Sound Patterns and Sound Change: New Threads in the Panchronic Tapestry

by

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A tribute to Panchronic Phonology

Panchronic Phonology is the study of sound change typology conceived of by Haudricourt (1940). One goal of Panchronic Phonology is to discover universal properties of sound change that are independent of language-specific properties, and to explore the possibility that some types of sound change and some aspects of sound change are predictable. For example, Haudricourt (1940: 70) suggests that a sound change #st > #Vst will occur predictably when the four conditions shown in (1) are met.

(1) Predicting word-initial epenthesis in #st clusters (Haudricourt, 1940: 70)

The sound change #st > #Vst will occur predictably when:

a) #st-initial words are not more frequent than #Vst-initial words

b) Words can end in Vs#

c) Initial syllables are not stressed

d) The output of the sound change is well-formed in terms of syllable count

While the prediction in (1) may not be empirically sound (see below), Haudricourt (1940) anticipates several developments of the late 20th and early 21st centuries. One is a nuanced theory of phonetic explanation, able to distinguish articulatory, aerodynamic, and perceptual properties of speech. Another is the integration of functional factors like homophony avoidance and contrast maintenance into evaluative equations, along with frequency effects of the lexicon like (1a). A final ingredient in his holistic approach are structural factors like (1b).

I. Leblic et L. Souag éds, 2020. *Du terrain à la théorie. Les 40 ans du LACITO*, Villejuif, LACITO-Publications, Hors série 1, pp. 255-274

Haudricourt (1940: 70) also anticipated three important methodological issues in identifying phonetic sources of sound change. Sound changes will only yield to universal phonetic analysis when: (i) the smallest 'steps' of change are investigated; (ii) sound change is distinguished from contact-induced change; and (iii) synchronic variation informs phonetic theory.

In honour of the 40th anniversary of LACITO, this paper highlights panchronic aspects of Evolutionary Phonology (Blevins, 2004, 2006 and 2015), paying tribute, in particular, to the work of Haudricourt (1940) and the continuation of the panchronic tradition at LACITO as exemplified, for example, in Hagège and Haudricourt (1978), François (2005), Mazaudon and Michailovsky (2007), Michaud (2011, 2012), Rivierre (2011), and other papers in this volume. After outlining phonetic sources of sound change within Evolutionary Phonology, I turn to non-phonetic properties of sound change and general relationships between sound patterns and sound change. These general relationships are similar to those envisioned by Haudricourt (1940) and represent new threads in the panchronic tapestry.

Evolutionary Phonology and the Panchronic Sound Pattern Generalization

Evolutionary Phonology (Blevins, 2004, 2006, 2007, 2008a, 2008b and 2015) is the study of synchronic sound patterns as partial reflections of their evolution or history. Central to Evolutionary Phonology is the attempt to explain relationships between sound patterns and sound change, and, more generally, to explain why sound patterns have the typological distributions they do. Among the central research questions in Evolutionary Phonology are: Why are certain sound changes common while others are rare? Why are certain sound patterns common while others are rare? What factors play a role in determining similar sound patterns across languages? A central goal of Evolutionary Phonology is to explain the many similarities between common instances and types of sound change and common synchronic sound patterns, as expressed, for example, in the Panchronic Sound Pattern Generalization (2). This goal of Evolutionary Phonology makes it different from other structuralist, generative, and post-generative frameworks.

(2) The Panchronic Sound Pattern Generalization

There is a strong correlation between the frequency of a sound change and the frequency of a corresponding sound pattern.

For example, as expressed by the Panchronic Sound Pattern Generalization, velar palatalization and final obstruent devoicing are common sound changes and they are also common synchronic sound patterns (Guion, 1998; Blevins, 2004, 2006). In contrast, palatalization of lingual trills (in contrast to velars), and final obstruent voicing (as opposed to devoicing) are uncommon sound changes and they are also uncommon synchronic sound patterns (Yu, 2004; Blevins, 2006; Kochetov and Howson, 2015). Within Evolutionary Phonology (Blevins, 2004, 2006 and 2015) the Panchronic Sound Pattern Generalization has a simple explanation. Frequent sound patterns correlate with frequent types of sound change because these sound patterns are phonologizations of common phonetically-based instances of sound change.

This simple explanatory model is illustrated by the well-studied phenomenon of final obstruent devoicing. As a synchronic sound pattern, final obstruent devoicing is found in unrelated languages that are not in contact, as for example in: Afar, a Cushitic language of the horn of Africa; many Indo-European languages including Russian and German; Ingush, a Nakh-Daghestanian language; and Tok Pisin of Papua New Guinea. Final obstruent devoicing is a common sound pattern because final obstruent devoicing is a common sound change with multiple phonetic sources including voicing decay, the aerodynamic voicing constraint, laryngeal gestures and non-release at phrase boundaries, and phrase-final lengthening (Blevins, 2004 and 2006). In contrast, final obstruent voicing is rare because there is no single phonetically natural process giving rise to it. Final lenition of voiceless obstruents yields segments that typically lack closure duration and closure properties of voiced oral stops (Lavoie, 2001; Yu, 2004; Blevins, 2006).

Evolutionary Phonology explains the Panchronic Sound Pattern Generalization in terms of common vs. rare instances of phonetically motivated sound change, under the hypothesis that all instances of regular, internal (non-contact-induced) sound change are, at least in part, phonetically motivated. However, whether all instances of sound change are phonetically motivated is an empirical question (*cf.* Blust, 2005). To date, a wealth of data suggests that all instances of regular sound change have a phonetic component, even if structural and functional factors, like those of central interest to Panchronic Phonology, are also at work. Indeed, Evolutionary Phonology poses a concrete challenge to theories of sound pattern frequency: if there is a high-frequency sound pattern that is not due to language contact and cannot be analyzed as having a source in common phonetically-based sound change, then non-phonetic factors must be recognized as primary for this sound pattern. For example, if intervocalic /t/-epenthesis, as in Algic and Apurucayali, *were common*, it would constitute evidence for non-phonetic structural forces of the kind argued for in de Lacy (2006). However, this sound pattern is rare, and can be shown to be morphophonologically conditioned, in contrast to high-frequency epenthesis of laryngeals and glides, which do have phonetic explanations (Blevins, 2008b; Staroverov, 2015).

Sources of recurrent sound patterns in Evolutionary Phonology

Within Evolutionary Phonology a sound pattern may have multiple potential phonetic sources, like the case of final obstruent devoicing reviewed above, or a single phonetic source. Common sound patterns are those that reflect common phonetically motivated sound change. Recall that one goal of Panchronic Phonology is to discover universal properties of sound change that are independent of language-specific properties, and to explore the possibility that some types of sound change and some aspects of sound change are predictable. Here, some universal properties of sound change revealed by the Panchronic Sound Pattern Generalization are summarized, organized by source of sound change.

Single phonetic source

Within Evolutionary Phonology a sound pattern may have multiple potential phonetic sources in sound change, like the case of final obstruent devoicing just reviewed, or a single phonetic source. For example, it appears to be the case that word-initial and intervocalic contrastive voiceless nasal consonants arise from coarticulation with an adjacent aspirated or spread-glottis segment, and that there is no other known source for contrastive voiceless nasals in these positions (Blevins, 2018). For example, initial voiceless sonorants in some Tibeto-Burman languages result from HR > HR̥ > R̥ where R is a sonorant consonant and H is an aspirated segment. Proto-Tibeto-Burman *s-man 'medicine' (Written Tibetan *sman*) is continued as Xiahe (Tibetan) hman, Alike (Tibetan) rm̥an, Batang (Tibetan) m̥ẽ^{55}, and Pumi (Qiangic) m̥iɛ̃^{55}. A sound pattern like this one, with a single phonetic historical source, can be used to assist in the comparative method, and in internal reconstruction. If we come upon a language like Klamath-Modoc, where initial voiceless sonorants occur, and there is little in the way of comparative data, a good working hypothesis is that the initial voiceless sonorant derives from an *HR or *RH cluster. In sum, a universal property of sound change is that sound changes giving rise to word-initial or word-medial contrastively voiceless sonorant consonants are HR > HR̥ > R̥ and RH > R̥H > R̥, though, the forces which result in this sequence of changes as opposed to maintenance of HR and RH clusters have yet to be discovered.

Multiple phonetic sources

Many unrelated languages with a long vs. short vowel contrast exhibit only short vowels in final position of the word, phrase, or utterance including: many Bantu languages (e.g. Bemba, Luvale, Yao, Kinyarwanda); Choctaw; Ibibio; Kekchi; Lithuanian; and Tagalog (Myers and Hansen, 2007). Neutralization to the short vowel category needs to be explained since universal phrase-final-lengthening makes final vowels longer than non-final vowels. Myers and Hansen (2007) argue that the sound change of V: > V has two components: (i) an articulatory/aerodynamic process of final vowel devoicing (*VV > VV̥ __#); and (ii) a perceptual component where, due to devoicing, the final long vowel is perceived as short (VV̥ > V/__#). In languages with the same synchronic patterns as Bemba and the others just mentioned, we can hypothesize that the same final devoicing and shortening processes have also occurred. A universal property of sound change is that regular final long vowel devoicing (*VV > VV̥ __#) leads to regular final long vowel shortening (VV̥ > V/__#).

Phonetic sources plus structural condition

Initial kl > tl sound change has occurred in some languages, while tl > kl has occurred in others (Blevins and Grawunder, 2009). Given the apparent symmetry of the sound change, it has been attributed, in part, to perceptual similarity: [kl] and [tl] are easily confused by the human ear. Co-articulation has been suggested as an additional factor for kl > tl, supported by experimental data. However, the distribution of these two sound changes is distinct: kl > tl occurs when there is a /tl/ gap, while tl > kl occurs only when /kl/ is pre-existing (Blevins and Grawunder, 2009). In this case, it is hypothesized that the phonetic similarity of [tl] and [kl] is, on its own, not sufficient to result in tl > kl or kl > tl: structural pre-existing phonotactic conditions, positive and negative respectively, must be satisfied, before either of these sound changes can take place. Note that these structural conditions differ from those offered in Haudricourt's example in (1): for kl > tl, a structural condition (a /tl/ gap) appears to be necessary, but it does not determine that a sound change will take place. In some varieties of English and German, one finds initial kl > tl; however, in other varieties, the sound change has not occurred (Blevins and Grawunder, 2009). A proposed universal property of sound change is that kl > tl occurs when there is a /tl/ gap, while tl > kl occurs only when /kl/ is pre-existing.

Phonetic sources plus functional condition

Functional conditions have been invoked by many linguists as facilitating or inhibiting sound change (Gilliéron, 1918; Jakobson, 1931; Martinet, 1952). Sound changes (mergers) which neutralize contrasts that have a very low functional load are more likely than those with a high functional load, while sound changes that result in rampant homophony have been argued to be inhibited (Blevins and Wedel, 2009; Wedel, Kaplan and Jackson, 2013).

An interesting functional factor involves the predictability of aspects of the speech signal. A range of studies suggest that phonetic reduction is more likely when a word is predictable or recoverable independent of its phonetic properties (Jurafsky *et al.*, 2001). In morphological reduplication, where the content of the reduplicated string is predictable and recoverable from the base, it has been observed that the reduplicant undergoes leniting sound changes more readily than the base, and more readily than other prosodically comparable domains. While lenition can be associated with phonetic undershoot, the restriction of certain leniting sound changes to reduplicants, and their unusual properties (e.g. the reduction of CRV->CV in Kokota), is best explained by non-phonetic factors (Blevins, 2005). A proposed universal property of sound change, then, is that all else being equal, leniting sound change will be more common in reduplicated forms, where phonological material is predictable, than in non-reduplicated forms, where it is not.

When phonetic conditions are insufficient

Very few languages are known to distinguish voiced vowels from voiceless vowels. The rarity of this contrast cannot be attributed to the rarity of phonetically voiceless vowels since voiceless allophones of voiced vowels are cross-linguistically common, and arise from coarticulatory effects as well as phrase-final devoicing (Blevins, 2018).

Word-final voiceless vowels may be silent and therefore imperceptible (Gick *et al.,* 2012). Clearly, the expectation is that they will be lost over time, and in many languages, a sound change of final (voiceless) vowel loss occurs. However, somewhat surprisingly this sound change does not always take place: final voiceless vowels may be maintained in a spoken language for hundreds of years (Blevins, 2004: 199; 2018). One condition that appears to facilitate maintenance is structural: final voiceless vowels are maintained for longer periods of time in languages where words are uniformly vowel-final (Blevins, 2018). One language with this pattern is Purépecha (aka Tarascan), an isolate of central Mexico with word-final unstressed voiceless vowels. Descriptions of the 20th and 21st centuries show voiceless vowels variably deleted, resulting in final consonants and consonant clusters, suggesting that final voiceless vowels are unstable, and on the path to eventual loss (Foster, 1969; Friedrich, 1975; Camacho, 2018). However, friar Maturino Gilberti's *Arte de la Lengua Michuacan* (1558) and *Vocabulario* (1559) both show Purépecha vowel loss where devoicing and loss occurs today, suggesting that final voiceless allophones of modally voiced vowels have been stable for over 500 years: compare Gilberti's 1559 <ches> with 20th century *chesï* 'bark (of tree)'; or Gilberti's <napis> 'acorn' with Gamboa's (2009) *napisi*.

In Purépecha, all stems and words are vowel-final. In languages with this kind of phonotactic, experimental evidence supports phonotactically motivated perceptual epenthesis in the absence of acoustic vowel cues (Dupoux *et al.*, 1999, 2011). Despite the silent nature of final voiceless vowels, the facts suggest that final vowels in Purépecha have been maintained for hundreds of years due to the dominant vowel-final structure of stems and words in the language. Due to this structural property, Purépecha speakers may hear phantom vowels in word-final position, even when no acoustic cues for these vowels are present. Haudricourt (1940: 71) may have anticipated this in his reference to "*le maintien du plus fréquent*". A proposed universal property of sound change is that final voiceless vowels are less likely to be lost by regular sound change if the language has a general phonotactic that all words end in vowels. In this case, a predicted sound change is inhibited by a structural condition.

Sound change can also be inhibited by functional conditions, as alluded to by Haudricourt (1940: 72), when he highlights the role of "*la conservation des oppositions utiles*" in conditioning sound change. Blevins and Wedel (2009) illustrate several cases where regular sound change is inhibited by paradigm-internal lexical competition. Unlike the case of voiceless vowels in Purépecha where sound change does not occur, regular sound change occurs everywhere except niches of high lexical competition. Inhibition can also be seen at the level of phonological contrast. Wedel, Kaplan, and Jackson (2013) provide cross-linguistic statistical evidence that the probability of phoneme merger correlates inversely to the functional load of the contrast. In sum, there is growing evidence that a neutralizing sound change can be inhibited when that contrast it neutralizes carries a heavy functional load.

A True Panchronic Generalization? Looking at Contact-induced change

Sound change typology is not uniform. Internal developments can be distinct in form and content from contact-induced sound change. Recently, it has been suggested that distinct areal sound patterns can arise from external perceptual magnet effects (Blevins, 2017a; Barry, 2019). In these cases, sound change is regular, and may appear natural, but it is not mirrored by internal developments. For example, Yurok, an Algic language of northern California, surrounded by languages with ejectives, shows regular *Ct > Cʔt > Ctʔ > Cʔ > C'. This development is not found in any other Algic language, and appears to be rare (Blevins, 2002 et 2017a).

Areal sound patterns are one key to understanding contact-induced change. But just as important are sound patterns that are not areal, but attested only when two languages come into contact, with possible conditions on the type of contact. The clearest case of a panchronic generalization that I have been able to discover is of this type, and I believe that Haudricourt's prediction in (1) (repeated below) may be of this type as well.

(1) Predicting word-initial epenthesis in #st clusters (Haudricourt, 1940: 70)

The sound change #st > #Vst will occur predictably when:

a) #st-initial words are not more frequent than #Vst-initial words

b) Words can end in Vs#

c) Initial syllables are not stressed

d) The output of the sound change is well-formed in terms of syllable count

However, before turning to a case where, I believe, sound change can be predicted when two languages of specific types come into contact, let us briefly review Haudricourt's example in (1), where an attempt is made to predict prothesis as regular sound change before #st clusters. (I thank M. Mazaudon, personal communication, 2017, for clarifying aspects of Haudricourt's proposal.) The suggestion in (1) is that prothesis depended on critical phonotactic differences between Latin, Italian and Romanian (where the sound change did not apply) and certain daughter Romance languages (e.g. Old Spanish, Old French) where it did. Classical Latin was thought to resist the change due to its failure to satisfy condition (1a); only after the shift of Classical Latin *ex* to Late Latin *es* before a consonant was (1a) satisfied. In contrast, word-final Vs# (1b) was lost in Southern Romance, but maintained in Spanish and Old French, making these latter languages subject to word-initial epenthesis.

Haudricourt's analysis can be compared to Janda and Joseph's (2003: 208-210) "Big Bang" theory of sound change, where purely phonetic conditions govern an innovation at its brief point of origin, but are rapidly replaced by phonological and sociological conditions. Under this account, early phonetic conditioning of prothesis in Romance begins as a phrase-level sandhi process in ...C#st... contexts, with reinterpretation of ...C#V#st... as ...C#Vst... in languages where the word-final consonants remained largely intact (for details, see Janda and Joseph, 2003). Janda and Joseph argue that their account is supported by the absence of prothesis in Romance dialects where final consonants were lost earliest and most extensively, since this consonant loss eliminated the illicit C#st phonotactic that originally triggered the epenthesis process (*ibid.*). Old records of Italian show sandhi epenthesis (*in iscuola*), though at the lexical level this was not continued in the modern language (*scuola* 'school'). At the same time, Sardinian and the Western Romance languages, but not Romanian, show prothesis. If Janda and Joseph's (2003) analysis is correct, there may be reason to question Haudricourt's proposal in (1), since it is meant to account for true prothesis, where, at its origin, the Romance change is not true prothesis, but, rather, resolution of C#st clusters in sandhi. Without this case, the remaining examples of #sC > #VsC are strongly associated with language contact and loan-word phonology (for a survey, see Fleischhacker 2005). The #sC > #VsC sound change occurs only when #sC-initial loanwords are taken into languages that disallow syllable-initial clusters, or when L2s with #sC-initial words are acquired by L1 speakers whose L1 lacks syllable-initial clusters. An instance of the first kind is English *stool* borrowed as Central Pahari [istu:l]. An example of the second type is schwa in Western Armenian *əstapil* 'come to one's senses' < *stapil* (Broselow 2015) where Western Armenian has been acquired within a Turkish-dominant environment, Turkish being a language without initial consonant clusters. Indeed, more generally, the only case where, it seems, one can predict a specific type of sound change is when two languages of distinct specific types come into contact. Let us turn to specific instances of these cases now.

A common feature of loan phonology and language contact of a very specific type is cluster-splitting epenthesis, as illustrated in Table 1 for a variety of loanwords (Fleischhacker 2001 and 2005). Where #sC clusters normally trigger prothesis (see above), initial obstruent-sonorant clusters are split by an epenthetic vowel.

TABLE 1. – Cluster-splitting epenthesis in loan-words

Source	Latin	crucem	'cross'
Target	Basque	**gu**rutze	'cross'
Source	Sanskrit	klēśa	'defilement'
Target	Indonesian	**ke**lesa	'indolent'
Source	Spanish	cruz	'cross'
Target	Q'eqchi'	**ku**rus	'cross'
Source	English	cross	'cross'
Target	Fijian	**ko**lósi	'cross'

As a synchronic phonological rule, the transformation relating the source words to the target forms would look something like: $\#TRV_i \rightarrow \#TV_{(i)}RV_i$. Within generative traditions, the locus of explanation for this sound pattern lies in phonotactic differences between the source and target language. The speaker of the target language hears a word pronounced in the source language, constructs a phonological representation with an initial #TR cluster based on this hearing, but then alters this phonological representation in line with the phonotactics of the speaker's native language which lacks initial #TR clusters (Broselow, 1987 and 2015). A more current and more explanatory account of cluster-splitting epenthesis combines two new findings in speech perception, – one related to perceptual similarity, and the other related to perceptual illusions.

A first component of the analysis is that vowel epenthesis between the oral stop and following sonorant is due to the vowel-like nature of the TR transition. Fleischhacker (2001, 2005) argues that the general pattern is determined by perceptual similarity: initial TR clusters are more perceptually similar to TVR than VTR. An important aspect of her work is the distinction between initial #TR clusters and initial #sT clusters, which rarely show vowel-splitting epenthesis, but show prothesis instead (as in the Romance case discussed above).

A second component of the analysis relates to specific structural differences between the source and target languages. Under the perceptual account, perception of #TR by native speakers of languages that lack initial #TR is biased: these speakers will tend to hear a vowel between the oral stop and the following liquid, even if no vowel is present. Experimental work supporting this hypothesis was presented in Dupoux *et al.* (1999), and has been supported by much subsequent work including

Dupoux *et al.* (2011), Kang (2011), Kabak and Idsardi (2007), Davidson and Shaw (2012), and Berent (2013).

Given these components, it is reasonable to ask whether something like cluster-splitting epenthesis ever occurs as a natural internal development without perceptual illusions triggered by distinct phonotactics between a source and target language. The answer appears to be no. In Table 2, three widely accepted Proto-Indo-European reconstructions with initial *TR clusters are shown with partial cognate sets.

TABLE 2. – Stability of word-initial *TR in Proto-Indo-European

a. *gras- 'eat'	*Cf.* Vedic *grásate* 'eats, feeds, Greek *grástis* 'green fodder, grass', Latin *grāmen* (<*grasmen) 'grass, fodder'
b. *prekj- 'ask'	*Cf.* Vedic *prccháti* 'asks', Latin *precor* 'I entreat', German *fragen*, Tocharian B *prek-*
c. *trejes 'three'	*Cf.* Lycian *tri-*, Vedic *tráyas*, Greek *tre˜is*, Avestan *θrayō*, Latin *trēs*

There are approximately 445 living Indo-European languages at present, and linguists agree that the major subgroups of Anatolian, Indo-Iranian, Greek, Italic, Celtic, Armenian, Tocharian, and Balto-Slavic have had long independent developments. If cluster-splitting vowel-epenthesis sound change ($\#TRV_i > \#TV_{(i)}RV_i$) has a natural phonetic basis in perceptual similarity, then a sound change like the one evident in Table 1 above might be expected to have occurred numerous times in the history of Indo-European. But it has not. Cluster-splitting vowel epenthesis as a regular sound change is rare in the Indo-European language family. *TR clusters are inherited intact in all major subgroups, and sound changes affecting these clusters at later stages of development are of distinct types, including palatalization of *l in Romance *Tl clusters, and loss of *p in Celtic.

Indeed, within the entire Indo-European language family, there appears to be only one or two clear instances of a potentially regular cluster-splitting epenthesis sound change. One is in Modern Persian, as illustrated in Table 3.

TABLE 3. – Cluster-splitting epenthesis in Modern Persian

	Middle Persian	Modern Persian	Proto-Indo-European
a.	brādar	barādar	$^{*}b^{h}réh_{2}ter$
b.	griftan	gereftan, giriftan	$^{*}g^{h}rebh_{2}$-
c.	draxt	daraxt	*drew
d.	griy-	geri-	$^{*}g^{h}reh_{2}d$-
Glosses: a. 'brother', b. 'grab, take', c. 'tree, wood', d. 'to cry'			

Another similar instance of cluster-splitting epenthesis occurs in Western Armenian, where a schwa breaks up inherited #OR clusters: *gərag* < grag 'fire', *vənas* < vnas 'harm', etc. (Broselow, 2015)

And a third instance occurs in the Siouan language family, with relevant data shown in Table 4.

TABLE 4. – Cluster-splitting epenthesis in Modern Siouan:
"Dorsey's Law" in Hoocąk (aka Winnebago), after Dorsey (1885)

	Chiwere	Hoocąk	Proto-Mississippi-Valley
a.	églųñį	waki/kųnųnį	*krųrį
b.	glé	keré	*kre
c.	wa/brú	ru/purú	*prú
Glosses: a. 'forget', b. 'go.back.to', c. 'powder/plough'			

Outside of Persian, Western Armenian and Hoocąk, it is difficult to find convincing cases of cluster-splitting epenthesis as potential diachronic developments. And here lies the central point of interest. Given that cluster-splitting epenthesis is common in loan word phonology, and appears to be a natural phonetically-motivated process, why is it rarely attested as a regular sound change? Why, out of more than 440 Indo-European languages, is there only one clear case of a $\#TRV_i$ > $\#TV_{(i)}RV_i$ sound change?

I suggest that cluster-splitting epenthesis occurs only when speakers of a language that lacks initial TR clusters begin to acquire a language that has initial TR clusters under special contact conditions where speakers dominant in the language that lacks initial consonant clusters suddenly (or without extensive exposure) acquire the language with #CR-clusters (Blevins, 2017b). It is only under these circumstances that the perceptual illusion of #TRV as #TVRV arises, with this perceptual illusion constituting the cognitive catalyst for phonological change.

Cluster-splitting epenthesis in the history of Persian arose as a result of contact between speakers of Turkic languages, which did not allow complex onsets, and speakers of Middle Iranian languages with initial #TR-clusters. As Turks became Persianized, they acquired Persian (and, other Middle Iranian languages). In this process, cognitive effects of CV(C) syllable structure resulted in the perception of illusory vowels in #TR-initial words, giving rise to the change in pronunciation that is cluster-splitting epenthesis. A similar situation appears to be true for Western Armenian, which at the time of the Ottoman Empire was acquired in the context of a Turkish-dominant culture.

A slightly different history is found in Siouan. Oral histories suggest that the split between Hoocąk and Chiwere occurred sometime in the mid-16th century. By the time Jean Nicolet made contact with the "Ho-Chunk" in 1634, their culture was very similar to that of surrounding Algonquian tribes, they were completely encircled by speakers of Algonquian languages, and the language had a significant number of borrowings from Central Algonquian languages. I suggest that sometime between the mid-16th and mid-17th centuries, (pre-)Hoocąk was acquired by speakers of neighboring Algonquian languages. Since none of the Central Algonquian languages had initial #TR clusters, we hypothesize that cognitive effects of #CV(C) syllable structure resulted in the perception of illusory vowels in #TR-initial words, giving rise to Dorsey's Law. However, in the case this Siouan language, this "percept" may have been strongly facilitated by a pre-existing phonetic property of the language: initial #TR clusters were likely already produced with open-transitions, or short vowel-like articulations, that were easily interpreted as true full vowels. This hypothesis is based on the production of word-initial clusters in related Siouan languages like Lakota and Omaha. In Lakota a word like *glá* 'go back' or *blé* 'lake' is produced with a noticable open transition or short schwa-like vowel on release of the initial stop (for examples, listen to recordings on *The New Lakota Dictionary Online* : Ullrich, 2019). Etymologically, Lakota *glá* is cognate with Hoocąk *keré* 'start going back', both from Proto-Siouan *ki-ré:(he), continued as Proto-Dakota *krá, Proto- Hoocąk-Chiwere *kré. Given the phonetics of modern Siouan languages, it seems that the phonologization of cluster-splitting epenthesis may have been faciliated by the pre-existing open transition in these clusters. However, it still seems that language contact has played a role, since Hoocąk is the only Siouan language that has reconstituted a full vowel of definite quality in this posistion.

Returning to the goals of Panchronic Phonology, these three examples could be the exceptions that prove the rule. Cluster-splitting epenthesis as regular sound change is rare, and occurs, exceptionally, when two distinct language types come into contact: one that has initial #TR clusters, and the other that lacks initial clusters. The sound change occurs under special contact conditions where speakers dominant in the language that lacks initial consonant clusters suddenly (or without extensive exposure) acquire the language with #CR-clusters (Blevins, 2017b). Similar conditions may be involved in cases of prothesis in the #st clusters that Haudricourt (1940) discussed, though, at present, it is difficult to find relevant (diachronic, non-loanword) examples outside of Romance for comparison. The only potential case is Western Armenian, mentioned above.

Evolutionary Phonology and sound change

The typology of sound change may seem like an odd place to uncover significant evidence of cognitive forces that are independent of universal phonetics, or evidence against widely assumed notions of simple versus complex sound patterns. Yet, the study of cluster-splitting epenthesis as regular sound change suggests that typological studies of this kind may illuminate our understanding of the role of human cognition in shaping sound patterns. Contrary to widely held notions, complex onsets like #TR do not appear to be dispreferred or unstable diachronically. Instead, the typology of sound change suggests that word-initial #TR clusters are phonotactically stable, with radical change occuring only when a language that lacks such clusters has significant contact with a language that produces them.

On the other hand, in the rare cases where initial #TR clusters undergo regular cluster-splitting epenthesis, this epenthesis is not a simple case of "syllable repair". Rather, native-language #CV-structure in language-contact situations results in the perception of phantom vowels which take on phonological status when speakers of #CV-initial languages must quickly, and with little earlier familiarity, acquire a language with #CR clusters. This, I suggest, was the original situation of Turkic speakers acquiring Persian, and of Central Algonquians acquiring Hoocąk.

Evolutionary Phonology integrates important aspects of the panchronic program as outlined by Haudricourt and as pursued in a long history of research at LACITO. It offers an explanatory theory of sound change integrating phonetic and non-phonetic factors, and it distinguishes universal properties from language-specific ones. Regular cluster-splitting epenthesis is panchronic, but it does not have a simple phonetic explanation, and it is not known as a language-internal development. By examining other sound changes with this profile, we may, unexpectedly, learn even more about the human mind and the limits of regular sound change.

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Sound Patterns and Sound Change: New Threads in the Panchronic Tapestry

Abstract

Panchronic Phonology, as conceived of by Haudricourt (1940), aimed to discover universal properties of sound change that were independent of language-specific sound patterns, and to explore the possibility that some types of sound change and some aspects of sound change might be predictable. This chapter highlights panchronic aspects of Evolutionary Phonology (Blevins 2004, 2006, 2015), paying tribute, in particular, to the work of Haudricourt (1940) and the continuation of the panchronic tradition at LACITO.

Keywords: Panchronic Phonology, Evolutionary Phonology, sound change, universals

Schémas et changements en phonologie : nouvelles pistes dans le paysage panchronique

Résumé

Dans la conception d'André Haudricourt, la phonologie panchronique visait à mettre au jour des universaux du changement phonologique, indépendants de langues particulières. L'article de 1940 appelle de ses vœux l'établissement de lois « valables pour toutes les langues à toutes les époques » permettant de prédire, dans une certaine mesure, certains types de changements ou certains aspects du changement.

Le présent chapitre met en lumière les aspects « panchroniques » de la théorie de la phonologie évolutive Evolutionary Phonology (Blevins 2004, 2006, 2015) en soulignant l'importance de la contribution d'Haudricourt et de la continuation de la tradition panchronique au LACITO.

Mots-clés : *phonologie panchronique, phonologie évolutive, changement phonétique, universaux*