Too many levels, too few solutions: Mutations and postlexical phonology in Breton

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1 Plan of talk

- The Breton data:

    - Feeding order and and mutation versus sandhi in Breton;

    - When autosegments are not enough;

    - Markedness versus mutation;

- OT can do it, but at considerable cost;

- Orthodox Lexical Phonology approaches also have problems;

- Mutation is not computed on-line, but sandhi is: mutation happens in the lexicon!

2 Sandhi and mutation

The data come from a selection of Breton dialects; I have tried to cover dialectal variation more or less evenly.

Table 1: Dialects and sources

Dialect		Source
Standard Breton		Kervella (1946)
Léonais	Saint-Pol-de-Léon	Sommerfelt (1978)
	Le Bourg Blanc	Falc'hun (1951)
Trégorrois	Plougrescant	Jackson (1960)
Cornouallais	Berrien	Ploneis (1983)
	Argol	Bothorel (1982)
Vannetais	Guémené-sur-Scorff	McKenna (1988)
	Île de Groix	Ternes (1970)
	Plouharnel	Hammer (1969)

Table 2: Lenition in Standard Breton

	Stops							Nasal	Spirants			
Radical	p	t	k	b	d	g	gw	m	f	s	ʃ	x
Lenition	b	d	g	v	z	ɣ/x	w	v	v̥	z	ʒ	ɣ/ɦ

The two interacting processes are **initial mutation**, which is triggered by certain lexical items and in certain morphosyntactic contexts, and **sandhi**, which is a surface-true phenomenon in most dialects.

In most if not all dialects this mutation involves a chain shift: voiceless stops are voiced and voiced stops are spirantized.

(1)   a.   da   benn
                  penn
            your head
      b.   da   vuoc'h
                  buoc'h
            your cow

Sandhi in most dialects operates on obstruent clusters. Normally obstruents are devoiced word-finally. In a phrasal context obstruents are devoiced before other voiceless obstruents. A cluster of two underlyingly voiced obstruents is also devoiced:

(2)   a.   de[k] de[g]-où
            dozen dozen-PL
      b.   koa[t t]an, cf. koa[d]-où
                  tan
            wood fire   wood-PL
            'firewood'
      c.   kra[p] kra[p]-où
            slope slope-PL
      d.   be[p k]wech, cf. pe[b]-all
                  gwech
            every time   every-other 'everything else, the rest'

Note: many sources, such as Le Dû (1986); Stephens (1993), claim that Breton consonants are voiced in sandhi before sonorants. This is an artefact of the data: for historical reasons most word-internal and word-final stops are lexically voiced, so this "voicing" is really the lexical form. More "traditional" sources such as Falc'hun (1951); Jackson (1960, 1967) recognize this.

Two processes that change voicing in Breton dialects:

- Voicing as part of mutation;

- Devoicing in sandhi;

But spirantization only applies to voiced consonants, so devoicing potentially interacts with it.

1. Mutation before sandhi:

(a) Voiceless stops are voiced, illicit clusters are repaired through sandhi: /p/→/b/→/p/ (**Duke-of-York order**);

(b) Voiced stops are spirantized, but devoicing applies: /b/→/v/→/f/ (**Feeding order**);

2. Sandhi before mutations:

(a) Voiceless stops are unaffected by sandhi but voiced by mutation: /p/→/p/→/b/ (**Counterfeeding order**);

(b) Voiced stops are devoiced in sandhi and voiced again in mutation: /b/→/p/→/b/ (**Duke-of-York order**);

3. No sandhi, mutation: /p/→/b/, /b/→/v/;

4. No mutation, sandhi: /p/, /p/→/p/ after obstruents.

2.1 The ugly truth

The real picture is a rather ugly mess.

> The examples concern noun + adjective syntagms because non-nominal mutation triggers almost exclusively end in vowels and sonorants and are thus useless for the purposes of sandhi. I skirt the possibility of morphological conditioning intruding onto phonological territory (i. e. mutation dying out in this context), but generally I have avoided dialects where mutation is dead.

In all examples below morphology requires the adjective to undergo lenition.

2.1.1 Mutation before sandhi

Mutation of voiceless stops is blocked after obstruents (1a), but voiced stops are spirantized and devoiced (1b). This is the situation in Standard Breton (Kervella, 1946) and at Le Bourg Blanc (Falc'hun, 1951):

(3) a. eur va[s t]ev
        maz tev
    ART stick thick
    b. eur ili[s f]rav
        iliz brav
    ART church good

At Le Bourg Blanc, however, sandhi is not categorical, so that voiced clusters are possible: *eur ili*[z v]*rav*.

At Saint-Pol-de-Léon the situation is more variable: final devoicing is variable ([maːb]) and [maːp] are both possible. At the same time mutation is restricted after obstruents. Table 3 presents mutation after feminine singular nouns.

> **Note:** The situation with masculine plural animates is much less consistent; I follow Jackson (1967) in assuming that mutation is simply dying out in that particular morphological context (this seems to be consistent with the general picture of the relative vitality of the two contexts cross-dialectally).

Table 3: Mutation at Saint-Pol-de-Léon

Preceding consonant	b	d	g	gɥ	m
p/b	v	d	ɦ	v	v
t/d	v	d	g	gɥ	v
k/g	v	d	ɦ	v	v
s/z	v	d	ɦ	v	v
ʃ/ʒ	v	d	ɦ	v	v
x/ɦ	v	d	g	gɥ	v

2.1.2 Partial sandhi

In some dialects the devoicing sandhi applies only in a subset of the possible contexts.

In Guémené-sur-Scorff stops are devoiced but spirants are not:

(4) a. [on   itawɪs   b̥ɔr]
          un   intanvez beur
          ART   widow   poor
     b. [o   plah vras]
          ur   plah bras
          ART   girl   big

At the same time mutation may be blocked, as in [onɪlɪs bra] *un iliz brau*, but there is still no devoicing. This looks like case (2b)!

2.1.3 Lexically restricted mutation

Certain Vannetais dialects (Île de Groix, Plouharnel) restrict the range of items undergoing mutation.

Île de Groix   According to Ternes (1970), lexical items beginning with voiced stops come in two sorts:

- If the preceding word ends in an obstruent, both consonants become voiced (this is the normal case): [rog donet] 'before coming', lexically /rok donet/ according to Ternes (1970);

- If the preceding word ends in an obstruent, both consonants become voiceless (lexically restricted): [peamzek taj] 'fifteen days', lexically /peamzek daj/ according to Ternes (1970).

There are several problems with Ternes's (1970) account:

- In his discussion of sandhi he is assuming that all preceding consonants are voiceless for the purposes of phonology, yet this is not true, as we have remarked above. Île de Groix does have an underlying laryngeal contrast for final stops: [taːt] 'father', pl. [taːdew], but [mok] 'iron pot', pl. [mokew], so his discussion is at best incomplete;

- The majority of his "devoicing" examples involve either contexts which in other dialects of Breton would lead to mutation ([labuse pijãn] 'small birds', underlyingly /labuset bijãn/), or prepositions which in Breton, like in all other Celtic languages, tend to undergo spontaneous mutation historically.

For lack of space I do not consider these data in detail here (see Krämer, 2000 for one analysis, which however takes Ternes' data rather too literally). I do propose that cases like /labuse pijãn/ involve derived environment effects (or rather derived environment blocking). In derivational terms, at least for the affected words sandhi seems to be cyclic: devoicing sandhi bleeds spirantization (case 2b) and then the voicing mutation does not affect consonants devoiced on the previous cycle. Note that /bijãn/ does undergo mutation if devoicing does not apply:

(5)   [ur ɥer   vijãn]
       ur gwer vihan
       the glass little

Plouharnel   Plouharnel is different from Île de Groix in that obstruent clusters are always voiceless. Epenthesis is also possible in this dialect:

(6)   [tokə dy]
       tog   du
       hat   black

Apparently this is a postlexical (phonetic implementation) process, as the underlying voiced stop is not voiced before the epenthetic vowel. Also, [tok ty] is fully possible.

On the other hand, if epenthesis applies it does block sandhi in this case: *[tokə ty].

Only a limited subset of adjectives undergo mutation, and only two of them start with voiceless stop; such examples as there are seem to show normal "Duke-of-York" phenomena, but only inside phonological phrases (cf. (Pyatt, 2003)):

(7)   a.   [ir vɛr   vəjã]
            ur verc'h vihan
            a girl   little
       b.   [ir vɛr   bəjãnox   ɛl   i   mam]
            ur verc'h bihan-oc'h   el   he mamm
            a girl   small-COMP than her mother

The cluster simplification process also obviously precedes sandhi.

2.2   Sandhi redux

- Normally mutation is a postlexical process operating on the output of mutation;

- In Guémené-sur-Scorff the picture is broadly similar, but sandhi in spirants is either blocked altogether or possibly precedes mutation;

- In Île de Groix for certain words sandhi apparently precedes mutation and looks very much like a cyclic rule.

3   Place and manner

If a mutation process conspires to create a postlexical stop–spirant sequence at the same place of articulation, mutation is often blocked. Examples are from Saint-Pol-de-Léon but are broadly representative:

- The "infixed" 1SG pronoun [m] triggers morphophonological spirantization of voiceless stops, but this does not apply to the labial: [ɛm haːlun] 'in my heart ([kaːlun])' but [ɛm pɛn] 'in my head';

- The final [n] of the article blocks the spirantization of [d] to [z]: [an dĩntĩn] 'the aunt' instead of *[an zĩntĩn];

Historically both of these are usually interpreted as "provections", i. e. sandhi.

4 Mutation vs. lenition

Table 4: Spirant mutation

	Consonants		
Non-mutated	p	t	k
Mutated	f	z	x

In many dialects voiceless spirants undergo a spontaneous voicing process known as "new lenition". It mostly happens after vowel-final proclitics, and if these happen to trigger spirant mutation, "new lenition" applies to its output.

4.1 Saint-Pol-de-Léon

Spirant mutation feeds new lenition, but new lenition applies less categorically to the output of spirant mutation than to underlying spurants:

- New lenition after vowels: [va vhrɛʎ] 'my flail [frɛʎ]';

- Spirant mutation + new lenition: [va fɛn] 'my head ([pɛŋ])' or [va vhɛn];

4.2 Berrien

There are two separate chain-shifting new lenition processes: [f]→[vh] and [vh]→[v]. New lenition operates as both part of the soft mutation (in grammatical contexts) and as a postlexical (phonological) sandhi-type process.

- New lenition applies as a sandhi: [ar vhri] 'the nose [fri]' (no soft mutation required);

- New lenition applies twice: [də vri] 'your nose' ([də] triggers soft mutation, final vowel triggers new lenition);

- New lenition variably applies to spirant mutation output: [ma vhɛn] or [ma vɛn] 'my head'.

4.3 Guémené-sur-Scorff

The simplest case: new lenition is a simple voicing process which applies to both derived and underived spirants, even though less consistently in the former case:

- New lenition of underlying spirants: [or zil] 'the strainer' ([sil];

- Spirant mutation + new lenition: [mɪ vatrõ] 'my boss' ([patrõ]).

5 Mutation vs. mutation

In many dialects the combined effects of mutation and sandhi have become grammaticalized further as new mutations triggered by arbitrary lexical items.

5.1 Lenition-and-provection

This is a grammaticalization of the feeding/Duke-of-York situation: certain triggers of lenition which ended in an obstruent and thus caused devoicing provection lost the final consonant but retained the devoicing effect (voiceless stops are unaffected on the surface).

Table 5: Lenition-and-provection

	Consonants			
Non-mutated	b	d	ɡ	m
Historically lenited	v	ð	ɣ	v
Result	f	t	x		f

A version of thus mutation is current in Île de Groix Breton: [baːlaj] 'walk', [e faːlaj] 'a-walking'; [mərɥel] 'die', [e fərɥel] 'dying'.

In a few Trégorrois dialects Jackson (1967) notes even further "new lenition" of the outcome of the lenition-and-provection to [vh], as in [o vhont] 'a-going' from [mont].

5.2 Mixed mutation

This is a more widespread modification of the previous case, where only the dental stop is provected.

Table 6: Mixed mutation

	Consonants				
Non-mutated	b	d	ɡ	ɡw	m
Result	v	t	x/h	w	v

This is found for example in Saint-Pol-de-Léon: [ɛ virvi ɛmã] '(s)he is drinking [birvi]' but [ɛ træːbi ɛmã] '(s)he is eating [dræːbi]'.

In Guémené-sur-Scorff mixed mutation is the norm, but fully lenited-and-provected forms are possible: [meɪ varo kafe] or [ma faro kafe] 'she is grinding ([maro]) coffee'.

6 Analysis

The accepted analysis of initial consonant mutations involves floating features or autosegments (Lieber, 1987; Swingle, 1993; Wolf, 2007); lately it has attracted criticism, such as Green (2006, 2007); Bye (2007). In this talk I argue that the data considered above make a nonphonological account preferable.

6.1 Floating segments

I follow Wolf's (2007) assumption that Con includes a constraint MaxFlt which enforces the docking of floating features. I also assume that there is way of making the chain shift work, even though this is a big assumption.

(8)

	[+voi] p	MAXFLT[voi]	IDENT[voi]
a.	~~[+voi]~~ p	*!	
b. ☞	[+voi] b		*

(9)

	[+cont] b	MAXFLT[cont]	IDENT[cont]
a.	~~[+cont]~~ b	*!	
b. ☞	[+cont] v		*

Now let's assume a markedness constraint which makes all obstruent clusters voiceless (the precise formulation is unimportant).

(10)

	k[+voi] p	*VOICECLUSTER	MAXFLT[voi]	IDENT[voi]
a. ☞	k~~[+voi]~~ p		*	
b.	k[+voi] b	*!		*
c.	g[+voi] b	*!		**

In the interesting case, a similar ranking for continuancy gives the feeding order, since the two top-ranked constraints do not conflict.

(11)

	k[+cont] b	*VOICECLUSTER	MAXFLT[cont]	IDENT[cont]	IDENT[voi]
a.	k~~[+cont]~~ b	*!	*		
b.	k~~[+cont]~~ p		*!		*
c.	k[+cont] v	*!		*	
d. ☞	k[+cont] f			*	*

It also appears possible to get Guémené-sur-Scorff

(12)

	k[+voi] p	IDENT[voi]	*VOICECLUSTER	MAXFLT[voi]
a. ☞	k~~[+voi]~~ p			*
b.	k[+voi] b	*!	*	
c.	g[+voi] b	*!*	*	

(13)

	k[+cont] b	IDENT[voi]	*VOICECLUSTER	MAXFLT[cont]	IDENT[cont]
a.	k~~[+cont]~~ b		*	*!	
b.	k~~[+cont]~~ p	*!		*	
c. ☞	k[+cont] v		*		*
d.	k[+cont] f	*!			*

What this simple ranking does not get:

• Île de Groix. Remember that in the default case clusters are voiced rather than voiceless,

so *VoiceCluster is not the culprit. In fact, it is not clear what the constraint may be.

- – Spreading is not an option, since both consonants may be voiceless underlyingly;
- – The logical negation of *VoiceCluster is not a good idea either. I am not aware of a typological justification for such a constraint.

A recap of the Île de Groix facts:

- For the majority of words, mutation operates normally and feeds sandhi, which unlike other Breton dialects produces voiced clusters;

- For a small subset of words mutation is preceded by a devoicing process, which produces voiceless clusters not affected by the normal sandhi process.

I propose the following:

- The voicing of clusters is identical to "normal" devoicing sandhi, in that it destroys laryngeal contrasts. The vocal fold vibration is a phonetic implementation effect for underspecified clusters;

- The lack of voicing in special items is due to the fact that the particular lexical items follow different lexical insertion rules.

- – The voicelesness is due to a specification for some feature which is present in the allomorphs of these particular items selected after obstruents
- – I leave the nature of this feature open. The necessity of a "devoicing" feature is demonstrated by the very existence of the "provective" mutations.

- The failure of mutation on the "devoiced" stops is explained, since they have a different feature composition than "normal" voiced ones.

It is perhaps possible to reproduce this account in a version of Wolf's (2007) model, if *VoiceCluster is reformulated accordingly, even though it would probably a very *ad hoc* constraint. I contend, however, that the account presented above is more straightforward.

6.1.1 Multiple feature mutation

Lenition-and-provection and the mixed mutation involve two floating features. It is fairly straightforward to account for the former: it is just two features acting more or less uniformly and giving spirantization and devoicing.

With the latter it is harder since [d] is the odd segment out, being devoiced but not spirantized. Since it can be spirantized in other mutations, this can apparently be resolved via indexed constraints. The lexical insertion account of course gives the pattern for free.

6.2 Lexical phonology

Another possibility of accounting for the facts is suggested by the fact that non-grammaticalized sandhi has all the hallmarks of a postlexical process:

- Its application is variable;

- It does not obey any version of Structure Preservation (e. g. in Île de Groix [x] can be voiced to [ɣ] which is otherwise noncontrastive);

- It applies on the phonological phrase level.

Mutation looks like a cyclic process:

- It is connected to morphosyntactic factors;

- It is categorical (*ceteris paribus*: if the mutation rule exists in a given dialect, the phonological exponence is categorical; the rule may fail to apply, but it is a morphological fact);

- It obeys Structure Preservation: e. g. in most dialects of Breton mutation spirantizes [d] to [z] rather than to [ð] (like Cornish, Welsh and a small subset of mostly Vannetais Breton dialects).

I submit that in a Lexical Phonology approach mutation must be cyclic. I also submit that it is a postlexical process.

> **Note:** it is of course possible to see mutation as triggered by some word-level "morphemes", i. e. morphosyntactic features. For lack of time I do not devote much time to this alternative; see Iosad, 2008 for some discussion. In a nutshell, this does not seem viable from a purely morphosyntactic point of view. One reason is that it is not only morphosyntactic features must be present, but also certain lexical items must be inserted, so the information contained in the word itself is not enough.

Does this mean that postlexical rules **can** be cyclic? Bermúdez-Otero (forthcoming) considers this possibility but ultimately rejects it. Do we accept it after all?

No.

7   Lexical insertion

I submit that while sandhi represents a bona fide postlexical/phonological process (depending on whether you subscribe to the tenets of Lexical Phonology), mutation is simply lexical insertion which takes into account both morphosyntactic factors (the traditional mutation-governing rules) and phonological context (giving the Île de Groix sandhi).

This is within the spirit of *fake cyclicity* (Bermúdez-Otero and McMahon, 2006; Bermúdez-Otero, forthcoming) and close to the morphological approach of Green (2006, 2007); other nonphonological approaches to morphophonological phenomena can be found in Hayes (1990); Stump (1995); Bye (2007).

Phonologically sensitive lexical insertion is not particularly controversial in itself, witness the English *a/an* alternation and cf. Paster (forthcoming).

What this gives us:

- There is very little special pleading in accounting for even very intricate patterns;

- The difference between mutation and sandhi is captured without recourse to dubious devices:

  – No postlexical cyclic rules;

– No special floating features indexed for certain places of articulation and/or morphological categories.

• The general feeding relationship between mutation and sandhi is captured naturally, but the Île de Groix case does not require special mechanisms.

Why is mutation so regular then?

• This is obviously a learnability question rather than a question about grammatical competence. Exemplar-based approaches agree that humans can learn very regular rules just from exposure (Wedel, 2007), so why not mutation?

Figure 1: The Breton dialects referred to in this paper
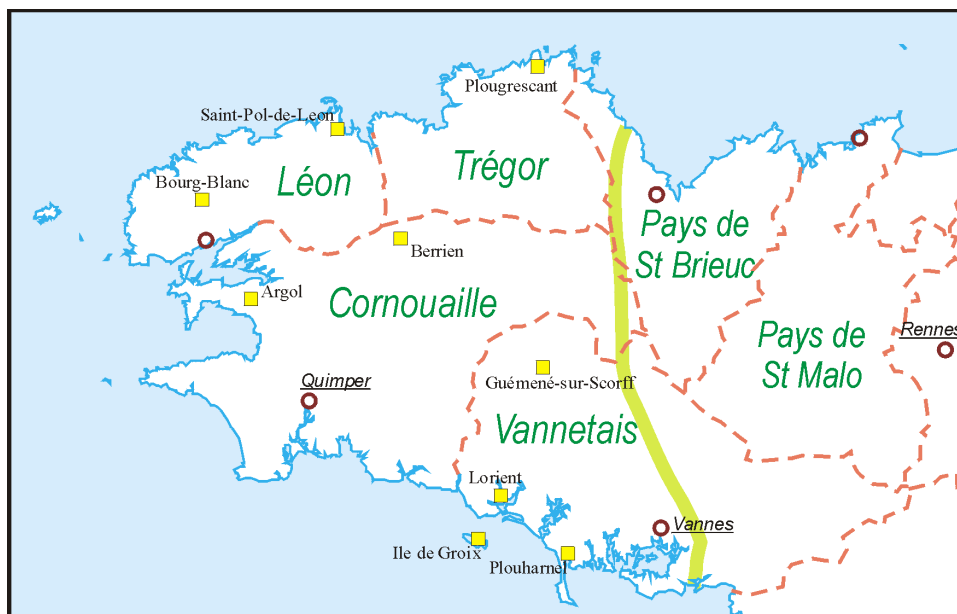
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