Lexical tectonics:
Mapping structural change in patterns of lexification

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Abstract

Whether it is based on philological data or on comparative research, historical linguistics accounts for modern words by formulating etymological hypotheses that entail changes both in form and in meaning. One way to represent semantic change is to describe modifications in "patterns of lexification": a polysemous word, which once lexified senses s1–s2–s3, has evolved so it now encodes s3–s4–s5. Meanings that used to be colexified are now dislexified, and vice versa. Leaning on empirical data from Romance and from Oceanic (Vanuatu), this study proposes a general approach to historical lexicology, by identifying five types of structural innovations: split, merger, competition, shift, and relexification.

The theoretical discussion is made easier by using a visual approach to structural change, in the form of diachronic maps. Semantic maps have already proven useful to represent synchronic patterns of lexification, outlining each language's emic categories against a grid of etic senses. The same principle can be profitably used when analysing lexification patterns in diachrony: lexical change is then viewed as the reconfiguration of sense clusters in a semantic space. Maps help us visualize the "lexical tectonics" at play as words evolve over time, gradually shifting their meaning, gaining or losing semantic territory, colliding with each other, or disappearing forever.

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"A semantic change will occur whenever
a new name becomes attached to a sense and/or
a new sense to a name." (Ullmann 1957:171)

1 Introduction: Mapping semantic change

1.1 Comparing lexical structures: from synchrony to diachrony

Systematic lexicology, pioneered by structuralists (Hjelmslev 1943, Ullmann 1957, Coseriu 1964), was revived recently through studies in lexical typology, bringing to light various ways in which lexicons can be compared across languages (see Koptjevskaja-Tamm, Vanhove & Koch 2007; Vanhove ed. 2008; Urban 2012; Juvonen & Koptjevskaja-Tamm 2016; Koptjevskaja-Tamm & Liljegren 2017).[1]

When comparing how languages cut up the semantic space, one efficient approach consists in breaking up a given lexical domain into a number of potential meanings, independent of their expression in individual languages. The universal "etic grid" formed by these senses then serves as a background against which emic categories of particular languages can be compared (François 2008, Evans 2010). For example, one can list the various forms taken by wood in human experience, and then compare how languages group these senses together (cf. Hjelmslev 1943): some languages will lump 'wood' with 'tree', or with 'stick'; some will distinguish 'timber wood' from 'firewood', others will express together 'firewood' with 'fire' (Schapper *et al.* 2016), and so on.

Several authors have advocated semantic maps as a powerful way to visualize the results of such cross-linguistic comparison (Haspelmath 2003; François 2008; Georgakopoulos *et al.* 2016; Georgakopoulos & Polis 2018, this volume). Until recently, most authors have adopted a synchronic approach to lexical maps (e.g. Rakhilina & Reznikova 2016: 113); however, the field shows increasing interest towards adapting the map approach to diachronic semantics.

The present study will discuss processes of semantic change and their impact upon lexical structures. Semantic maps will appear as a powerful device to capture graphically the way in which every semantic innovation redesigns lexical domains and their internal organisation.

1.2 Describing lexical structures through dis- and co-lexification

Lexical structures (Coseriu 1964), taken as a synchronic property, can be defined by the patterns of correspondence between senses and forms.[2] The main criterion, particularly

[1] I wish to thank Siva Kalyan, Catherine Fuchs, and the volume editors, for their comments on earlier versions of this work. This work contributes to the research program "Lexical typology across time and space" within the Paris-based network *Empirical Foundations of Linguistics* (strand "Typology and dynamics of linguistic systems").

[2] Note here that "forms" may refer to words, but also to conventionalised constructions (in the sense

…/…

central to the structuralist approach, is the presence or absence of formal oppositions in the lexical expression of particular senses.

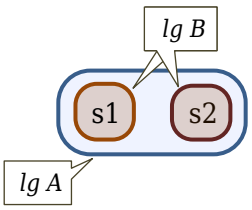
Languages may be compared in their patterns of COLEXIFICATION – that is, their ability to encode two distinct senses using the same lexeme (François 2008). For example, Japanese uses a single word for 'tree' and 'wood' (木 *ki*), while English distinguishes these two concepts using separate words. In principle, two senses can be considered distinct if they can be simply conceived as different (e.g. 'male salmon' vs. 'female salmon'); but for practical purposes, the identification of individual senses should better be empirical: two senses will then be deemed distinct *iff* they are distinguished formally in at least one language in the world.

Symmetrically, languages can be compared in the way they draw contrasts between close meanings – what I here propose to call DISLEXIFICATION. Thus, Japanese distinguishes lexically between 姉 *ane* 'older sister' and 妹 *imōto* 'younger sister', while the default in English would be to use the same noun *sister*. One can say that Japanese, unlike English, dislexifies these two senses.

Patterns of dislexification are the mirror-image of colexification. Selecting the right descriptor here is essentially a matter of perspective, and is ultimately arbitrary. From the perspective of Japanese, Eng. *sister* illustrates colexification; from that of English, Jap. *ane* vs. *imōto* is a case of dislexification; co- and dis-lexification are just two facets of the same coin. Together, they define a structural property which I propose to name PATTERNS OF LEXIFICATION[3] – i.e. the patterns of distribution of meaning across forms.

Lexification patterns can be compared across languages, and shown visually on a simple map such as *Figure 1*. A semantic domain is projected onto a two-dimensional space, in such a way that its component senses s1 and s2 occupy distinct locations on a two-dimensional plane. Using sets, senses s1 and s2 are here shown to be colexified in language A, but dislexified in language B.

Figure 1 – Two senses s1 and s2 may be colexified (language A) or dislexified (language B)



While *Figure 1* compares separate languages, nothing prevents us from using the same principle for comparing two historical stages of the same language. A language may dislexify two senses at a certain point in history, but its descendent may colexify them, or vice versa. This will be central to our discussions on historical lexicology.

1.3 This study: data sources and outline

My observations will focus on two language groups for which the history of semantic

of Fillmore *et al.* 1988, Goldberg 2003).

[3] This is similar to the term *clusivity*, a neutral term referring to the contrast between *inclusive* and *exclusive* personal pronouns (Filimonova 2005).

change can be reconstructed with precision: Romance and Oceanic. Romance is a family with a well known history, and a linguistic ancestor that is well understood. Oceanic languages, in turn, have no written tradition, and are only known in their modern forms. However, their shared ancestor Proto Oceanic (POc) can be reconstructed with reasonable confidence thanks to the Comparative method, based on its 500 modern descendants (Pawley & Ross 2006; Ross *et al.* 2016). Among these 500 Oceanic languages, 138 (François et al. 2015) are spoken in the Vanuatu archipelago (*Figure* 2). This study will focus on the 17 languages of the Torres and Banks Islands of north Vanuatu (*Figure 3*).

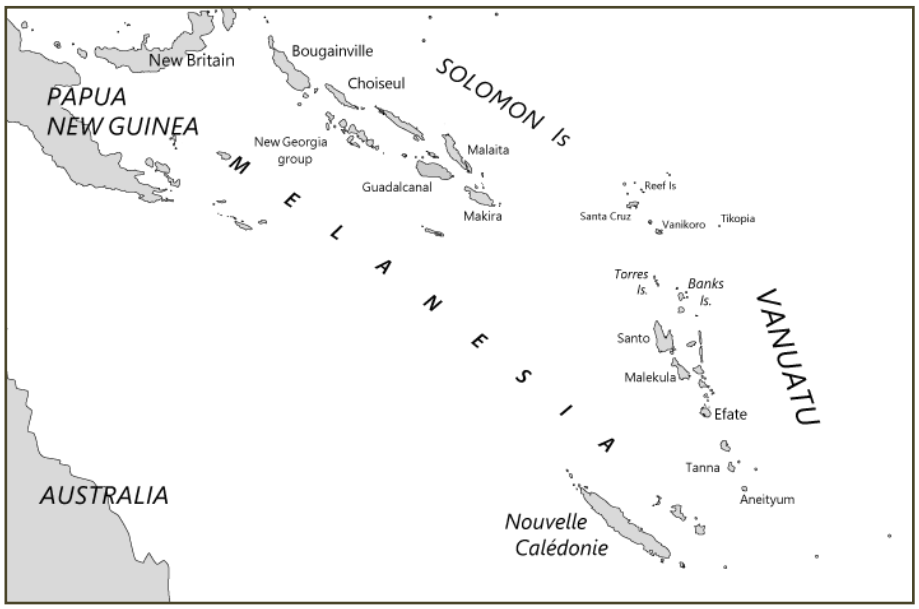


Figure 2 – Location of Vanuatu within Island Melanesia (Pacific ocean)

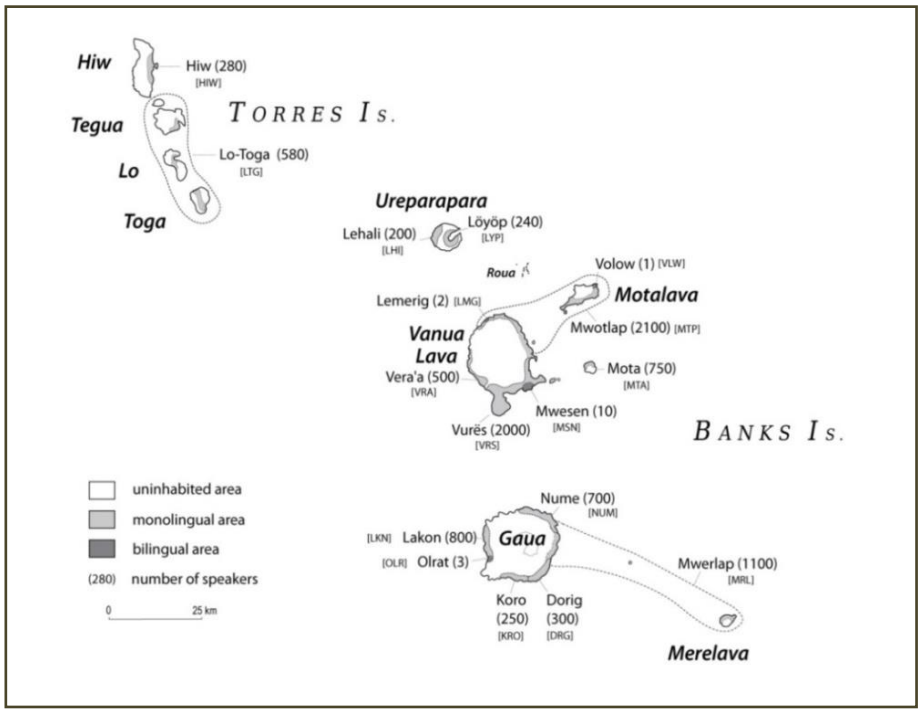


Figure 3 – The 17 languages of the Torres and Banks Islands (northern Vanuatu)

Little has been published yet on the lexicon of the Torres–Banks languages – apart from a dictionary of Mota (Codrington & Palmer 1986), and a dictionary of Mwotlap currently in progress (François 2020). My data originates in personal fieldwork carried out on the 17 languages of the area, combining language immersion, recordings of connected speech, and linguistic elicitation by means of a homemade questionnaire (François 2019).

When an innovation is shared by Torres and Banks languages together, it can be captured by positing an intermediate common ancestor called PTB "Proto Torres–Banks" (François 2011a, 2016) – itself a descendant of Proto Oceanic. Lists of PTB lexical reconstructions appear in François (2005, 2013).

The present study will explore the diachrony of lexical structures. I will approach these structures by focusing on *patterns of lexification* – though it must be acknowledged that other aspects, not dealt with in the present work, also contribute to a lexicon's organisation: e.g. lexical gaps, combinatorics, phraseological routines (Kopjevskaja-Tamm & Liljegren 2017).

Section 2 will discuss instances, first of structural stability, and secondly of structural innovation – based on Romance and Oceanic data. Section 3 will discuss the phenomenon of lexical competition, a key for understanding the process of lexical replacement and structural change. Section 4 will propose a typology of structural innovations in the lexicon – and provide some of them with empirical illustrations from firsthand data.

2 Stability and change in lexical structures

Lexical structures may evolve in different directions – including the absence of change. This section will first examine cases of structural stability in Romance languages, before discussing two cases of structural innovation in the languages of Vanuatu. These examples will be the occasion to define two important innovations in lexification patterns: lexical mergers and splits.

2.1 Structural stability

If a set of modern languages descend from a single ancestral protolanguage, part of their lexical structures will just be inherited from that ancestor. These structures can prove stable over time.

To take a simple example, we know that Latin distinguished between *bracchium* 'arm' and *manus* 'hand' – contrary to 37 percent of the world's languages, which colexify these two body parts (Brown 2013).[4] This pattern of dislexification ⟨arm⟩ ≠ ⟨hand⟩ has been preserved intact in modern Romance languages, which all contrast 'arm' vs. 'hand'

[4] The Database of Cross-Linguistic Colexifications "CLiCS" (List *et al.* 2018) lists 196 languages colexifying 'arm' and 'hand' [https://clics.clld.org/edges/1277-1673].

(*Table 1*). In this specific case, the inheritance of lexical structures came along with the preservation of the inherited etyma themselves: such a case could just be seen as an unremarkable instance of linguistic conservation.

Table 1 – 'Arm' and 'hand' in Romance languages

meaning	Latin	Portug.	Castilian	Catalan	French	Italian	Roman.
'arm'	*bracchium*	braço	brazo	braç	bras	braccio	braț
'hand'	*manus*	mão	mano	mà	main	mano	mână

Interestingly, lexical structures may remain stable even though the word itself changes its form due to lexical replacement. Consider, in *Table 2*, the terms for 'leg' and 'foot' in Romance languages. The word *crūs* of Classical Latin was lost in modern Romance languages, which have replaced it with new lexical material – either from Lat. *perna* 'ham', or from Late Lat. *gamba* < Gr. κάμπη 'flexure'. And yet, in doing so, they never lost the original structural pattern whereby 'leg' is dislexified from 'foot'.

Table 2 – 'Leg' and 'foot' in Romance languages

meaning	Latin	Portug.	Castilian	Catalan	French	Italian	Roman.
'leg'	*crūs*	perna	pierna	cama	jambe	gamba	gambă / *picior*
'foot'	*pēs*	pé	pie	peu	pied	piede	*picior*

The only exception here is Romanian, where *picior* 'foot' can also be used for 'leg'.[5] In modern Romanian, the inherited form *gambă* is now mostly used for the lower leg (calf, shank), while the default term for the lower limb nowadays is *picior*. Examples such as *picioare strâmbe* 'crooked legs', or *un picior mai scurt decât celălalt* 'one leg longer than the other', clearly refer to the leg rather than just the foot. This structural innovation reflects areal influence, as Romanian calqued the colexification of 'leg' and 'foot' characteristic of its neighbouring languages: Hungarian *láb*, Bulgarian *крак*, Russian *нога*, Greek *πόδι*. Romanian is here the only exception to the general observation that Romance languages generally show structural stability in the domain of body parts for upper and lower limbs.

Many other examples could be found, in the world's languages, of inherited lexical structures being preserved over time. While this preservation sometimes goes along with the conservation of the original lexemes, we saw that it can also occur even in the case of lexical replacement – as though the structural properties of the lexicon were somehow independent of the specific words that embody its different categories (François 2010; 2011a:226). The structuralist Coseriu (1964) made the same point: "a semantic structure

[5] The CLiCS² database [https://clics.clld.org/edges/1297-1301] lists 191 languages colexifying 'leg' and 'foot'.

can be maintained even when the word forms have been replaced".[6] Such observations encouraged him to promote SEMANTIC LEXICOLOGY ("lexicologie du contenu": 1964:164) as a science of the lexicon dedicated to semantic structures *per se*, independent of changes in their phonological form.

2.2 Structural innovations: mergers and splits

Languages commonly go through structural innovation. A given lexification pattern can be lost or redesigned over time. Ultimately, any semantic change in the lexicon comes with a change – whether minor or major, temporary or permanent – in the structural organisation of its semantic domain.

I will illustrate the notion of structural innovation by observing two lexical domains in the Oceanic languages of northern Vanuatu: body parts and kinship terms.

2.2.1 Body part terms in northern Vanuatu

Contrary to Romance (*Table 1*), Oceanic languages generally colexify 'hand' with 'arm'. This pattern can be reconstructed for Proto-Oceanic with a form **lima* 'arm, hand; five' (Osmond & Ross 2016:160). Within our northern Vanuatu sample (*Table 3*), all languages have preserved the colexification pattern { arm = hand }, whether they reflect the etymon **lima* (white cells) or an innovative form (colored cells).[7] This is another case of structural conservation in spite of lexical change [§2.1].

Table 3 – Some body parts in a sample of northern Vanuatu languages

	etymon	HIW	LTG	LYP	MTP	LMG	VRS	MTA	DRG	LKN	MRL
'arm'	**lima*	mja	lime	n-pene	na-mne	pini	ᵐbeni	pane	lma	lima	lime
'hand'	**lima*	mja	lime	n-pene	na-mne	pini	ᵐbeni	pane	lma	lima	lime
'wing'	*ᵐ*bani*	pini	pəni	n-pene	na-mne	pini	ᵐbeni	pane	ᵐbni	pane	beni

Nine languages in the central area (five of which are represented in *Table 3*) went through lexical replacement. They lost their reflexes of **lima*, and replaced them with *ᵐ*bani(c)*, whose original meaning was '[bird] wing' (Osmond & Ross 2016:162). For the innovative languages shown in *Table 3*, we can reconstruct a process of semantic extension that gave rise to a new pattern of colexification:

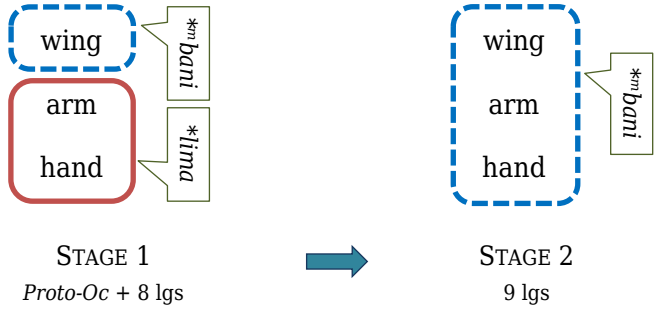
- T1: *ᵐ*bani-* {wing} ≠ **lima-* {arm = hand}
- T2: *ᵐ*bani-* {wing = arm = hand}

[6] In the original: "une structure sémantique peut se maintenir en dépit des remplacements des signifiants" (Coseriu 1964:172).

[7] *Table 3* is ranked geographically, from Hiw in the northwest to Mwerlap in the southeast (see *Figure 3* p.5). To gain space, only ten languages are cited here out of 17. Forms are given in IPA.

This structural change can be visualized on a semantic map (*Figure 4*), showing the two stages successively. Compared to Proto-Oceanic, or to the eight conservative languages that have preserved Stage 1, the nine that went through the lexical merger illustrated in *Figure 4* have modified their lexical structures.

Figure 4 – Terms for upper limbs in northern Vanuatu: a lexical merger



I propose to describe this type of change as a LEXICAL MERGER:

(1) A LEXICAL MERGER is a historical process of semantic change, whereby two sets of senses that used to be dislexified (encoded by different lexemes) end up being colexified (encoded by the same lexeme)

Coseriu (1964) discusses similar cases of "fusion fonctionnelle", which he defines by the loss of a contrast[8] – drawing explicit analogies with structural mergers in phonology or morphology. As an example, he cites the Latin kin terms *patruus* 'father's brother' vs. *avunculus* 'mother's brother' – a contrast which modern Romance languages later merged into a single category 'uncle' (Fr. *oncle*, Ital. *zio*, Cast. *tío*…). The opposite of a lexical merger is a lexical split; we will see an example in the next section.

2.2.2 Words for siblings in northern Vanuatu

A second, more complex case of structural reshaping can be found with the different terms for siblings in northern Vanuatu languages. English divides this lexical domain based on the target's gender, contrasting *sister* vs. *brother*; but other languages use different criteria to organise the different types of siblings (Evans 2010).

2.2.2.1 A system with three categories of siblings

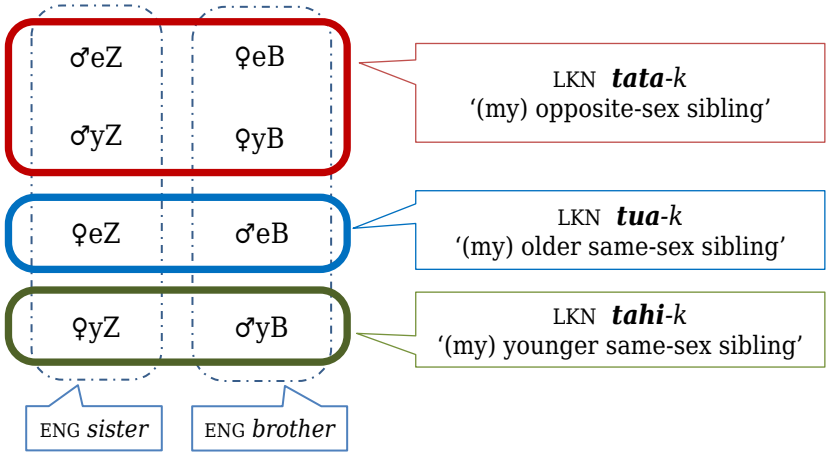
Let us start by observing how the domain is structured synchronically in one language of the Banks islands, e.g. Lakon [LKN] from the island of Gaua. In this language, the sibling domain is organised according to two semantic features:

[8] "[O]n constate la disparition d'un trait distinctif, et en conséquence la réduction de deux unités fonctionnelles à une seule unité" (Coseriu 1964:175).

- the "relative sex" of the target compared with that of its anchor ('ego'):
  - ***tata*** 'opposite-sex sibling' is the term used
    for a *male's sister* [♂Z]
    or for a *female's brother* [♀B] [9]
  - *tua* and *tahi* (see below) both refer to a 'same-sex sibling',
    whether a *male's brother* [♂B] or for a *female's sister* [♀Z]
- [for same-sex siblings] the "relative age" of the target compared with that of its anchor:
  - ***tua*** 'older same-sex sibling' is the term used
    for a *male's elder brother* [♂eB]
    or a *female's elder sister* [♀eZ]
  - ***tahi*** 'younger same-sex sibling' is the term used
    for a *male's younger brother* [♂yB]
    or a *female's younger sister* [♀yZ]

Lakon and English thus differ drastically in the way they categorize sibling relations. Their differences can be shown on a semantic map whose background is an "etic grid" (Evans 2010) listing a number of specific kin relations – e.g. ⟨♀yB⟩ 'a female's **y**ounger **b**rother'. Each language groups these atomic senses according to its own emic categories – see Figure 5.

Figure 5 – Terms for siblings in the Lakon language of Gaua island (Banks group)



2.2.2.2 The ternary structure at the source of modern Torres–Banks systems

The ternary pattern of Lakon is also found in several other languages of the Torres–Banks area, and even in several Oceanic languages spoken outside that area. This semantic organisation can thus be safely reconstructed for PTB ('Proto-Torres–Banks'), the region's shared linguistic ancestor:

[9] For kinship abbreviations (see Dousset 2011, Hamberger *et al.* 2011), I use the following conventions: B 'brother'; Z 'sister'; ♂ 'male ego'; ♀ 'female ego'; |e| 'elder', |y| 'younger'. Thus ⟨♀eB⟩ reads '[*female ego*] **e**lder **b**rother; ⟨♂yZ⟩ '[*male ego*] **y**ounger **s**ister'.

- PTB **tuatua* ‘opposite-sex sibling’ (François 2005:500)
- PTB **tuaɣa* ‘older same-sex sibling’ (Clark 2009:203)
  < POc **tuqaka* (Pawley & Ross 2006:53)
- PTB **tasi* ‘younger same-sex sibling’
  < POc **taci* (Pawley & Ross 2006:53).

Like Lakon, several modern languages of northern Vanuatu reflect the protoform of their common ancestor (albeit with sound change[10]) as well as its semantic organisation. Forms are given here for a 1sg possessor (suffix **-ᵑgu* > *-k*):

(2) **tuatua (-ᵑgu)* ‘(my) opposite-sex sibling’ >
Hiw *tʉtβɔ-k*; Lo-Toga *səse-k*; Löyöp *ʧøtʃø-k*; Mwotlap *tɪtɛ-k*; Lemerig *ʔœwœ-k*; Vera’a *ʔɔwɔ-k*; Vurës *tytyœ-k*; Mwesen *tutuɔ-k*; Mota *tutua-k*; Dorig *tuta:-k*; Koro *tɛtɛ͡a-k*; Olrat *tati-k*; Lakon *tata-k*; Mwerlap *tɞtɞ-k*.

(3) **tuaɣa (-ᵑgu)* ‘(my) older same-sex sibling’ >
Vera’a *ʔuwa-k*; Vurës *toɣœ-k*;[11] Mota *tuaɣa-k*; Nume *tua-k*; Olrat *tua-k*; Lakon *tua-k*; Mwerlap *tuɔ-k*.

(4) **tasi (-ᵑgu)* ‘(my) younger same-sex sibling’ >
Vera’a *ʔisi-k*; Vurës *tɪsi-k*; Mota *tasi-k*; Nume *tisi-k*; Olrat *tisi-k*; Lakon *tahi-k*; Mwerlap *tɛsi-k*.

All the forms cited in (2–4) have preserved the ternary system of their ancestor – the one illustrated in Figure 5 for Lakon. The rest of the Torres–Banks languages have gone through a couple of innovations, which I will present now.

2.2.2.3 Semantic change and restructuring

The first innovation is the generalisation of **tasi* to refer to any ‘same-sex sibling’ regardless of relative age. This is a new example of a lexical merger [§2.2.1]. As a corollary, the root **tuaɣa* was eliminated:

(5) **tasi (-ᵑgu)* * ‘(my) younger same-sex sibling’
> ‘(my) same-sex sibling’
Mwotlap *ithi-k*; Lemerig *ʔisi-k*; Mwesen *tisi-k*; Dorig *tsi-k*; Koro *tsi-k*.

The five languages listed in (5) have lost the feature of RELATIVE AGE as a structuring principle in their sibling domain. The only relevant criterion is now RELATIVE SEX: these languages contrast only two terms for siblings, namely **tuatua* ‘opposite-sex sibling’ vs. **tasi* ‘same-sex sibling’. This innovation likely reflects a cognitive pressure for symmetry in the system.

Finally, the four northernmost languages in the area show evidence of the same change (loss of **tuaɣa*), but have added to it a further innovation. In addition to the feature RELATIVE SEX which provides the sibling system with its overall structuring principle, these languages split the subdomain “same-sex sibling” according to the referents’ ABSOLUTE SEX.

[10] Regular sound correspondences for the 17 northern Vanuatu languages are exposed in François (2005) for vowels, and François (2016:31) for consonants.

[11] See also Schnell (2011:128) for Vera’a, and Malau (2016:284) for Vurës.

This was made possible by allowing a new lexeme, reconstructable as **ta^{ŋ}gele*, into the kinship domain. This root (whose original meaning must have been 'other half, counterpart')[12] became used specifically for the female instances of 'same-sex sibling' – that is, a woman's sister:

(6) **ta^{ŋ}gele (-^{ŋ}gu)* * '(my) counterpart'
> 'female same-sex sibling = (woman's) sister'
Hiw *takje-k*; Lo-Toga *takəle-k*; Lehali *takle-k*; Löyöp *takle-k*.

As a corollary, these four languages restricted their root **tasi* to male referents, i.e. a man's brother:

(7) **tasi (-^{ŋ}gu)* * 'same-sex sibling'
> 'male same-sex sibling = (man's) brother'
[Hiw *ŋ^{w}ati-k*];[13] Lo-Toga *təɣi-k*; Lehali *tihi-k*; Löyöp *ʧisi-k*.

In sum, the root **tasi* (POc **taci*) has been assigned three different meanings in the course of its evolution – from its original sense 'younger same-sex sibling' to a broader meaning (5) 'same-sex sibling [= woman's sister ~ man's brother]', and then to an innovative gendered gloss (7) 'man's brother'.

The latter type of change (structurally the opposite of a lexical merger) can be called a LEXICAL SPLIT:

(8) A LEXICAL SPLIT is a historical process of semantic change, whereby two sets of senses that used to be colexified (encoded by the same lexeme) end up being dislexified (encoded by different lexemes)

Coseriu (1964) discusses similar structural processes, and defines them by the creation of a new emic contrast ("l'apparition d'un trait distinctif nouveau" 1964:174). He illustrates this with Lat. *avis* 'bird', a generic category which Portuguese divided in two – with *pássaro* 'small bird' vs. *ave* '(non-small) bird'.

2.2.2.4 Synthesis: a diachronic map

This complex history of sibling terms in northern Vanuatu can be synthesized in the form of Figure 6 – a diachronic map showing the three stages of lexical change. The first innovation was a LEXICAL MERGER; the second one was a LEXICAL SPLIT.

Stage 1, the initial organisation of meaning that can be reconstructed for Proto-Torres-Banks, is preserved in seven languages (including Lakon, shown in Figure 5); the two other stages illustrate successive innovations by a subset of the Torres–Banks group. Among its 17 members, ten languages went through the lexical merger of Stage 2, losing the dimension of relative age. Among these, four languages later went through the lexical split of Stage 3, as they divided the 'same-sex sibling' category according to the referent's absolute sex.

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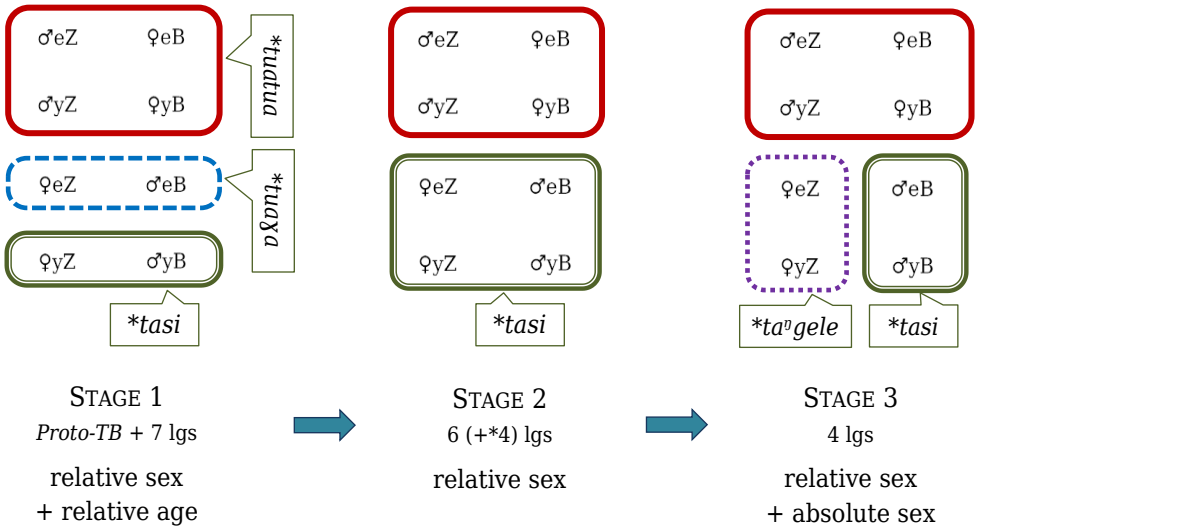
[12] The root **ta^{ŋ}gele* is also reflected, for example, by Volow *tɛ^{ŋ}gɛl X* 'across X, opposite X'; or by Mwesen *taklɛ* 'portion, part of; some; several X'.

[13] Hiw has an innovative form *ŋ^{w}ati* ('♂B') of unknown origin.

Figure 6 – Terms for siblings in northern Vanuatu: three stages of evolution



3 Lexical competition and replacement

Through examples taken from body parts or kinship terminology, we saw that a given lexical field can be characterized by structural stability [§2.1] or by semantic innovations [§2.2]; the latter may correspond to lexical mergers or lexical splits.[14] These structural changes result in new patterns of lexification, as each language's emic categories are redefined. They can be usefully represented on a set of semantic maps, displaying the historical evolution of lexification patterns; such maps provide a clear view of which areas of the domain have remained stable, and which ones have evolved over time.

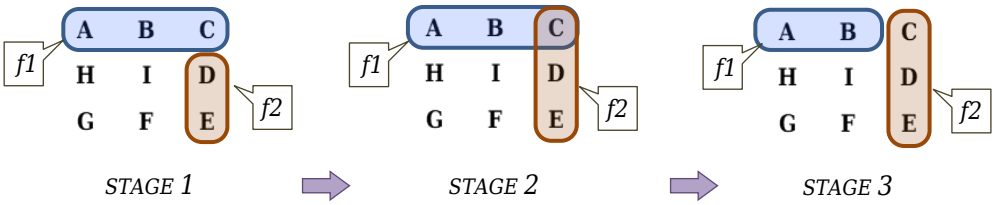
A sequence of maps gives the impression of discrete stages and abrupt changes, but we know this is not exactly what happens. This raises the question of how exactly lexical innovations emerge. How can we describe the linguistic phenomenon that is being captured by these maps? What must actually happen for semantic structures to change?

3.1 Lexical replacement and the markedness shift

Based on the examples and analyses above, we can propose an abstract representation of lexical change. Let us represent a lexical domain Δ as a set of atomic senses numbered ⟨A B C … H I⟩. These meanings can be spread out on a two-dimensional semantic map. Taking such a map as its background, *Figure 7* illustrates the three successive stages of lexical change.

[14] See §4.1 for further types of structural innovations.

Figure 7 – The three stages of lexical replacement



In an initial STAGE 1, a form *f1* colexifies together the three senses ⟨A B C⟩, whereas a form *f2* encodes two neighbouring yet distinct meanings ⟨D E⟩. Then, through a process of semantic extension – whether due to external influence (language contact) or to internal change – *f2* starts encroaching upon *f1*'s territory, as it becomes capable of also lexifying the sense C. Plotted on a map, such a change translates visually through the reshaping of each line – i.e. the blob encompassing all the senses of a polysemous word.

STAGE 2 represents a phase of LEXICAL COMPETITION between the words *f1* and *f2* when expressing the sense C. Such a competition can last for generations, giving rise to ongoing variation between *f1* and *f2* with respect to that particular meaning (see Traugott & Dasher 2001:11–12; Enfield 2003:29). The variation can be a matter of stylistic register, where typically *f1* goes from being the norm to becoming marked and archaic, while *f2*, which started as a marked synonym for sense C, ends up becoming the normal, unmarked form to express it. This reversal process is called *markedness shift* (Dik 1989:44); it can be captured by the formula in (9), where 'S' refers to a specific sense:[15]

(9) S : ***f1*** → S : ***f1***~(*f2*) → S : (*f1*)~***f2*** → S : ***f2***
STAGE 1 STAGE 2a STAGE 2b STAGE 3

Were the new usage to take root and spread through the speech community (via social diffusion), eventually the old term becomes obsolete, and ends up being replaced by the new term. The final result, shown here as STAGE 3, is one where sense C is not lexified by *f1* any more, but exclusively by *f2*. As far as this sense is concerned, the language has gone through the whole process of lexical replacement.

As *Figure 7* shows, the process of lexical replacement affecting the sense C can technically be broken into two subphases:

- [*stage 2*] a (partial) merger {C ≠ D=E} → {C=D=E}
- [*stage 3*] a split {A=B=C} → {A=B ≠ C}

Lexical replacement, in principle, always consists of a lexical MERGER (resulting in lexical competition) followed by a lexical SPLIT (resolving the lexical competition).

[15] The forms in bold constitute the default terms for a given meaning, while brackets flag the synonyms that are stylistically or pragmatically "marked".

3.2 Lexical competition as a slow, emergent process

In the reality of linguistic use, the sort of change illustrated here would take the form of a continuous process of variation between two strategies *f1* and *f2* to express a given sense: variation over time, variation across speakers, and even intra-speaker.

The lexical competition between variants can span over several generations, sometimes centuries. Analyses based on diachronic corpora, when they are available, show that the process of language change manifests itself as a slow evolution in the distribution of the two variants, such that *f1* remains the preferred option for a long period, while *f2* increases its prevalence over time. Far from being a sudden shift, the emergence of *f2* is incremental; and what is transmitted from one generation to the next is really a particular statistical distribution of *f1* vs. *f2*, together with a sense of the directionality of change – as *f1* decreases towards obsolescence while *f2* grows in frequency, and evolves towards becoming the new norm. Rather than forming a linear, steady increase, the trajectory of the distribution along the time axis typically takes the form of an "S-curve" (Chambers 2002:361, Blythe & Croft 2012). The competition between the two variants begins slowly, then accelerates for a short while, before it finally fades off during another long period. This trajectory, drawn along a time axis, is visually reminiscent of the shape of the letter S or $\int$ (hence its name 'S-curve').

This point deserves to be kept in mind whenever a linguistic innovation (whether phonological, syntactic or lexical) is represented by an abstract formula, of the type $\{f1 \rightarrow f2\}$ "*f1* was replaced by *f2*". Just like geological activity, lexical tectonics must be understood as a slow process, which can span over many generations and still be imperceptibly active. Competition in the lexicon involves long periods when the two variants coexist in discourse. During that transitional period, the perception of norms and markedness fluctuates among speakers, before it finally stabilises.

3.3 An example of lexical replacement

To take a classic example, Late Latin progressively replaced its inherited term *caput* 'head' with another noun *testa*, originally 'earthen pot' (cf. Blank & Koch 1999). The four stages followed by this case of lexical replacement – in line with the formula in (9) – can be shown in *Table 4*.

Table 4 – When markedness shift drives lexical replacement: Words for 'head' in Late Latin / Romance

	'head'	'leader, chief'
Stage 1	*caput*	*caput*
Stage 2a	***caput*** *~ (testa)*	*caput*
Stage 2b	*(caput) ~* ***testa***	*caput*
Stage 3	*testa*	*caput*

The first innovation (STAGE 1→2a) was to use the noun 'pot' as a figurative, slang word for 'head', in competition with the inherited form *caput* – in a way similar to early 20th-c. French slang *carafe* 'jug' used sometimes for 'head'. Eventually, *testa* lost its jocular connotations, and ended up as the standard term for this body part (STAGE 2b), as evidenced by Italian *testa*, and French *tête*. The older term *caput* (> Italian *capo*, O.Fr. *chief*) resisted for some time, but eventually became the marked term in the pair.

Standard Italian still belongs to STAGE 2b. While *testa* has become the default name of the body part, *capo* still survives as a marked synonym – i.e. archaic, regional or medical – and in idioms (e.g. *mal di capo* 'headache'). Yet the word's main modern meaning is 'leader, chief' (e.g. *capo dello stato* 'head of State').

French has gone one step further. In Classical French, *chef* was still used as an archaic synonym of *teste*, until it disappeared in this sense. In modern French, if one puts aside a couple of vestigial compounds (e.g. *couvre-chef* 'hat'), the only living meaning of *chef* is 'leader, chief': the language has reached STAGE 3, and the lexical split is now complete.

If a typologist wanted to list the languages that colexify the meanings 'head' and 'leader', Standard Italian would still qualify (with *capo*), but modern French would not: *le chef* is no longer used to refer to the head, and *la tête* can hardly refer to a chief.[16]

One could summarise the whole process by stating that French "replaced" its noun *caput* (STAGE 1) with an innovative form *testa* (STAGE 3). While not untrue, this simplified formula encapsulates what was really a gradual sequence involving lexical competition and markedness shift between polysemous terms (see Sweetser 1990:9; Evans & Wilkins 2000: 549), spanning – in this case – over almost two millennia. Rather than a leap from STAGE 1 to STAGE 3, the key turning point in this evolution was really the shift from STAGE **2a** to STAGE **2b**, and the reversal of markedness.

3.4 Subtypes of lexical replacement

The process of lexical replacement, which we just examined from the angle of a single sense, can be revisited in the broader perspective of its impact on the system's lexical structures. As a language goes through lexical replacement, a corollary is a new configuration of its lexical patterns.

As far as the time axis is concerned, we just saw that lexical replacement can be complete (cf. **chef → tête* in French for 'head') or it can take the form of an ongoing competition (cf. Italian *capo ~ testa*). This contrast can be visually represented on a map by the presence or absence of an overlap: compare Stage 2 and Stage 3 in *Figure 7*.

[16] Following a cyclical evolution, the analogy {leader ⇔ head} (cf. Eng *head of state*, *head of department*) is being reactivated in modern French – this time based on *tête*, the standard term for the body part. Yet this is still limited to a few idioms, e.g. *tête de liste* 'first name on a party-list ballot'; *il est à la tête du pays* 'he is [at] the head of the country'. The word *tête* alone cannot refer to a human (**La tête viendra demain ~ ?The head will come tomorrow*).

On a different dimension – namely, the distribution of meaning on the semantic map – lexical replacement can be LOCAL or TOTAL:

- LOCAL REPLACEMENT: *f2* replaces *f1* for only some of its senses.
- TOTAL REPLACEMENT: *f2* takes over *f1* in all of its senses, resulting in the elimination of *f1* from the lexicon.

For example, Table 4 showed that Lat. *caput* 'head; leader' has been replaced by *testa* only for the body part, while the sense 'leader' remains lexified by *caput*: this is a case of LOCAL REPLACEMENT (ongoing in Italian, complete in French).

Conversely, we saw in §2.2.1 (Figure 4) that POc **lima* 'arm, hand' was replaced by **^{m}bani* 'wing' for all its senses; this resulted in the total replacement – or RELEXIFICATION – of **lima* by **^{m}bani*, and the loss of **lima*.

4 The main types of structural innovation

4.1 A typology of innovations in patterns of lexification

Let us recapitulate the different types of innovation that can affect lexical structures.

In line with *Figure 7*, let us posit two word forms *f1* and *f2*, and a segment of the semantic space defined by three senses A B C. In STAGE 1, senses { A B } are lexified by the form *f1*, and { C } by *f2*. Assuming these words undergo semantic change, we can characterise STAGE 2 by how this initial pattern of lexification is modified over time. Table 5 defines five main types of diachronic scenarios: *lexical competition, lexical split, lexical merger*, *lexical shift,* and *relexification*.

Table 5 – Types of innovation in lexification patterns. Three senses A B C are distributed across word forms f1–f2*, in different ways in stage 1 vs. stage 2.*

type of innovation	***STAGE 1***		***STAGE 2***	
LEXICAL COMPETITION	*f1*: **A B**	*f2*: **C**	*f1*: **A B**	*f2*: **B** (**C**)
LEXICAL SPLIT	*f1*: **A B**	*f2*: **C**	*f1*: **A**	*f2*: **B** (**C**)
LEXICAL MERGER	*f1*: **A B**	*f2*: **C**	*f1*: **A B C**	*f2*: (**C**)
LEXICAL SHIFT	*f1*: **A B**	*f2*: **C**	*f1*: **B C**	*f2*: (**C**)
RELEXIFICATION	*f1*: **A B**	*f2*: **C**	*f1*: —	*f2*: **A B** (**C**)

In Table 5, the sign '—' means that the form in question "exits" the subdomain defined by senses A B C: either it moves on to take up a separate meaning D, or it disappears altogether from the language. When *stage 2* in Table 5 shows the sense "(C)" in brackets, it means that the innovation is of the same nature whether *f2* keeps its initial meaning C, or loses it and exits the domain.

Here is a short description for each innovation type:

- LEXICAL COMPETITION:
  Sense B is initially lexified by a word *f1*; but another word *f2*, by semantic extension, acquires that same sense B. The two words *f1* and *f2* compete for some time with respect to lexifying B.
- LEXICAL SPLIT:
  A word *f1* initially colexifies two senses { A B }; but another word *f2* acquires the sense B, and after a period of lexical competition, *f2* ends up replacing *f1* for sense B. As a result, the initial pattern of colexification { A B } is split apart.
- LEXICAL MERGER:
  Senses A B C used to be dislexified across two separate forms *f1* and *f2*. Following lexical replacement of *f2* by *f1* (for sense C), these senses become colexified.
- LEXICAL SHIFT:
  A word *f1* loses some senses (e.g. A) and gains others (e.g. C) which used to be lexified with another word *f2*. A lexical shift combines a split ({ A=B } → { A≠B }) and a merger ({ B≠C } → { B=C }).
- RELEXIFICATION:
  Senses A B used to be lexified by a word *f1*. Following wholesale lexical replacement, they become lexified by another word *f2*, and *f1* exits the domain.

4.2 Further examples from Oceanic languages

I will end this study by briefly providing a few more examples of lexical innovations, taken from my firsthand data on Vanuatu languages. In each case, I will describe the type of innovation at stake according to the typology in Table 5.

(10) The Proto-Oceanic etymon ***panua*** 'inhabited territory' (Pawley 2005) is well reflected in Torres–Banks languages, where it commonly colexifies ⟨'country'='island'='village'⟩. Yet in **Hiw**, its regular reflex /vənjə/ had to concede some ground to an innovative compound /mətevənjə/ (etym. 'island spot') for the sole meaning 'village'. As a result, Hiw now splits the semantic array of **panua* across two lexical items: /vənjə/ 'inhabited territory, country, island, (*village)' vs. /mətevənjə/ 'village'. This is a case of LEXICAL SPLIT.

(11) The POc etymon ***pulan*** 'moon' colexifies everywhere ⟨'moon'='month'⟩. The language **Lakon** now lexifies the moon using an innovative form /siŋaː/, from PTB **siŋaRi* 'shine' (François 2011b:186); yet it keeps its reflex of **pulan*, namely /vʊl/, for the sense 'month': this is a neat case of a LEXICAL SPLIT.

Interestingly, the other languages of Gaua have gone one step further, and have generalised the innovative root **siŋaRi* for both meanings, thereby eliminating **pulan* altogether from the language: e.g. **Dorig** now has /sŋaːr/ 'moon, month': this is wholesale RELEXIFICATION.

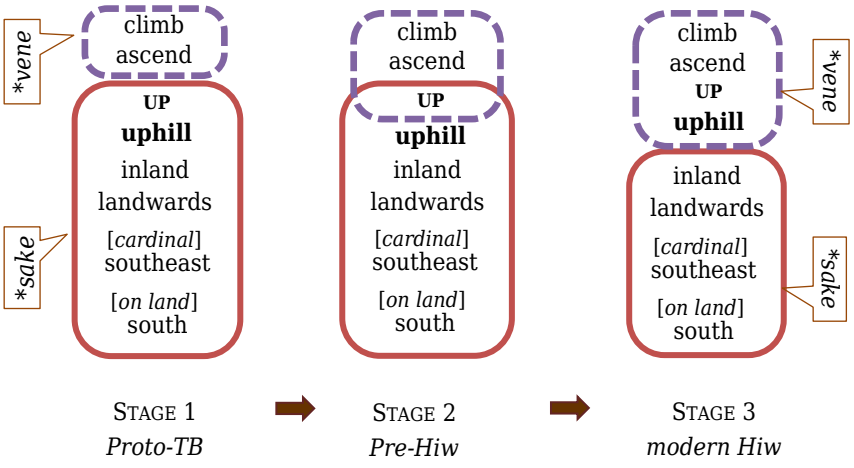
(12) The Proto-Oceanic etymon ***ta^{m}bu*** (the origin of Eng. *taboo*) was polysemous: it evidently included such senses as 'sacred, holy; forbidden, secret; ban, proscription; reserved to initiated men; [place] haunted by spiritual forces…' (François f/c). In **Mwotlap**, this root **ta^{m}bu* was replaced by **salaɣoro* (etym. 'forbidden path') for most of its senses; yet **ta^{m}bu* survives in the noun /nɛ.tɛk͡pʷ/ '(haunted place >)

graveyard' (François 2013:225; f/c).
This is a case of RELEXIFICATION, as *f1* **ta^{m}bu* was replaced by *f2* **salaɣoro* essentially in all its senses. As for *f1* **ta^{m}bu*, it survives elsewhere in the lexicon, with a meaning 'graveyard' that did not belong to the initial domain of **ta^{m}bu*.

(13) The word ****[a]tamate*** (lit. 'dead person' → 'spirit') can be reconstructed at the level of PTB with a broad polysemy, including ⟨'corpse', 'ghost', 'bogeyman', 'ogre', 'ancestral spirit', 'deity', 'headdress representing a spirit', 'mask'…⟩ (Codrington 1891:80; François 2013:214–8).
The modern language **Lo-Toga** has divided this semantic set across three lexemes (François 2013:216). The sense ⟨'headdress representing a spirit'⟩ is now called /kʷəɣar/; a separate word /ŋʷiɛ/ has replaced **atamate* for its dangerous meanings ⟨'ghost', 'bogeyman', 'ogre'…⟩; as for /təmet/, the reflex of **atamate*, it now only refers to positively valued senses ⟨'ancestral spirit', 'deity'⟩. This is a double case of LEXICAL SPLIT.

(14) In the domain of space directionals (François 2004, 2015), the inherited word ****sake*** 'up' can be reconstructed (for Proto Torres–Banks) as encoding a number of different directions: { ⟨1⟩ [vertical] UP; ⟨2⟩ [on hilly islands] UPHILL; ⟨3⟩ [on flat islands] INLAND; ⟨4⟩ [on sea] LANDWARDS'; ⟨5⟩ *upwind* > [inter-island] SOUTHEAST; ⟨6⟩ [on land] parallel to the shore, towards SOUTH }.
Now, the language **Hiw** has split the lexical domain of **sake* in two. An innovative directional **vene* ('climb → [go] up') has evicted **sake* – but only for the meanings most clearly linked to the vertical dimension, namely ⟨1⟩–⟨2⟩. As for senses ⟨3⟩–⟨4⟩–⟨5⟩–⟨6⟩, they are now lexified by a vestigial form /aɣ/ (François 2015:184–5). Even though it reflects **sake* '[go] up', this form has now lost any semantic connection with verticality. The historical outcome is a neat lexical split, represented in *Figure 8*.

Figure 8 – A lexical split: In Hiw, the original polysemy of **sake* 'up+' was split in two. Some senses are now lexified by **sake*, others by **vene*.



If one considers the senses lexified by **sake*, then Figure 8 is clearly a case of a LEXICAL SPLIT. The change resulted in the dislexification between 'inland' (on gentle slopes) and 'uphill' (on steeper ground) – a rare pattern among the geocentric systems of north Vanuatu (François 2015:151, 176).

In all these cases, the use of sequential maps proves helpful in visualising the process of lexical change as a whole. To take a geological analogy, Figure 8 could be described as a collision between two tectonic plates: as the **vene* plate expanded its semantic range, it must have gone through a period of friction at the boundary, in the form of lexical competition [§3.1] between **sake* and **vene* for the meaning 'up' (STAGE 2). Eventually, the boundary friction was resolved, so to speak, by the "subduction" of **sake* with respect to vertical meanings ('up', 'uphill'), giving way to **vene* for that particular zone. As a result of these tectonic movements, the two plates **sake* and **vene* changed their shapes, and redesigned the local semantic landscape.

Just as the movement of tectonic plates can create a rift in the Earth's mantle, likewise lexical tectonics can end up cleaving an emic category that used to form a unit, and force the semantic outline of each lexical item to be redesigned accordingly.

5 Conclusion

In a way, the semantic structures of languages live a life of their own, independent of the phonological material they attach to. Structural patterns evolve in time, they compete with each other, they expand and shrink, they spread across dialect networks, migrate from language to language through calquing, and can be shared across entire linguistic areas. Some patterns are universal, others are local and rare; they can be inherited or innovative, stable or fragile. Lexical competition between two words – itself the trigger for lexical change – may be resolved in a generation, but it may also last for centuries in the form of stylistic variation between competing synonyms.

Historical lexicology, approached through the study of lexification patterns, offers promising avenues of research to the discipline of lexical typology. It also raises many questions, which can feed further research. Is it possible to identify some regularities in structural change? Are some innovations directional in nature (e.g. a word can change its sense from s1 to s2 but never the opposite)? Are lexical splits or mergers more likely to take place in certain semantic domains (kinship terms? verbs of motion or cognition?…)? Are they more prevalent in some stylistic registers?[17] Do social factors play a role in maintaining vs. resolving lexical competition? Is structural change most often due to contact, or can it be triggered by language-internal factors?

The evolving geometry of meaning can usefully be captured using semantic maps that display the changing patterns of lexification. While this visualization is best achieved, for the time being, in the form of sequential static maps, in future years we could make the best of animation technologies, so as to emulate visually the ever-changing configurations of our lexicons.

[17] For example, technical vocabulary probably favours lexical splits; but poetry, slang, pidgins, emergent sign languages and avoidance registers (Evans 1992) might well foster mergers.

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