Pertinacity in loanwords:
Same underlying systems, different outputs

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Abstract

Native speakers are often surprised by the way different languages adapt their words; the same phoneme may be borrowed into different languages in different ways. Even related languages need not adapt the same phoneme in an identical fashion. Evidence from a variety of languages suggests that during loan adaptation, the underlying phonological systems of the donor language need to match those of the borrowing language, as has been proposed by many in the literature. Here we show that the universal principle of "PLACE first", which promotes overlapping place of articulation features (including ARTICULATORS and TONGUE HEIGHT), guides the substitution choice, resulting in different outputs from the same loan.

Keywords: phonology, loanword adaptation, FUL, Bengali, English

1. Introduction

Social contact will inevitably lead to linguistic as well as cultural borrowing. As Bloomfield (1933) points out, the reasons for borrowing can be manifold and dependent on the type of contact. From a linguistic perspective, although both syntactic structure and morphological exponents may be borrowed (or reanalysed due to borrowing), word loans are the most frequent example of borrowing. Many English affixes have their origin in Romance; however, in all probability a suffix such as *–ity* did not enter the language as a morpheme but rather once many loanwords with *–ity* were available a derivational relationship was established with the base. Consequently adjective bases such as *sane* occur in texts much later than the suffixed noun *sanity* (cf. Lahiri & Fikkert 1999). Our focus is on loanwords which are borrowed by adult speakers who have a firm grasp on their native language system already, and the way in which the native phonology guides the adaptation. It is not at all unexpected that loans would then be adapted to the phonological system of the borrower. However, sometimes languages with similar phonologies appear to borrow the same phoneme or phonological contrast in different ways. Thus, a question of vital importance is how the perceptual system of a listener copes with the diversity and variability when faced with foreign loans. We will argue, however, that it is ultimately the underlying phonological system of contrast which guides loan adaptation. We will critically examine a few cases where there are apparent differences and show that a hierarchy of feature adaptations and a system of default are responsible for the way in which loans are accepted into the native system.

The way in which a famous impressionist is named in different languages illustrates the variability in loan adaptation even within related languages.

(1) Adapting *Vincent van Gogh*

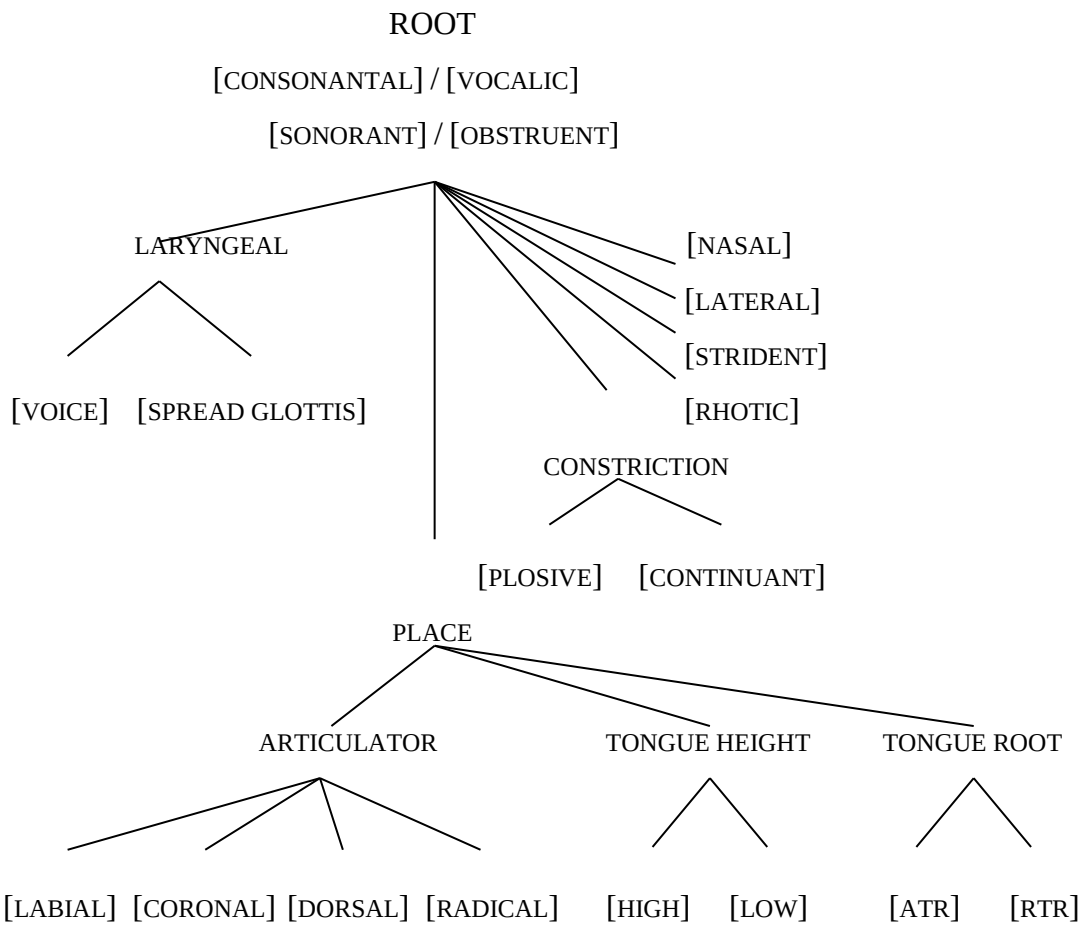
Dutch (original)	[fan xɔx]
English (UK)	[væn gɔf]

English (USA)	[væn goʊ]
German	[fan gɔk] / [fan gɔx]

The initial fricative in *van* is adapted as voiced in the English dialects, probably due to the spelling, and the initial consonant in *Gogh* is always pronounced as a plosive since none of these languages allow word initial voiceless velar fricatives. The two English variants adapt the rhyme in *Gogh* to the orthographic *ough* as in *cough* or *though*. In German, the final consonant in *Gogh* is realised the same as in Dutch since [x] is permissible word finally when preceded by a back vowel. Clearly the native phonologies play a role in the output.

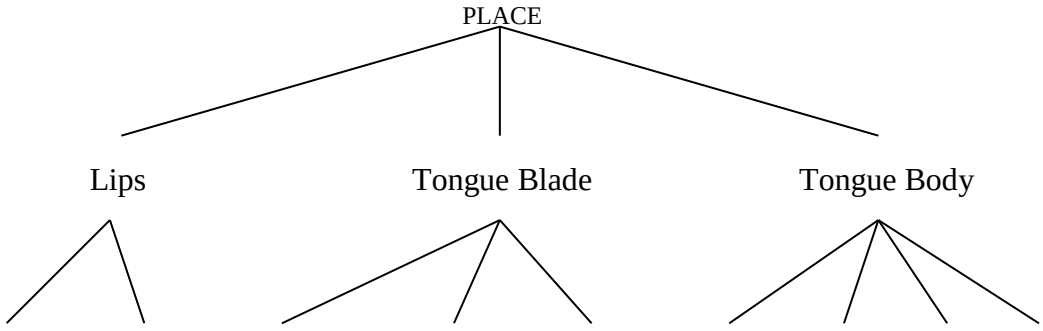
In this paper, we outline a model of phonological feature organisation attempting to predict how sounds of the donor language which are not phonemes in the borrowing language are adapted. The model, *Featurally Underspecified Lexicon*, was devised largely to account for asymmetries in language processing and language change (Lahiri & Reetz 2010). Two aspects of the feature organisation are critical for us: (i) All vowels and consonants share PLACE features where the PLACE node includes ARTICULATORS, TONGUE HEIGHT, and TONGUE ROOT; (ii) No dependent features are permitted; a combination of ARTICULATORS and TONGUE HEIGHT permit, for instance, multiple contrasts under place of articulation as we will explain below. The feature tree that we will use is given in (2). This feature organisation and its consequences for synchronic systems as well as for language processing has been critically examined in several publications (cf. Kotzor, et al. 2015, Lahiri 2012, Lahiri & Reetz 2010, Roberts, et al. 2013). For our purposes here, we will focus largely on the interactions of PLACE features in loan adaptation.

(2) Feature organisation in FUL



To distinguish between various places of articulations that fall under [CORONAL] including dental, alveolar, palatoalveolar and palatal, SPE (Chomsky & Halle 1968) as well as later feature geometry accounts (cf. Sagey 1986) have used either features such as [±anterior] dependent on [coronal] or in addition to [coronal]. A partial feature organisation from Halle et al. (2000) demonstrates this division.

(3) Feature organisation based on Halle et al. (2000)



Under Halle et al.'s account, if /ʃ ʂ/ exist in the same language they could be distinguished by [±distributed] (/ʃ/ as [+distributed]) while /s ʃ/ would be distinguished primarily by [±anterior]. Our assumptions differ; we assume that phonologically neither binary and monovalent features are necessary and that a combination of our ARTICULATORS and TONGUE HEIGHT features can provide the contrasts for any given language. A partial list of segment classification based on FUL is given in (4).

(4) Features and segment classifications in FUL[1]

[LABIAL]	labial consonants, rounded vowels
[CORONAL]	front vowels, dental, palatal, palatoalveolar, retroflex consonants
[DORSAL]	back vowels, velar, uvular consonants
[RADICAL]	pharyngealised vowels, glottal, pharyngeal consonants
[HIGH]	high vowels, palatalised consonants, retroflex, velar, palatal, pharyngeal consonants
[LOW]	low vowels, dental, uvular consonants
[ATR]	palatoalveolar consonants
[RTR]	retroflex consonants

Under this account, three types of consonantal contrasts could be potential problems: palatal versus retroflex stops /c ʈ/ and nasals /ɲ ɳ/, and palatoalveolar versus retroflex sibilants /ʃ ʂ/. Both palatal and retroflex consonants are specified as [CORONAL] and [HIGH] and therefore they are not distinguishable by these features alone. According to FUL, other features keep these consonants apart. In our research, we have observed that palatals belong to the CORONAL family (Keating & Lahiri 1993, Lahiri & Blumstein 1984). We have proposed that the underlying contrast in palatal versus retroflex stops is only possible if the palatal stop is affricated or is an "alveopalatal" consonant, both of which would be [STRIDENT] (cf. Hall 1997), or if one is derived from the other (Lahiri & Reetz 2010). In Malayalam, for instance, where both retroflex and palatal stops exist, the latter are derived in specific morphological environments from intervocalic velars when preceded by front vowels and only retroflex stops occur in the underlying inventory. Furthermore, our claim is that even if both palatal and retroflex nasals exist in any given language, they can never be contrastive. Either the palatal nasal /ɲ/ would consist of a nasal+glide sequence, or it would be an assimilated variant of an alveolar or dental, or the retroflex nasal would be derived. Again, Malayalam is a good example since it has seven phonetic nasals derived from three underlying ones which are labial, dental and velar /m n ŋ/ (Mohanan & Mohanan 1984: 583-586, 596-598). Both

[1] A reviewer wondered if the FUL model was "abandoned" here since we do not mention underspecification. By no means is it abandoned. Underspecification plays no special role in this instance. FUL is not a model of specification and markedness but also one where feature contrasts are crucial. Here we are focusing only on CORONAL stops and fricatives and adaptation of /θ/ and consequently, there was no specific reason for discussing for other ARTICULATOR features.

retroflex and palatal nasals are derived by a homorganic nasal assimilation rule and the palatal stops are in turn derived from velars. Malayalam is also said to have multiple coronal fricatives but Mohanan & Mohanan (1984) suggest that the palatoalveolar [ʃ] ([s̻] in their account) is also derived via palatalisation and does not contrast with the underlying retroflex [ʂ]. However, contrasts between retroflex and palatoalveolar sibilants do occur and in our account they would need to be distinguished with the features [ATR]/[RTR], where the palatoalveolar [ʃ] would be [ATR].

A brief outline of the phonological feature set of standard southern British English fricatives will illustrate how the feature combinations provide the appropriate contrasts (see Table 1).

	f	θ	s	ʃ
[OBSTRUENT]	√	√	√	√
[CONSONANTAL]	√	√	√	√
[STRIDENT]			√	√
PLACE				
ART				
[LABIAL]	√			
[CORONAL]		√	√	√
TH				
[HIGH]				√
[LOW]		√	√	

Table 1: Crucial features for English voiceless fricatives

Although there are three [CORONAL] fricatives, two of them are [STRIDENT] while /θ/ is not. While /θ/ and /s/ are both [LOW], they are distinguished by [STRIDENT], while /ʃ/ is [HIGH] thus contrasting with /s/. This underlying feature contrast, we will argue, plays a role when words with /θ/ are borrowed in other languages.

A third aspect of the feature organisation is that we assume that PLACE takes precedence over other features when it comes to the assignment of features in acquisition, and this too, we will claim, plays a role in the adaptation of loans (cf. Ghini 2001).

(5) Feature assignment: PLACE first

Thus, in assigning the features, the contrast in PLACE is established before all other "manner" features. In addition to the constraint in (5), loan adaptation is also related to a characteristic of grammars called ***pertinacity*** which suggests that a rule or pattern may persist over time, though its realisation may change (Dresher & Lahiri 2005, Lahiri 2002). Pertinacity has two variants, as detailed in (6).

(6) Pertinacity

(i) The persistence of a particular pattern in a language may apply to new forms and different outputs may emerge.

[A] *same pattern, different output realisation*

(ii) Persistence of output forms may occur despite changes in the grammar. Such change always involves a reanalysis of the output form, provoked by changes elsewhere in the system.

[B] *different pattern, same output realisation*

Where loanwords are concerned, adults unfamiliar with the donor language will most often be guided by principle [A] in the sense that their own underlying pattern of contrasts will adapt the output realisation, which could then differ from that of the donor language. Later, either they themselves or future generations may come closer to the output realisation of the donor language, whereby the underlying pattern may undergo reanalysis. We will elaborate on this in §5 once we have closely examined a number of case studies. The first example examines the way in which the underlying feature system of Bengali adapts Portuguese and English coronal stops and fricatives.

We will then discuss the way in which English /θ/ is borrowed differently in German and Dutch although both languages are closely related.

2. Adapting /θ/ in Bengali[2]

Standard Colloquial Bengali (Bengali), as spoken in Calcutta, has five places of articulation (bilabial, dental, palato-alveolar, retroflex, velar) for obstruents where the palato-alveolar sounds are affricates and the others are plosives. All plosives and the affricates contrast in [VOICE] and [SPREAD GLOTTIS]. There exists only one fricative /ʃ/ with a alveo-dental variant /s/ which occurs either word initially in clusters or preceding a dental stop. The inventory is given in Table 2 (adapted from Chatterji 1975 [1926], Klaiman 1990).

p	pʰ	b	bʰ	
t̪	t̪ʰ	d̪	d̪ʰ	[s̪]
tʃ	tʃʰ	dʒ	dʒʰ	ʃ
ʈ	ʈʰ	ɖ	ɖʰ	

Table 2: Obstruents in Bengali

The underlying feature system reflects the use of TONGUE HEIGHT features together with ARTICULATOR features to obtain the correct contrasts as given in Table 3. For our purposes only the voiceless [CORONAL] plosives, affricates and fricatives are relevant.

Table 3. Distinctive features for Bengali obstruents

	t̪	t̪ʰ	ʈ	ʈʰ	tʃ	tʃʰ	ʃ
ROOT							
CONTINUANT							√
PLOSIVE	√	√	√	√	√	√	

[2] The research on Bengali is based on joint work by Stephen Parkinson and Aditi Lahiri; cf. Parkinson (2015).

STRIDENT					√	√	√
LARYNGEAL							
SPREAD GLOTTIS		√		√		√	
ARTICULATORS							
CORONAL	√	√	√	√	√	√	√
TONGUE HEIGHT							
HIGH			√	√			
LOW	√	√					

Table 3: Distinctive features for Bengali obstruents

In FUL, the stops and affricates in Bengali are distinguished by [STRIDENT]. Since Bengali has only one sibilant fricative, there is no other features are necessary to distinguish it from the other obstruents, unlike in English where the two strident fricatives require TONGUE HEIGHT features to distinguish them (cf. Table 1).

For centuries, India has drawn foreign nations, presumably attracted by the wealth of the country. Our focus is on the Portuguese and English influence on the Bengali language. The Portuguese influence can be felt from the 16th century while the English becomes relevant a little later, following the establishment of the East India Company in 1600. As we can see in Table 4, the plosives from the two foreign languages are borrowed in different ways in Bengali. Chatterji (Chatterji 1975 [1926]: 620-648) provides a list of loans from various “foreign” languages including Portuguese and Bengali (cf. also Chatterji & Sen 1931).

		Bengali
English	t	t̪
	θ	t^h
	sC	ʃC
	st	ʃt̪
Portuguese	t̪	t̪
	sC	ʃC
	st̪	st̪

Table 4: English and Portuguese loans in Bengali with [CORONAL] obstruents; C refers to all phonemes, OBSTRUENTS and SONORANTS, other than English /t/ and Portuguese /t̪/.

Examples of loans will show how very common words have come into Bengali from these two European languages. Since most Bengalis have some knowledge of English and rarely any knowledge of Portuguese, they would be able to recognise the English source but invariably exhibit disbelief that words completely integrated in the language are from Portuguese.

(7) Loans with Portuguese /t/ and English /t, θ/ in Bengali

(a) Portuguese loans

[t̪]oalha	[t̪oale]	towel
fi[t̪]a	[p^hit̪e]	tape, string
bo[t̪]ão	[bot̪am]	button
a[t̪]a	[at̪a]	custard apple

(b) English loans

/t/	*time*	[t̪aim]
	taxi	[t̪æksi]
	mutton	[mɔt̪on]
	notice	[not̪iʃ]
/θ/	*theatre*	[t̪^{h}iet̪ar]
	thank you	[t̪^{h}æŋkiu]

Transfer from a Portuguese dental to a corresponding sound in Bengali is no real surprise. What is more unexpected are the English correspondences where the alveolar /t/ is borrowed as a retroflex /ʈ/ while the interdental fricative is accepted as a dental aspirated stop. Since matching PLACE is crucial, Bengali speakers choose a [CORONAL] match. However, they have to differentiate in English between two [CORONAL] non-strident obstruents /t/ and /θ/; the only options are the TONGUE HEIGHT features. Recall that Bengali differentiates between /ʈ/ and /t̪/ using the height features and the closest match to the [LOW] feature for /θ/ (see Table 1) is the corresponding [LOW] / t̪ʰ/ with additional aspiration as a substitute for frication. Since the only fricative in Bengali is /ʃ/, which is strident and has no height feature, it is not an acceptable match for replacing /θ/. Additional evidence for this hypothesis comes from the way in which [CORONAL] clusters are replaced. First, however, we need to touch on an assimilation process in Bengali.

Word initial clusters with two obstruents are infrequent in Bengali and the inherited clusters all begin with the dental /s/; these are rare: [st̪ʰan] 'place', [st̪ri] 'wife', [spɔrd̪ʰa] 'dare'. Classically, English loans with word initial /st/ clusters are broken up with an initial or medial epenthetic vowel.

(8) English word initial /st/ clusters in Bengali

E *station*	B [iʃʈiʃan]
E *slate*	B [ʃeleʈ]

Word medial sibilant and obstruent clusters are all voiceless and begin with /ʃ/; however, when a dental stop is the second member, the sibilant becomes /s/. Examples are given in (9) and (10).

(9) Assimilation of /ʃ/ and dental plosive in Bengali

[kɔʃʈo]	suffering	[mɔst̪o]	large
[kriʃno]	Krishna	[ʃust̪ʰo]	healthy
[mɔʃla]	masala	[kʰast̪a]	crisp

[ʃ] always assimilates to [s] across morphemes when a dental plosive follows

/kaʃ-/	$\text{cough}_{\text{verb}}$

[kaʃ-l-o]	cough-PAST-3PERS
[kaʃ-b-e]	cough-FUT-3PERS
[kaʂ̪-ʈ̪-o]	cough-HABITUAL PAST-3PERS

Thus, the [LOW] of the dental stop spreads to the palato-alveolar fricative:

(10) /ʃ/ assimilation

[CONTINUANT]	[PLOSIVE]	[CONTINUANT]	[PLOSIVE]
[CORONAL]	[CORONAL] —>	[CORONAL]	[CORONAL]
	[LOW]	[LOW]	[LOW]

How are /sT/ clusters borrowed from English and Portuguese into Bengali? If there is a consistent matching of [LOW] for /ʈ̪/ but [HIGH] for /ʈ/ we should see a systematic difference across Portuguese and English loans with clusters. First we examine the borrowing of sibilants in isolation along with /sC/ clusters preceding a phoneme which is not an alveolar or dental plosive.

(11) Sibilants in Bengali from Portuguese and English

P *sabão*	B [ʃaban]	soap
P *saia*	B [ʃaẹ̯a]	petticoat
P *sorte*	B [ʃurʈ̪i]	lottery
E *soda*	B [ʃoɖ̯a]	
E *cigarette*	B [ʃigareʈ̚]	
E *police*	B [puliʃ]	

As we can see, irrespective of the donor language, all sibilants are borrowed as /ʃ/ which would naturally be the obvious choice since that is the only phoneme in Bengali. The same holds true for most consonant clusters.

(12) Regular /sC/ clusters from Portuguese and English

P *espada*	B [iʃpaʈ̪]	iron/steel
E *steel*	B [iʃkul]	

These words are totally integrated into Bengali but although speakers with a "proper" English education may pronounce *steel* as [sʈiːl], no one would recognise [iʃpaʈ̪] as a loan from Portuguese. However, /sT/ clusters show a very different pattern.

(13) /sT/ clusters in Bengali from Portuguese and English

P *mestre*	B [miʂ̪tri]	craftsman (expert)
P *estirar*	B [iʂ̪tiri]	iron
P *mastro*	B [maʂ̪tul]	mast
E *master*	B [maʃʈar]	teacher
E *plaster*	B [plaʃʈar]	
E *register*	B [redʒiʃʈar]	

All English /sT/ clusters are borrowed with a retroflex plosive preceded by a palato-alveolar fricative. In fact, this is no different from any other /sC/ cluster (e.g. /sk/ or /sl/ as above). For Portuguese loans, we see a different scenario. Since the stop is borrowed as a dental, the regular assimilation rule operates and the output is also a [LOW] fricative. The feature mapping from the donor languages to Bengali is illustrated by the feature comparisons in Table 5.

		ROOT					
		[PLOSIVE]	[CONTINUANT]	[STRIDENT]	ARTICULATORS	TONGUE HEIGHT	
					[CORONAL]	[HIGH]	[LOW]
Bengali	t̪/t̪ʰ	√			√		√
	ʈ/ʈʰ	√			√	√	
	ʃ		√	√	√		
Portuguese	t̪	√			√		
	s		√	√	√		√
	ʃ		√	√	√	√	
English	t	√			√		
	θ		√	√	√		√
	s		√	√	√		√

	ʃ		√	√	√	√	

Table 5: Feature comparisons for Bengali, Portuguese and English [CORONAL] voiceless plosives and fricatives.

The English interdental fricative /θ/ is matched to a Bengali [LOW] dental stop. The use of an aspirated stop for a fricative, i.e. translating the feature [CONTINUANT] into [SPREAD GLOTTIS] could arguably be a phonetic match. Presumably /θ/ could have been adapted with the fricative /ʃ/ but again, as we can see, PLACE features take precedence. Consequently, the features [CORONAL, LOW] of non-strident [θ] matched the phonological representation of /t̪ʰ/ best. The fricative [s] was not an option since it is not a phoneme of the language. Thus, the fact that the feature [CONTINUANT] was not blindly copied into the nearest available fricative suggests that the PLACE features dominated.

(14) Adapting English /θ/ into Bengali /t̪ʰ/

E /θ/ [CORONAL, LOW, CONTINUANT] > B /t̪ʰ/ [CORONAL, LOW, SPREAD GLOTTIS]

≠> *ʃ/ [CORONAL, STRIDENT]

The strongest support for such feature mapping comes from the treatment of sibilants. As we mentioned, in Bengali the allophone [s] occurs only in the context of dental plosives. This is clearly seen in the pattern of borrowings from Portuguese and English.

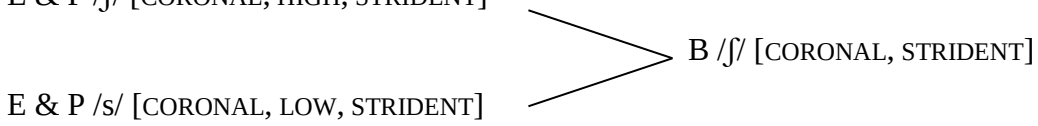
(15) Loans from Portuguese and English /ʃ/ and /s/

Word initial /ʃ/	(P & E)	>	/ʃ/ B
Word initial /s/	(P & E)	>	/ʃ/ B
Word medial /sC/	(P & E)	>	/ʃC/ B
Word medial /st/	(P)	>	/st̪/ B
	(E)	>	/ʃt̪/ B

Thus the /s/ from Portuguese was adapted as /ʃ/ word initially, but as soon as a dental [LOW] plosive followed, the fricative was assimilated to a [LOW] [s]. Since the English alveolar plosive was borrowed as a retroflex which is [HIGH], the sibilant remained /ʃ/. The phonological match would have been as shown in (16).

(16) Portuguese and English sibilants in Bengali

(a) In isolation



(b) In clusters

P [st] > B /ʃ/√/t̪/ > [st̪] i.e. [STRID]√[LOW] > [STRID, LOW] √ [LOW]

E [st] > B /ʃ/√/t̻/ > [ʃt̻] i.e. [STRID]√[HIGH] > [STRID, HIGH] √ [HIGH]

This pattern of adaptation clearly indicates that a fairly close feature mapping as well as apply appropriate assimilation processes.

Although Bengali avoids fricatives to replace /θ/, other languages do not. We now turn to German and Dutch, closely related languages where the former uses /s/ as a replacement for /θ/ while Dutch uses a stop. We will again show that the underlying feature inventory of the two languages is responsible for the types of adaptation.

3. English /θ/ in German and Dutch

Before turning to present day loans, for the sake of comparison, we will make a short excursus into the changes from Indo-European (IE) to Proto Germanic (PGmc) and later to the various Germanic languages with respect to [CORONAL] stops. Grimm's Law converted all voiceless stops into fricatives but they did not survive equally in all the Germanic languages. Furthermore, the voiced stops became voiceless, and these as well did not all survive (Prokosch 1939). We tabulate a brief history in (17).

(17) Development of word initial [CORONAL] stops and fricatives from IE to modern English, Dutch and German

(a) Grimm's Law: IE > PGmc

IE	*t	*d	*d^h	*s
PGmc	*þ (θ)	*t	*d	*s

(b) Old High German consonant shift: West Germanic > OHG in comparison with Old English (OE) and Middle Dutch/Middelnederlands (MNL)

WGmc	OHG	OE	MNL
*t	ts	t	t
*d	t	d	d
*θ	d	θ	d

PGmc *θ has survived in English but not in German and Dutch while WGmc *t and *d survived in both English and Dutch but not in German; relevant examples are given in (18).

(18) English, German and Dutch examples corresponding to WGmc

WGmc	German	English	Dutch
*t	zehn [ts]	ten	tien
*d	Tochter	daughter	dohtor
*θ	Dank	thank	dank

Although Dutch and German words with original *θ were realised as /d/, words with modern English /θ/ display different manifestations. Here we can consider two types of data — "true" loans vs. mispronunciation of English words. For the second, it is undoubtedly the case that Germans who are not fluent English speakers pronounce words like *think, thanks, thick* as *[s]ink, [s]anks, [s]ick*. Using this replacement phenomena in an advertisement for learning English, the Berlitz language school presents a clip of a young German coastguard who is unable to distinguish between /θ/ and /s/ monitoring rescue calls. He responds to an English call of help "*Mayday, we are sinking*" with the measured reply "*What are you sinking about?*". However, there are certain words with initial [θ] which have been truly adapted into German such as *think tank, thesis, theme park, thriller.* The [θ] in the first three words are usually replaced by [s] while the cluster [θr] is pronounced as [tr] since [sr] is not a possible cluster in Standard German. Although the Duden *Fremdsprache* dictionary

gives the idealised English pronunciation, German speakers unfamiliar with everyday English invariably replace the [θ]. In the same vein, Dutch speakers however, when unable to master /θ/ replace it with /t/ and not /s/.

Examining this phenomenon, in an eye-tracking study Hanulíková and Weber (2012) presented mispronounced English words to Dutch and German listeners by substituting /θ/ with /f/ /s/ /t/; e.g., *thief* mispronounced as **fief, *sief, *tief.* Their question was whether all mispronunciations guide German and Dutch listeners to look at the real word equally. Their results showed unambiguously that Dutch preferred /t/ substitutions while the Germans opted for /s/. One should note that both languages at present have /t/ as well as /s/ and historically both changed PGmc *θ to /d/. Why this difference? We would like to argue that the substitution choice depends on their synchronic phonological feature contrast and the closest contrastive feature matching allows Germans to prefer /s/ as a replacement while the Dutch prefer /t/. To illustrate this we give the relevant features for /t d s ʃ θ/ in all three languages in Table 6. The main difference is between the sibilant fricatives where German contrasts /ʃ/ and /s/ while Dutch (like Bengali) has only one fricative /s/ and the allophone [ʃ] is derived via palatalisation (/sj/ > [ʃ]) and largely appears in diminutives such as *ijsje* 'ice cream', *meisje* 'little girl' (Lahiri & Evers 1991, Trommelen 1984). German dialects vary as to whether word initial /s/ is pronounced as voiced /z/ or voiceless /s/ (e.g. *Sinn, sauber, See*) but either way they contrast with /ʃ/ in words like *Schaal, Schuh, Schnee.* In FUL, this contrast is in TONGUE HEIGHT and parallels that of English and not Dutch where there is no height contrast necessary in the underlying representation for the [CORONAL] fricatives. Thus, [HIGH] and [LOW] are required in German and English but not in Dutch (see Table 6).

Table 6. Feature comparisons for German, Dutch and English [CORONAL] voiceless plosives and fricatives

		ROOT					
		[PLOSIVE]	[CONTINUANT]	[STRIDENT]	ARTICULATORS	TONGUE HEIGHT	
					[CORONAL]	[HIGH]	[LOW]
German	t	√			√		
	ts	√		√	√		
	s		√	√	√		√
	ʃ		√	√	√	√	
Dutch	t	√			√		
	s		√	√	√		
English	t	√			√		
	θ		√		√		√
	s		√	√	√		√
	ʃ		√	√	√	√	

Since PLACE features have precedence, and English and German both require TONGUE HEIGHT features to distinguish certain [CORONAL] fricatives, matching the feature [LOW] from /θ/ is preferred, allowing the Germans to choose /s/. In contrast, in Dutch, TONGUE HEIGHT features are not contrastive and /s/ is unmarked since there is no contrastive /ʃ/. Like Bengali, the extra feature [STRIDENT] makes /s/ less preferred than the plosive /t/. Thus, closely related languages adapt the same phoneme in different ways depending on their own phonological system. We now turn to English borrowing words with /θ/. Since English, unlike the other West Germanic languages, has kept this phoneme ever since Grimm's Law, one might imagine that there would be a one-to-one adaptation, and that is what happened with, however, slight complications depending on the source of the borrowing.

4. Brief excursus: /θ/ into English via Greek

English has borrowed words from Greek throughout its history, and continues to do so. Some of the earliest loans include both very common as well as less frequent words, such as *amethyst, authentic, lethargy, orthodox, orthography, panther,* etc. However, unlike the spelling and pronunciation in present day English, these words were originally spelt with a plosive and probably pronounced as such (see Table 7).

	Early spelling	Date of loans	Source			
amethyst	amatist	1290	OF	amatiste	G	ἀμέθυστος
authentic	autentic	1387	AN	autentic	HomG	αὐθεντικός
lethargy	litergi	1374	MedLat	litargia	G	ληθαργία
orthodox	ortodox	1453	Post-CL	orthodoxus	HomG	ὀρθόδοξος
orthography	ortografye	1460	AN & MF	ortografie	HomG	ὀρθογραφία
panther	panteere	OE	CL AN	panthera panthere	G	πάνθηρ

Table 7. Earlier writing and dates of some loans from /θ/ (based on the OED): OE (Old English), OF (Old French), AN (Anglo-Norman), MedLat (Medieval Latin), Post-CL (Post Classical Latin), MF (Middle French), CL (Classical Latin), G (Greek), HomG (Homeric Greek)

The point we want to emphasise is that the loans from Greek were mediated via Old French, Latin, Anglo Norman. The Romance languages must have adapted /θ/ as /t/, which is what came into English. Figure 1 gives an example of *orthography* written with <t>.

Figure 1: From Hawes Stephen *"The historie of graunde Amoure"* (1509, p.14)

Later, as knowledge of Latin and Greek increased, scholars who were aware that these words had originally had a Greek origin were responsible for changing the spelling, and a change in pronunciation followed. Some proper names remained consistently /t/ such as *Thames, Theresa, Thomas* (the shortened variant of the last one, *Tom,* is often written with <t>), suggesting that the

change to /θ/ was at that stage *not* just a matter of spelling pronunciation. Indeed, the word *thyme* (< Greek *θύμον*, first attested 1398) has also retained an initial /t/, rather than shifting to /θ/, despite its change in spelling. Later loans, which came directly from Greek, are all pronounced with /θ/, including a vast number of medical words such as *arthritis, orthopaedics, anaesthesia,* etc. Spelling can therefore also play a role in loanword adaptation (cf. Vendelin & Peperkamp 2006).

5. Mapping loans – same pattern, different output?

Our view has been that adapting loans from an unfamiliar language involving an unknown phoneme requires replacing that phoneme by a native one. This in turn entails comparing the features of the donor language with one's own language and choosing the replacement based on the best feature matching. We have been discussing scenarios where the contact situation has been extensive enough that the borrowers are not just adapting a single word but are exposed to a number of words which ultimately make their way into their language. Consequently, when an isolated name is borrowed such as *Vincent van Gogh*, in all likelihood *Gogh* was borrowed via the written word. Thus, there was no real phonological adaptation of the output as we can see from the adaptations as [væn gɔf] or [væn goʊ].

We now need to ask to what extent adults can correctly interpret the phonological system of the donor language. A phonological model suggesting that adult borrowers have access to the underlying contrasts of the language they borrow from has been suggested by many authors (Hyman 1970, Jacobs & Gussenhoven 2000, Paradis 2006, Paradis & LaCharité 1997, 2011). The opposite view, namely phonetics-only access, has also been proposed (cf. Best, et al. 2001: Perceptual Assimilation Model, Kuhl 1994: Magnet Model, Peperkamp & Dupoux 2003, Silverman 1992). A hybrid version, phonetic similarity along with the influence of the phonological grammar, suggests that both the phonetics and the phonology play a role in loanword adaptation (cf. Broselow

2009, Kenstowicz & Suchato 2006, Yip 1993, 2006). The mixed approach would explain why in Thai word-initial plosives from English seem to use both phonetic and phonological routes. Thai has a three-way laryngeal contrast /p pʰ b/ while English has a two way contrast with initial aspiration for voiceless stops. The aspirated English stops are borrowed via a phonetic one-to-one match (e.g. *pool* [pʰ] > Thai /pʰ/) while the lack of phonetic voicing in English *bin* is substituted in Thai by the phonemic /b/ and not by /p/.

We are opting for the phonological model since the evidence of loans from English into various languages (Bengali, Dutch, German) and a comparison of Portuguese and English loans into Bengali suggest that an underlying phonological feature matching is imperative. This suggests the borrowers have access to the phonological contrast. How is that feasible? As we mentioned earlier, within FUL, the assumption has been that in acquisition, after the ROOT features (SONORANT/OBSTRUENT, CONSONANT/VOWEL), PLACE comes first and this node includes ARTICUALTORS, TONGUE HEIGHT and TONGUE ROOT features. Consequently, universally, any language with a three way contrast in [CORONAL] fricatives (e.g. /θ s ʃ/) would require TONGUE HEIGHT features to distinguish between them. Thus, a pre-requisite for the borrower to be familiar with the underlying system of the donor is to be able to realise that a three-way contrast exists; once this is established, the feature system would automatically follow. Note, however, this does not mean that the same phonetic sound would always have the same feature: the features depend on other related phonemes. Thus /ʃ/ in Bengali and /s/ in Dutch have no TONGUE HEIGHT feature compared to German and English which have both /ʃ/ and /s/ and hence require such a feature to distinguish them.

A major consequence of these assumptions is that the same phoneme can be substituted in different ways even in related languages. Consequently, English /θ/ is replaced by a variety of phonemes in different Indo-European languages. Table 8 gives a summary.

English	Bengali	German	Dutch	Swiss German
θ	t̪ʰ	s	t	s

Table 8: English /θ/ in various languages

Returning the notion of *pertinacity* in language change (cf. (6)), can we conclude that the maxim "same pattern, different output" restricts loan adaptation and substitution? We believe so. The assumption has been that the closest feature match, keeping in mind that PLACE features override other features, will guide the way in which loans are replaced. Thus, it is the "same underlying" pattern that governs the substitution, but may easily lead to a "different output". Consequently, the guiding features for /θ/ have been [CORONAL, LOW], which led to a variety of replacements as we see in Table 8. A pure phonetic match will not necessarily be the best match. For example, although Bengali has a four way laryngeal contrast (e.g. /p pʰ b bʰ/), English initial aspirated [pʰ] is not borrowed as aspirated but as an unaspirated plosive: English *police* becomes Bengali [puliʃ]. The feature [SPREAD GLOTTIS] is not contrastive in English and hence does not play a role in the matching process. Thus, the underlying phonological grammar of the donor as well as the borrowing language plays a crucial role in loan substitution.

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References

Best, Catherine T., Gerald W. McRoberts & Elizabeth Goodell. 2001. Discrimination of non-native consonant contrasts varying in perceptual assimilation to the listener's native phonologial system. *Journal of the Acoustical Society of America* 109(2). 775-794.

Bloomfield, Leonard. 1933. *Language.* New York: H. Holt & company.

Broselow, Ellen. 2009. Stress adaptation in loanword phonology: perception and learnability. In P. Boersma & S. Hamann (eds.), *Phonology in Perception*, 191-234. Berlin: Mouton.

Chatterji, Suniti Kumar. 1975 [1926]. *The Origin and Development of the Bengali Language. Volume 1*. Calcutta: Rupa & Co.

Chatterji, S and Sen, P. 1931. *Manoel de Assumpçam's Bengali Grammar. Facsimile of the Original Portuguese with Bengali Translations and Selections from his Bengali-Portuguese Vocabulary*, Calcuta: Calcutta University Press.

Chomsky, Noam & Morris Halle. 1968. *The Sound Pattern of English.* New York: Harper.

Dresher, Elan & Aditi Lahiri. 2005. Main stress left in Early Middle English. In M. Fortescue, E. S. Jensen, J. E. Mogensen & L. Schøsler (eds.), *Historical Linguistics 2003: Selected papers from the 16th International Conference on Historical Linguistics, Copenhagen, 11-15 August 2003,* 75–85. Amsterdam: John Benjamins Publishing Company.

Ghini, Mirco. 2001. *Asymmetries in the phonology of Miogliola.* New York: Mouton de Gruyter.

Hall, T. Alan. 1997. *The phonology of coronals.* Amsterdam; Philadelphia: John Benjamins.

Halle, Morris, Bert Vaux & Andrew Wolfe. 2000. On feature spreading and the representation of place of articulation. *Linguistic Inquiry* 31(3). 387-444.

Hanulíková, Adriana & Andrea Weber. 2012. Sink positive: Linguistic experience with *th* substitutions influences nonnative word recognition. *Attention, Perception, & Psychophysics* 74(3). 613-629.

Hyman, Larry. 1970. The role of borrowings in the justification of phonological grammars. *Studies in African Linguistics* 1. 1-48.

Jacobs, Haike & Carlos Gussenhoven. 2000. Loan phonology: Perception, salience, the lexicon and OT. In J. Dekkers, F. v. d. Leeuw & J. v. d. Weijer (eds.), *Optimality theory: phonology, syntax and acquisition,* Oxford: Oxford University Press.

Keating, Patricia & Aditi Lahiri. 1993. Fronted velars, palatalized velars, and palatals. *Phonetica* 50. 73-101.

Kenstowicz, Michael & Atiwong Suchato. 2006. Issues in loanword adaptation: A case study from Thai. *Lingua* 116(7). 921-949.

Klaiman, M. H. 1990. Bengali. In B. Comrie (ed.) *The World's Major Languages,* 490-513. Oxford: Oxford University Press.

Kotzor, Sandra, Allison Wetterlin, Adam C. Roberts & Aditi Lahiri. 2015. Processing of Phonemic Consonant Length: Semantic and Fragment Priming Evidence from Bengali. *Language and Speech*. 1-30.

Kuhl, Patricia K. 1994. Learning and representation in speech and language. *Current Opinion in Neurobiology* 4(6). 812-822.

Lahiri, Aditi. 2002. Pertinacity in Representation and Change. *Paper presented at the Workshop on Pertinacity, Schloss Freudental, July 10-14, 2002.*

Lahiri, Aditi. 2012. Asymmetric phonological representations of *words* in the mental lexicon. In A. C. Cohn & C. Fougeron (eds.), *Oxford Handbook of Laboratory Phonology,* 146-161. Oxford: Oxford University Press.

Lahiri, Aditi & Sheila E. Blumstein. 1984. A re-evaluation of the feature "coronal". *Journal of Phonetics* 12. 133-145.

Lahiri, Aditi & Vincent Evers. 1991. Palatalization and coronality. In C. Paradis & J.-F. Prunet (eds.), *The special status of coronals: internal and external evidence,* 79-100. San Diego; London: Academic Press.

Lahiri, Aditi & Paula Fikkert. 1999. Trisyllabic shortening in English: past and present. *English Language and Linguistics* 3(2). 229-267.

Lahiri, Aditi & Henning Reetz. 2010. Distinctive Features: Phonological underspecification in representation and processing. *Journal of Phonetics* 38. 44-59.

Mohanan, K. P. & Tara Mohanan. 1984. Lexical phonology of the consonant system in Malayalam. *Linguistic Inquiry* 15(4). 575-602.

Paradis, Carole. 2006. The unnatural /Cʲu/ (< foreign /Cy/) sequence in Russian loanwords: A problem for the perceptual view. *Lingua* 116(7). 976-995.

Paradis, Carole & Darlene LaCharité. 1997. Preservation and minimality in loanword adaptation. *Journal of Linguistics* 33(2). 379-430.

Paradis, Carole & Darlene LaCharité. 2011. Loanword Adaptation: From Lessons Learned to Findings. In J. A. Goldsmith, J. Riggle & A. C. L. Yu (eds.), *The Handbook of Phonological Theory,* 751-778. Malden, MA.: Wiley-Blackwell.

Parkinson, Stephen. 2015. Portuguese into Bengali. *Presentation in the General Linguistics Seminar, University of Oxford, Faculty of Linguistics, Philology and Phonetics, May 19.*

Peperkamp, Sharon & Emmanuel Dupoux. 2003. Reinterpreting loanword adaptations: The role of perception. In M. J. Solé, D. Recasens & J. Romero (eds.), *Proceedings of the 15th International Congress of Phonetic Sciences,* 367-370. Adelaide: Causal Productions.

Prokosch, Eduard. 1939. *A comparative Germanic grammar.* Philadelphia: Linguistic Society of America, University of Pennsylvania.

Roberts, Adam C., Allison Wetterlin & Aditi Lahiri. 2013. Aligning mispronounced words to meaning: Evidence from ERP and reaction time studies. *The Mental Lexicon* 8(2). 140-163.

Silverman, David. 1992. Multiple scansions in loanword phonology: evidence from Cantonese. *Phonology* 9(2). 289-328.

Trommelen, Mieke. 1984. *The syllable in Dutch: with special reference to diminutive formation.* Dordrecht; Cinnaminson: Foris Publications.

Vendelin, Inga & Sharon Peperkamp. 2006. The influence of orthography on loanword adaptations. *Lingua* 116(7). 996-1007.

Yip, Moira. 1993. Cantonese loanword phonology and Optimality Theory. *Journal of East Asian Linguistics* 2(3). 261-291.

Yip, Moira. 2006. The symbiosis between perception and grammar in loanword phonology. *Lingua* 116(7). 950-975.

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