: one behaves as predicted by the Neogrammarians, while the other is implemented by diffusion." Labov (1981:296) summarizes his findings as shown in table 49.

If lexical diffusion involves discrete changes, then consonants, rather than vowels, are the best segments to spread. This is due to the fact that vowels are not discrete in their production or perception, whereas there are fewer clines between consonants, merely discrete points (certainly true for place, and somewhat true also for manner—see Lass 1984).

5.3 MARKERS OF DIALECTAL IDENTITY. Furthermore, there is strong evidence that vowels, more than consonants, are salient in the perception and differentiation of dialects. This view is supported by many researchers. We can note that:[20]

TABLE 49. LEXICAL DIFFUSION VERSUS NEOGRAMMARIAN CHANGE

	LEXICAL DIFFUSION	NEOGRAMMARIAN CHANGE
Discrete	yes	no
Phonetic conditioning	rough	fine
Lexical exceptions	yes	no
Grammatical conditioning	yes	no
Social affect	no	yes
Predictable	no	yes
Learnable	no	yes
Categorized	yes	no
Dictionary entries	2	1
Lexical diffusion	yes	no

20. The English-centric presentation that follows partly reflects the preponderance of that language in the published literature on dialect studies. The data from the previous sections (e.g., 5.2) shows that languages other than English also show a strong tendency for consonants to show wave-model-like spread, rather than to remain as an ethnolinguistic marker in one variety. Of course, consonants that do not diffuse can, and do, function as markers of ethnic identity in many cases: Donohue (2000) presents one such study.

- Frazer (1987:42–51), in describing phonological differences in Midland Illinois, describes twelve vowel differences, and two consonantal differences, both involving [ɹ]. These are: the presence of [ɹ] in codas such as *barn* and *floor*, and the presence of nonetymological [ɹ] in words like *wa*[ɹ]*sh*, which is "due to settlement from WM or western Pennsylvania" (thus diffusional) (1987:49);
- Hughes and Trudgill (1979) describe several varieties of British English accents, emphasising the vowel differences. This is repeated in Kirk, Sanderson, and Widderson (1985) and Upton, Sanderson, and Widderson (1987);
- Anderson (1987) devotes 116 pages to vowel differences (98 for monophthongs, 18 on diphthongs), compared with seven pages used to characterize and display differences in consonants;
- Habick (1991) notes that the realization of certain phonologically back vowels and diphthongs with high F_2 values is a social group-defining feature of less academically oriented high school students in Farmer City, Illinois;
- Labov (1991) poses the question "How do dialects of English differ," and two pages later restates the question as "How do the vowel systems of English differ," implying that vowels are the most salient aspect of dialect variance;
- informal quizzing of linguists and nonlinguists on how they would imitate speakers of other dialects, or how they would characterize those speakers, universally resulted in answers referring to vowels (and all mentioned postvocalic [ɹ] for North Americans).[21]

When accommodating to another dialect, it is again vowels that are a feature of assimilation, rather than consonants. Trudgill (1986) reports that linguistic accommodation observed in the imitation of dialect in pop songs, in adults resident in the locale of a different dialect, and in resident children, in all cases relies on vowel modification more than anything else (for instance the ration of vowel accommodation: consonant accommodation changes observed is 3:2 for pop singers and 13:2 for children). It remains to be seen whether the same patterns hold for accommodation to a stigmatized variety of the same language.[22]

It seems clear, then, that speakers treat vowels and consonants in significantly different ways for the purposes of language change, partly as a result of the different process of articulating and perceiving the different segments, partly as a result of historical processes (see below), and partly as a result of the role of vowels in defining social groups. This begs the question, "Why do vowels define groups?"

5.4 VOWELS AS EMBLEMATIC, CONSONANTS AS ACCOMMODATION. We are all familiar with the maxim, attributed to Voltaire, that in historical linguistics consonants count for little, and vowels for nothing at all; this is based on

21. Thanks to Melissa Crowther, Bill Foley, Nicoletta Romea, Lila San Roque, Cherie Seeto, St. John Skilton, and several others, for judgments.

22. Personal experience suggests otherwise. Anecdotally, I have found myself adapting my vowels to Canadian English norms, and inserting the occasional [ɹ], in order to buy goods at bakeries (in Canada), but have not followed the same vowel-adapting strategy in New Zealand, which is a stigmatized (or, better, ridiculed) variety of English for me. Neither have I inserted [ɹ] when interacting in California, for similar, though less extreme, reasons.

the usual regularity of correspondence sets found with consonants, as opposed to those involving vowels.[23] I suggest that it is precisely because of these differences that vowels are taken as emblematic of social identity: they are not as predictable as consonantal changes, and are not as easily differentiated from other minimally distinct qualities. Consonants are more often in a regular relation to those found in other closely related varieties, and speakers are aware of these patterns, and so can easily accommodate to a new target. Ross (1988:11), drawing on Weinreich (1963:2), notes that "speakers who are bilingual in closely related languages may employ 'automatic conversion formulae'. These embody the sound correspondences between the two languages, such that the speakers replace the phonemes of a lexical item in one language with the corresponding phonemes of the other when they transfer it between languages." This is characteristic of speech across language varieties when "assumed competence" outstrips communicative ability. Dutch speakers adapting to Germans, even with little direct experience with German themselves, happily recognize that their [sx] cluster corresponds to [ʃ] (while not noticing that other *s*C- clusters correspond to *ʃ*C-), and apply this and other regular changes to produce [ʃrajbɛn] for German [ʃʀajbən] 'write', a close approximation (compare with Dutch [sxrɛjvən]).[24] Overconfidence in these formulae is common: in adapting [døɥm] 'thumb' to German, I have heard a Dutch speaker apply automatic conversion rules to produce *[tawm / tawmɛn], rather than the correct [dawmən] (and so create confusion with [tawməl] 'dizziness') (this in a hospital setting).

In the Skou area, the essential parts of this statement are true, even if true bilingualism is often lacking (there is, at best, passive bilingualism). Wutung speakers, for instance, are very aware of the Skou *k:* Wutung *ʔ* correspondence, and among speakers of all the Skou languages the reflexes of Proto-Skou *g^{w} are well known, albeit applied in a somewhat indiscriminate way. I have heard Dumo speakers adjust all their *d* phonemes to *b* when speaking to Leitre people. This is effective in most cases, such as *g^{w}ã 'husband', which is reflected as *dã̃* in Dumo and *bã̃* in Leitre, and so amenable to a simple *d* → *b* rule. This substitution, however, applies indiscriminately, even to cases of *d* that reflect *d. For instance, a lexeme such as 'bird', *dĩ̃* in Dumo and *dɛ̃̃* in Leitre, is incorrectly produced as *bĩ̃* by Dumo people speaking to natives of Leitre.[25] It is of particular note that, when speaking to people from another village, this application of conversion formulae does not extend to vowels: the *ʔ* : *k* correspondence is known, and Dumo *ʔɵ* 'egg' is assumed to correspond to Leitre *kɵ*, whereas the Leitre form is in fact *kɔ*. Why should this be so, given that vowels are the most salient feature of closely related languages?[26]

23. This observation was based on Indo-European data. Other linguistic groups show more regularity, such as the developments of vowel systems in Western Malayo-Polynesian languages, for instance. See the beginning of section 5 for a brief discussion.
24. The speakers were speakers of a dialect without uvular ("gebrouwen") *r*.
25. The *d* : *s* sets that reflect *j are also ignored by Dumo speakers.
26. Other than "emblematic" lexical items, such as the insistence on the use of, for instance, *naki* 'dog' in Barupu, rather than the inherited Piore River lexeme *rapa*, to establish the fact that their clan ancestors are recent immigrants to the area.

In part, it is the very salient nature of vowels that prevents them from being used indiscriminately by outsiders who are not trying to assimilate. The use of particular vowel systems is strongly emblematic of ethnic or group identity, and so the use of that vowel system is appropriate only for residents in a locale, or members (aspiring or established) in a group. When accommodating to another variety of speech, the gross, easily convertible consonants are the most liable to change. Vowels will change either when there is a strong imperative to communicate, or when the speaker knows that the target audience has a phoneme that the speaker is lacking in the base language (such as the use of [aj] by Dutch speakers noted earlier; in Dutch [aj] is a rare diphthong). The other social environment in which vowels are adapted is where the speaker wishes to express solidarity with the audience: either attempting to assimilate to that group, or in the face of a third party who is an outsider to both of them. Moreover, and what is more important, the irregularity of vowel correspondences between communalects (owing to the irregularity of sound changes as they apply to vowels in many languages) makes it hard for speakers to set up automatic conversion formulae; in addition to *ɵ* : *ɔ* correspondences, Dumo speakers also need to be aware of *u* : *ɔ* and *ɔ* : *ɔ* correspondences, and for which lexemes they are valid.[27] This level of knowledge goes beyond knowledge of automatic conversion formulae, and into extensive bilingualism.

We can summarize the tendential differences between vowels and consonants in terms of their historical development and contact behavior. In practical terms, this means that attempting to sort through areally spread features and genetically inherited features is not an impossible task, because we can formalize a set of principles that can be used to sort the myriad changes: (1) sound changes that are part of a drag chain can be assumed to originate in the variety that shows the greatest instantiation of that chain; languages that instantiate some of the chain only, or that have an irregular order to the changes, have the sound change as a result of diffusion; (2) sound changes apply to nonbound morphemes before they apply to bound morphemes; (3) "repair" changes, such as the return of *h* in Dusur, are indications that the initial change that brought about the loss of that phoneme was not innovated in the language or its ancestor, but has spread into that variety; and (4) shared vowel patterns are more likely to represent shared innovations than diffusion.

TABLE 50. CHARACTERISTICS OF VOWELS AND CONSONANTS IN SOUND CHANGE

	VOWELS	CONSONANTS
Regular historical development?	no	yes
Tendency to diffuse?	no	yes
Discrete changes?	no	yes
Group-identifying?	yes	?
Salient feature?	yes	?

27. The front vowels are worse: there we see the following correspondences *i* : *i*, *e* : *e*, *ɛ* : *ɛ*, *a* : *i*, *i* : *i*, and *ɛ* : *i*.

This leads to the following procedural steps when we want to sort out inherited and diffusional change: (a) examine sound changes for evidence of a drag chain; the language or group with the longest drag chain is likely to be the source of the innovation; (b) examine sound changes for differential application in bound morphemes; if there is a difference between languages (for instance, one language might allow the sound change only on free lexical items, and the other language in all cases), the language that allows the sound change on the bound morphemes is likely to be the source of the innovation; (c) if there is evidence for the cyclic loss and reintroduction of a single phoneme, that is evidence that the sound change does not originate in the language; the cyclic reappearance of an entire chain, however, is likely to be innovated in the language; and (d) shared patterns in vowel systems—especially irregular ones—are likely to represent shared innovations, rather than diffusion, and so are strong markers of linguistic affiliation.

I am not claiming that all instances of partial chains must be ascribed to contact; indeed, there is no requirement on any language that it must drag its chains to completion. What I wish to suggest is that, given the suspicion of contact and the presence of a chaining or networking-like complexity in the possibilities for subgrouping,[28] these methodological steps should be considered as a tool for unravelling the history. Similarly, it would seem to be quite possible for vowels to diffuse in some manner. If the correspondences were highly regular, which is more likely in systems with fewer vowel phonemes, then we might expect to see vowel changes diffusing. But given phonemic systems of the type discussed here, each with seven or eight vowels, this does not seem to be the case.

The task of applying historical linguistic methodology to the New Guinea area is still a daunting one, but far from impossible. Ross (1988) tackled the several hundred Austronesian languages of Western Oceania, in the face of similar complications of borrowing, diffusion, and mutual influence. While the non-Austronesian languages of the region represent an in-some-ways greater challenge, they do not represent a difference in methodological approach.

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28. See Ross (1988:7) for discussion of these terms. Essentially, and to do some degree of violence to Ross's thoughtful distinctions, chains are one-dimensional and networks are two-dimensional.

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