Pertinacity in diachrony and synchrony

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'Not everything goes': a familiar phrase, applicable to phonological and morpho-phonological variation, observable both in synchronic systems and in change. Variability occurs on all levels — segmental, metrical as well as tonal. Critical sources of variation range from differences in vocal tract sizes, regular phonological alternation followed by the attrition of phonological contexts of regular rules and of course loans, leading to the maximal modification of reanalysis.
The level of variation as well as *change*, we will claim, is however, severely constrained. The hypothesis entertained is the following: phonological opacity may lead to varying choices for native speakers, and the resulting choice is governed by existing phonological preferences. Evidence that the native system plays a constraining influence comes from detailed examination of texts and poetry from Germanic languages (Dutch, English, German, Norwegian, Swedish) and Bengali. Phonological *nonesuches* (segmental, quantity and tonal) could change the statistical preferences but at each stage the phonological grammar has a restrictive effect.

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1. Introduction

'Not everything goes' is a familiar phrase, applicable to phonological and morpho-phonological variation, observable both in synchronic systems and in change.[1] From a phonological perspective, variability occurs on all levels — segmental, metrical, as well as tonal. Critical sources of variation range from differences in (i) vocal tract sizes (production), (ii) noisy background (perception), (iii) regular phonological alternation followed by the attrition of phonological contexts, and of course (iv) loans leading to reanalysis.

A familiar cycle in phonological change is

- *what the phonology starts off with*
- *what it maintains*
- *what develops later*
- *what survives and is perhaps reanalysed*
- *what we reject (perhaps due to reanalysis)*

A crucial factor concerning the phonology of a language is variation. However, the argument we have made in the past is that the level of variation is severely constrained. The hypothesis entertained is the following: phonological opacity may lead to varying choices for native speakers, and the resulting choice is governed by existing phonological preferences. Phonological *nonesuches*[2] (segmental, quantity and tonal; cf. Kennard & Lahiri 2020) could change the statistical preferences but at each stage the phonological grammar has a restrictive effect.

In recent years, we have called attention to a characteristic of grammars called ***Pertinacity*** (e.g. Lahiri 2002, Dresher & Lahiri 2005). Either an existing phonological pattern persists and applies to new forms and different outputs emerge; thus: **[A] *same pattern, different output realisation*.** The patterns may be visually represented as follows:

The other option is that output forms persevere despite changes in the phonological grammar. Such changes always involve a reanalysis, incited by changes elsewhere in the system; thus: **[B] *different pattern, same output realisation.***

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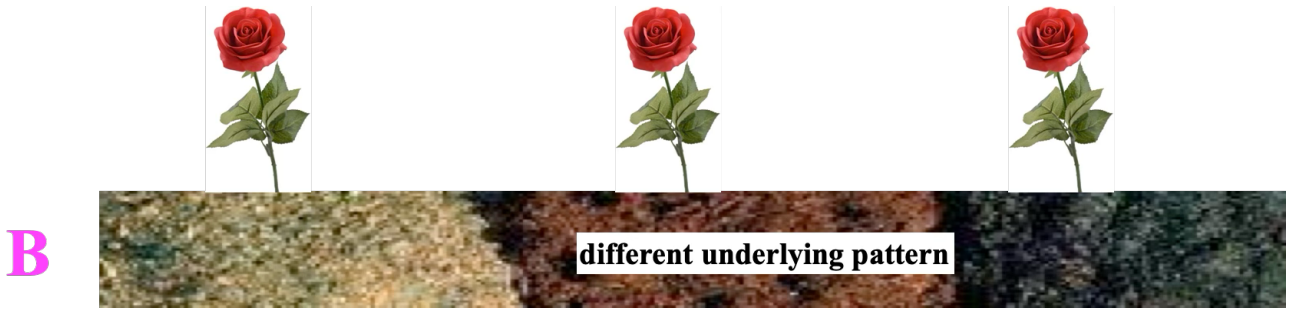
[2] Nonesuch in this context refers to typologically unusual phonological contrasts or phonemes, such as the interdental fricative [θ] in English or [p͡f] in German (segmental) or initial geminates in Swiss German or Berber (quantity).



The default is *Pattern A*. However, the focus here will be on *reanalysis,* and thus *Pattern B.*
We will examine (i) two phonological rules involving vowel features—fronting and raising, and sometimes both—and (ii) the importance of prosodic preferences such encliticisation and stability of metrical patterns. The phonological rules we will first discuss applied in two different language families (both Indo-European), Germanic and Indo-Aryan. The first is the classic example of Germanic *Umlaut* (first used in its modern sense by Jacob Grimm 1819) which has been a source of interest for phonologists for centuries. This rule, which started off life as a perfectly normal phonological process in Old English (OE) and Old High German (OHG), was eliminated as a productive rule from English and survived as a morphological marker in German. The second is a similar phonological process which affected verbs in Middle Bengali. A later reanalysis led to a morphological alternation. The adjustment of a purely phonological alternation to a morphological alternation or indeed complete lack of alternation, was entirely due to the loss of the trigger which itself was an entirely transparent and regular synchronic syncope process. Our focus is on the differences in the reanalyses across the languages. We conclude with a discussion of pertinacity in relation to prosodic preferences, beginning with the pertinacious preference for enclticisation of phonologically weak forms in Germanic, drawing on evidence from historical and experimental work. We then turn to *Pertinacity A*, considering the ways in which metrical parameters have been maintained in Arabic and Germanic, again providing supportive evidence from diachronic, synchronic and neurolinguistic experimental analyses.

2. Germanic umlaut

The gradual transformation of a purely phonetically driven rule to eventually a lexical alternation (possibly reanalysis) is the model suggested in the life-cycle of phonological change (Bermúdez-Otero & Trousdale 2012, Bermúdez-Otero 2015a). From our perspective, we believe that perception and comprehension play a significant role in changing the status of a phonological rule and more importantly, reanalysing the underlying form of the stem (e.g. English after umlaut) or changing the context of the phonological rule but to maintain the pattern of alternation. We begin with umlaut (Booth & Lahiri 2024).

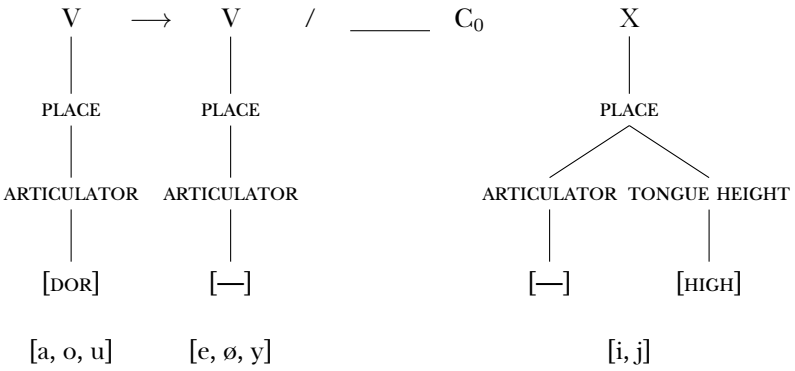
Descriptively speaking, umlaut involves the fronting of back vowels and occurred synchronically in Old High German (OHG) and Old English (OE). Back vowels are fronted in the context of high front vowels and glides and is best attested in the history of West Germanic (as <e/ä>, <ö>, <ü>). Gothic (an East Gmc language) can be used for comparison, since it did not show umlaut: Gothic: *nati*, OHG *nezzi*, OE *nett*; modern German *Netz*, English *net*.

Table 1: OE & OHG relevant vowel and glide features					
Features	i/ɪ	y (ü)/ʏ	u/ʊ	e	a
CORONAL	√	√		√	
DORSAL			√		√
LABIAL		√	√		
HIGH	√	√	√		

(1) Rule A - UML:

[a, u] → [e, y(ü)]/ ____ i/j

At first glance, umlaut looks like a feature spreading assimilation rule. However, we have argued elsewhere that [CORONAL] is always underspecified (Lahiri 2018). A more accurate version of umlaut would be deletion of the feature [DORSAL] in the context of a segment with unspecified segments.



A close examination reveals that the interaction of umlaut (Rule A) and the deletion of high vowels [i, u] after heavy syllables (HVD - Rule B), led to different surface outputs in OE and OHG.

(2) Rule B: HVD: [i, u] →Ø / σ_{HEAVY} —

In actual fact, HVD is best understood as the deletion of the high vowels in the weak branch of a foot, but for the sake of brevity, this will suffice (cf. Dresher & Lahiri 1991, 2022).

A sample derivation is given below in Table 1 for the noun *string* (i-noun).[3] The underlying representation of this noun is as follows: the noun STEM, the STEM-EXTENSION (i.e., class marker /i/) and the PLURAL suffix /-i/: *string:* STEM + /i/$_{\text{STEM EXTENSION}}$ + {-i}$_{\text{PLURAL}}$.

[3] OE and OHG had a number of declensional classes. These could be defined by their stem-extensions (e.g. *-i*, *-ja*) which give their name to the relevant declension classes. These stem extensions were added after the nominal stem but before the case and number suffix. Unlike the *i*-nouns, the *a*-nouns no longer had an overt stem extension in synchronic OE, although the *ja*-nouns survived with the stem extension *-j*.

The synchronic underlying forms stated here can be deduced when comparing the rest of the nominal patterns (cf. Bermúdez-Otero 2015b; Fikkert et al. 2006). A sample derivation in both OE and OHG account for the alternations.

Table 1					
OE *string*	SINGULAR	PLURAL	**OHG** *string*	SINGULAR	PLURAL
	/strang - i /	/strang - i - i/		/stranc - i /	/stranc - i - i/
A. UML	streng - i	streng - i - i	**B. HVD**	stranc- Ø	stranc - i - Ø
B. HVD	streng - Ø	streng - i - Ø	**A. UML**	—	strenc - i
final [i] > [e]	[streng]	[strenge]		[stranc]	[strenci]

A noticeable difference between OHG and OE is that there is a vowel alternation in the OHG stem vowel in *stranc~strenci* (German *Strang~Stränge*), while in OE, the stem vowels in the SG~PL forms *streng~strengi* (cf. English *string~strings*), are identical and both [CORONAL]. The consequences of this dissimilarity are quite multifaceted and we discuss them in turn.

2.1 Consequences of umlaut for English and German

The first point relates to the consequences of the rule of umlaut in English and German. The phonological rule of umlaut led to morpho-phonological stem alternations in both languages in certain noun classes. Only few of these [DORSAL]~[CORONAL] alternations have survived in English (E: *foot~feet*; G: *Fuß~Füße)*, but there are plenty in German: *Blatt~Blätter , Bank~Bänke* [a]~[ɛ]*;* cf. English *blade~blades* [eɪ]~[eɪ], *bench~benches* [ɛ]~[ɛ]. The plural suffixes have generalised over time; here the focus is only on the stem-vowel alternations. Although English still maintains a few such alternations, in German, umlaut is one of the most important markers of plurality, for nouns of all genders (cf. Plank & Lahiri 2015). The second issue relates to the consequences in *underlying* phonological contrasts. In English, although the front rounded vowels (from OE) lost their rounding, they are still front, i.e., [CORONAL] e.g., [yː]>[iː]>[aɪ] (Great Vowel Shift) & [ʏ]>[ɪ]. In Table 2, we compare original OE monosyllabic nouns with [y] and their modern English corresponding words:

Table 2											
	/ȳ/				/y/						
OE	brȳd	hȳf	hȳd	flȳht	fyst	gylt	lyft (air)	dyne	brycg	syll	/yː/, /y/
E	bride	hive	hide	flight	fist	guilt	lift	din	bridge	sill	/iː/ > /aɪ/, /ɪ/
G	Braut		Haut	Flucht	Faust		Luft				/uː/ > /aʊ/, /ʊ/

This is by no means a complete list — many more English words have survived with original umlaut (i.e., front vowels). Synchronically, it is traditionally accepted that umlauted vowels thrive in present day German. However, this statement is somewhat misleading; there are only a handful of German monosyllabic nouns with inherited high front umlaut vowels. Based on the CELEX database (Baayen, Piepenbrock, & van Rijn 1993)[4] German has only 2 monosyllabic monomorphemic inherited nouns with [yː] (*Kür, Tür*) and 5 with [ʏ] (*Fürst, Glück, Müll, Stück, Bütt* (dialectal)). The other nouns listed in CELEX include *Tüll,* with [ʏ] and *Plüsch* with [yː] which

[4] The CELEX database was accessed via the search interface Reelex (version 0.4.5, Reetz 2014).

are non-Germanic. Note that most of the OE words in English with front vowels listed above have *not* survived with umlaut in German: *Braut, Haut, Flucht, Faust, Luft* etc. are all back vowels.

Returning to *Pertinacity*, the interaction of these two rules and the subsequent consequences require attention. Our hypothesis was that all things being equal, *Pertinacity A* will prevail - the native speaker continues to maintain the alternations. However, as we see from Table 2, the phonological alternations within a paradigm in OE were levelled. Not due to analogy, but simply due to the interaction of the rules: UML occurred before the high vowel trigger could be eliminated. Thus, as shown in Figure 1, there has been a complete reanalysis of the underlying stems: all stems with [DORSAL] vowels in the class of /i/ nouns have been reanalysed. Since there was no alternation to sustain the rule of UML, and no longer any clear evidence of the different morphological classes which maintained different stem extensions, subsequent generations had no motivations to support an underlying [DORSAL] stem vowels. The rule of umlaut would have been marginalised to a handful of consonantal stems such as *goose-geese.*

Figure 1: Graphical presentation of the interaction of UML & HVD and the effects of Pertinacity.

Rule UML: (fronting of vowels)

V		V		
[back]	→	[front]	/	[front]
[a, u]	→	[e, y(ü)]	/	i

Rule HVD: [i, u] → Ø / σ_{heavy} —

A. All else being equal, ***Pertinacity A*** prevails
B. Output forms undergo reanalysis, ***Pertinacity B***

Structure of the nouns: stem + /i/ stem extension + /i/ plural.

German: ***Bank Bänke***

Old High German	**singular**	**plural**
	/banc -i/	**/banc -i -i/**
HVD	**banc - Ø**	**banc - i - Ø**
UML	—	**benc - i**
	[banc]	**[benci]**
Mod German	*Bank*	*Bänke*

Underlying representation remains the same & umlaut continues to trigger alternation
Pertinacity A

English: ***bench benches***

Old English	**singular**	**plural**
	/banc -i/	**/banc -i -i/**
UML	**benċ - i**	**benċ - i - i**
HVD	**benċ - Ø**	**benċ - i - Ø**
final [i] > [e]	**[benċ]**	**[benċe]**
Mod English	*bench*	*benches*

No alternation: Surface forms create NEW underlying representation.
Pertinacity B

What were the consequences in English and German? Turning to English, UML affected many more forms, singulars and plurals. Lack of overt surface alternation, easily led to a reanalysis of underlying forms of the stems. There was no need for words like *streng~strenge* to be derived from underlying *strang;* the underlying form now included the front vowel and the rule of umlaut was redundant. The native speakers of English reanalysed the original umlauted vowels into underlying phonological front (now unrounded); i.e., all /y/ > /ɪ/ and /y:/ > /i:/ (> [aɪ] after the Great Vowel Shift). Consequently, the main effect of UML in English is the increase of [CORONAL] front Vs; *reanalysis of original* [DORSAL] *vowels into* [CORONAL] *with no synchronic umlaut, thus Pertinacity B.* We turn to this again later after we touch upon the consequences for German.

Superficially, German has a three-way underlying contrast (e.g., /i/ [CORONAL], /y/ [CORONAL, LABIAL], /u/ [DORSAL, LABIAL]). However, if we consider nouns, this contrast is restricted largely to disyllabic monomorphemic words; inherited monomorphemic monosyllabic nouns with underlying /y ʏ ø œ/ are very rare in German. Instead, the rule of umlaut exists productively, in morphological (inflectional and derivational) paradigms. Thus, the rule of umlaut is retained, though morphologised. *Pertinacity A* prevailed in German because the alternations were an obvious clue for the rule of umlaut: G: *Braut~Bräute, Gast~Gäste* vs. E: *bride~brides, guest~guests.*

2.2 What sort of phonological process was umlaut?

If we consider a phonological process like place assimilation, [CORONAL] consonants followed by different places of articulation ([LABIAL] or [DORSAL]) take on these features: *rainbow* [reɪmbəʊ], *raincoat* [reɪŋkəʊt]. Compounds like *handkerchief* [hæŋkəʧɪf] have deleted the final coda consonant of *hand* and the resulting word has only retained the velar nasal. Umlaut results from a [DORSAL] vowel losing its place feature when a following vowel (ignoring intervening consonants) is [CORONAL]. Vowel raising or lowering in the context of other vowels also ignore intervening

consonants, as does progressive vowel harmony. As we mentioned earlier, the focus is on vowel alternations particularly those of a regressive nature. As we mentioned earlier, the life-cycle proposal of phonological change (Bermúdez-Otero & Trousdale 2012, Bermúdez-Otero 2015a) assumes a phonetically gradient process becoming phonologised (*ban cuts* [bæn kʌts] > [bæŋ kʌts]. However, it is not clear what 'phonologised' would mean in this instance. There is no real need for *ban* to have been reanalysed to *bang,* since this word appears with a [CORONAL] nasal in other conditions. But what happens when the context is eliminated and the alternation is no longer phonologically transparent? The principle of *Pertinacity* assumes that under the circumstances of consonant place assimilation or vowel feature changes, if the context is transparent (perhaps by paradigm structure conditions), there is no imminent danger of a reanalysis of the underlying form.

Let us consider for instance the /a-/ and /ja-/ neuter nouns of Old English, light and heavy stems, to get a sense of the umlaut alternations with and without HVD. The surface forms maybe opaque, but there is enough evidence in terms alternations which would allow the native speaker to assign the correct underlying forms. Three phonological rules are critical: HVD, umlaut and gemination (GEM). Broadly speaking, gemination allows coda consonants to be geminated in a light syllable when followed by /j/. Thus, /j/ can trigger UML, GEM and, when vocalised, is subject to HVD (cf. Fikkert et al. 2006). A quick glance at the tables below shows the possible alternations.

TABLE 3: OE NEUTER NOUNS								
SG ~ PL	Ø ~ **-u**				Ø ~ Ø		-e ~ -u	
	stem extension / Ø /				stem extension /j/			
stem type	LIGHT		HEAVY		LIGHT		HEAVY	
	DOR	COR	DOR	COR	COR	COR	COR	COR
SINGULAR	hol	scip	word	lēaf	bedd	c**y**nn	st**y**cc**e**	stīel**e**
PLURAL	hol**u**	scip**u**	word	lēaf	bedd	c**y**nn	st**y**cc**u**	stīel**u**
	hole	*ship*	*word*	*leaf*	*bed*	*race*	*stick*	*steel*

The noun classes have been grouped into three classes according to the SG~PL endings in Table 3. Certain generalisations can be drawn on the basis of the ending and the stem class.

(3) Observations concerning assumptions about abstract underlying forms and inflectional exponents

- The stem vowel **/y**/ occurs **only** in contrasts with Ø ~ Ø or **-e** ~ **-u** but **never** with the pattern Ø ~ **-u**
- Within the class of nouns ending in Ø or -u, the stem vowel can be unrounded CORONAL [i,e] or DORSAL [o a] but **never** /**y**/.
- When the ending is /-e/ or /-u/, the stem vowel must be [**CORONAL**], including [i, e, y]

These patterns make a stable system and the underlying forms of the stems as well as the order of the rules are retrievable. The clearest case is that of Ø ~ **-u**: as in *scip* ~ *scip**u.*** The singular has no overt exponent, while the plural has the exponent [u]. Closer observation shows that in the Ø ~ Ø instances, [u] does <u>not</u> appear after a heavy syllable — either a long vowel or a syllable closed with a consonant cluster or a geminate (e.g. *word, leaf*). We can conclude that HVD is applying. However, this explanation does **not** work for *stycc**e*** ~ *st**y**cc**u*** & *stīel**e*** ~ *stīel**u.*** In these instances, the final [u] survives after a heavy syllable. We can infer from the examples above that the stem vowels in *stycce* ~ *styccu* and *stīele* ~ *stīelu* class <u>must</u> be derived due to an additional element

producing all [CORONAL] vowels, the stem extension **/j/** which surfaces as the final /-e / and blocks deletion of /-u/. The derivations in Tables 4a and 4b explain the rule interactions.

Table 4a

SINGULAR	word - Ø	stucc - j - Ø	cun - j - Ø
Umlaut	—	st**y**cc - j	c**y**n - j - Ø
Gemination	—	—	c**y**nn - Ø
High Vowel Deletion	—	—	—
Final /j/ vocalises	—	st**y**cc - i	—
Final /i/ vowel lowering	—	st**y**cc**e**	—
Surface	*word*	*st**y**cc**e***	*c**y**nn*

Table 4b

PLURAL	word - **u**	stucc - j - **u**	cun - j - **u**
Umlaut	—	st**y**cc - j - **u**	c**y**n - j - **u**
Gemination	—	—	c**y**nn - **u**
/j/ > /i/ syllabification	—	stycc - i - **u**	**—**
HVD	word Ø	st**y**cc Ø - **u**	c**y**nn Ø
Final /i/ vowel lowering	—	—	—
Surface	*word*	*st**y**cc**u***	*c**y**nn*

From the derivations we can see that /j/ can cause umlaut and gemination in *cyn-* which then undergoes HVD: *cun-j-u* > *cyn-j-u* > *cynnu* > *cynn.* But the heavy stem *stucc-* retains the plural /u/ on the surface since the underlying /j/ did not trigger gemination of a heavy stem and was deleted by HVD, allowing the plural marker [u] to survive.

For our purposes however, it is crucial to note that umlaut applied in both the singular and the plural — i.e., everywhere the conditions were met. Sometimes the trigger has survived ending in final unstressed position as [e] (which was possibly a schwa) or deleted due to HVD. For the /i/ nouns (Figure 1), again we saw that in OE (unlike OHG), umlaut applied both in the singular and in the plural (*benc ~ bence*).

Thus, umlaut applied in both singular and plural forms in all major noun classes in OE. And it was possible to retrieve the underlying forms for a very long time, as *Pertinacity A* would predict. However, as time went on, in early ME, it was difficult to retrieve the underlying forms, and given the lack of umlaut alternations, the new generations reanalysed the underlying forms of the stems like OE *stucc, cun, bank* etc. into front vowels *stycc-, cynn-, benc-*. Even later, the front rounded /y/ became /i/, when the entire trace of umlaut disappeared other than a handful stems like *foot~feet, goose~geese.* Could one describe this a form of phonologisation? Yes, possibly the umlaut rule governing *foot ~ feet* would be a level 1 lexical rule. But more importantly, there has been a systematic reanalysis of the old [DORSAL] stems into [CORONAL] stems. That is definitely *Pertinacity B.* The change has not been in the phonologisation of a rule, but rather the reanalysis of the stem. The cause of the reanalysis is because the underlying stems were no longer retrievable due to lack of overt contextual information.

3. Bengali vowel raising — consequences for *Pertinacity* in loss of trigger, root allomorphy, and new phonological rule

We next turn to another rule involving vowels. Like Germanic umlaut, the vowel alternation is also triggered by a high front vowel /i/. Unlike umlaut, where the vowel is fronted (affecting the ARTICULATOR features), this rule affects TONGUE HEIGHT, raising the vowels.

Bengali has a total of seven oral vowels /i u e o æ ɔ ɑ/, all of which have underlying nasal counterparts. The vowels /e o æ ɔ/ underwent raising when followed by /i/ which is particularly observable in verbal paradigms. Bengali distinguishes two forms in the verb paradigms - a literary form which reflects an earlier form of the language (about 16thC), but still used in formal literature, and the colloquial form, which is the current speech of Bengali in Kolkata - [ʧoliṯ bʰɑʃɑ] (Chatterji 1926; Lahiri 2000). Thus, we can pinpoint precisely changes between early Bengali and the current language. The critical forms are listed in Table 5. Two types of verb roots are significant, closed and open syllalbles. Two additional factors are as follows: Bengali does not allow word final clusters and there is no vowel length contrast. We will only be concerend with monosyllabic verb roots.

The following morphological exponents are important. The PRESENT TENSE has no special marker, but there are markers for other simple tenses: SIMPLE PAST /-l-/, HABITUAL PAST /-ṯ-/, and the FUTURE /-b-/. For our purposes, only the exponent of the 1 PERSON is significant, and it is not identical across the tenses. The 1P suffixes are the following: PRES /-i/, SIMPLE & HABITUAL PAST /-ɑm/, FUTURE /-o/. The 1PERS PRESENT TENSE suffix /-i/ has remained unchanged up until now. Additionally, at the earlier stage of the language, reflected in formal writing ([ʃɑḏʰu bʰɑʃɑ]), an aspectual marker /-i/ was added before the PERSON suffix in all simple tenses except the PRESENT. Again, for the sake of simplicity, we have only listed the forms of the 1PERSON. Note that Bengali does not mark number distinctions on the verb. The CV roots are restricted to the vowels /ɑ, e, o, ɔ/ because /æ/ does not occur word finally in morphemes or words. The verbal nouns of the CV roots surface with a *hiatus* [o̤], making them clearly disyllabic.

Table 5: Patterns of vowel alternations in Bengali verbs

				Literary (early) non-PRESENT marker /-i-/			Colloquial (current) syncope of /i/		
		VERBAL NOUN *underlying root V*	1P PRES /-i/	1 P SIMPLE PAST /-i-l-ɑm/	1 HAB PAST /-i- ṯ-ɑm/	1 P FUT /-i-b-o/	1 P SIMPLE PAST /Ø-l-ɑm/	1 P HAB PAST /Ø-ṯ-ɑm/	1 P FUT / Ø-b-o/
C/ɑ/C	*mix*	mɑkʰ-ɑ	mɑkʰ-	mɑkʰ-	mɑkʰ-	mɑkʰ-	mɑkʰ-	mɑkʰ-	mɑkʰ-
C/æ/C	*play*	kʰæl-ɑ	kʰel-	kʰel-	kʰel-	kʰel-	kʰel	kʰel-	kʰel
C/ɔ/C	*speak*	bɔl-ɑ	bol-	bol-	bol-	bol-	bol-	bol-	bol-
C/e/C	*learn*	ʃekʰ-ɑ	ʃikʰ-	ʃikʰ-	ʃikʰ-	ʃikʰ-	ʃikʰ-	ʃikʰ-	ʃikʰ-
C/o/C	*open*	kʰol-ɑ	kʰul-	kʰul-	kʰul-	kʰul-	kʰul-	kʰul-	kʰul-
C/ɑ/	*get*	pɑ-o̤-ɑ	pɑ-	pɑ-	pɑ-	pɑ-	**pe-**	**pe-**	**pɑ-**
C/e/	*give*	ḏe-o̤-ɑ	ḏi-	ḏi-	ḏi-	ḏi-	ḏi-	ḏi-	**ḏe**
C/o/	*lie down*	ʃo-o̤-ɑ	ʃu-	ʃu-	ʃu-	ʃu-	ʃu-	ʃu-	**ʃo-**

The alternations essential for our argument are listed below in (3)

(3) Summary of vowel alternations in Bengali

a. Closed syllables: in all PRES TENSE, literary and colloquial PAST & FUTURE
   (i) /a/ remains unchanged throughout (cf. /mɑkʰ-/)
   (ii) All other vowels are raised **one step** before PRESENT TENSE /i/, which continues through the medieval period until now: [æ, ɔ, e, o] > [e, o, i, u] (cf. [kʰæl~kʰel], [bɔl~bol], ʃekʰ~ʃikʰ], [kʰol]~[kʰul]).
b. Open syllables:
   (i) Verbs with /ɑ/ in open syllables remain unchanged in the context of the 1PERS /-i/ ([pɑi]). It is also not affected in the literary period in the context of the aspectual /-i-/; cf., [pɑilo], [pɑibo].
   (ii) But root vowels /e, o/ in open syllables are rasied to /i, u/ before the 1P PRES TENSE /i/ as well as in the literary language when aspectual /i/ follows; cf. [ʃui], [ʃuilo], [ʃuibo].
c. Crucially, in the later period, **after** syncope of /i/, the root vowels in open syllable roots do not follow their closed counterparts. Instead,
   (i) /ɑ, ɔ, e, o/ revert back to the original stem when followed by /-b-/ in the FUTURE tense,
   (ii) /ɑ, ɔ, e, o/ are raised when the PAST SUFFIXES /-t, -l/ follow.

The CV verbs are not as plentiful as CVC verbs, but others of this format include:

/Cɑ-/ /kʰɑ-o̱-ɑ/ 'eat', /ʤɑ-o̱-ɑ/ 'go', /ʧɑ-o̱-ɑ/ 'want', /gɑ-o̱-ɑ/ 'sing'
/Ce-/ /ne-o̱-ɑ/ 'take'
/Co-/ / d̪ʰo-ɑ/ 'wash', /ʧʰõ-ɑ/ 'touch'

/Cæ/ roots do not exist, as /æ/ cannot be morpheme/word final. Although /ɔ/ is also not a possible word-final vowel, /Cɔ-/ roots do exist. However, they number only a handful and represent a mixed bag. For example, /bɔ-o̱-ɑ/ 'become', /ʃɔ-o̱-ɑ/ 'to bear, tolerate' do not syncopate /i/ in the PAST or FUT tenses in current Bengali: [ʃoilɑm], [boibo] etc. The verb / hɔ-o̱-ɑ/ 'become' is more frequent, and does pattern like /o/. However, given the variation, these verbs are best treated as a separate group.

We now turn to the differences in the vowel alternations between the CVC and CV roots.
The diachronic scenario we are interested in concerns the consequences of the deletion of the aspectual /i/ from the medieval period until now. Metrical stress in Bengali is initial (Hayes & Lahiri 1991, Lahiri 2000). The syncope of /i/ after the root was a general process introduced in the beginning of the colloquial period. This is similar to the Germanic HVD except that the deletion is always word medial and not word final, when it follows a stressed vowel.

(4) /i/ deletion in Bengali:
/i/ > Ø / σ́ — σ

The vowel raising in the PRESENT TENSE forms continued as before, with no change in the underlying forms of the roots. But the effect of the syncope of the aspectual /-i-/ had varying consequences. In colloquial speech, after syncope, the raised stressed vowels in the CVC roots (other than /a/) were reanalysed, contrasting PRESENT vs. all other tenses: cf. PRES / kʰæl-/ /ʃekʰ- / /bɔl-/ ~ non-PRES /kʰel-/ /ʃikʰ- / /bol-/. Again, this is reminiscent of the English umlauted vowels being reanalysed as underlying front vowels once the phonological rule of umlaut was not available.

However the CV roots, where the root vowel was immediately adjacent to the non-present marker /-i/, behave differently. Compare /kʰol-/ and /ʃo-/. Both vowels continue to be raised in the context of the PRES 1P /-i/: [kʰul-i] [ʃu-i]. But in the PAST and FUTURE, in current Bengali, the CVC roots differ from the CV roots: HAB PAST 1P [kʰul-t̪-ɑm], [ʃu-t̪-ɑm] but FUT 1P [kʰul-b-o], [ʃo-b-o].
we see a different pattern with the future marker /-b/: /ʃu-i-bo/ > /ʃo-bo/ (same as the base vowel) but /kʰul -i -bo/ > /kʰulbo/, where the vowel is raised.

Until now we have not formalised the Bengali vowel raising rule (VR). Before we turn to a discussion of the vowel roots, we will formalise the process. Recall that /æ, ɔ, e, o/ raise one step to /e, o, i, u/. Table 5 provides the ARTICLUATORS and TONGUE HEIGHT features of Bengali. The feature [CORONAL] is assumed to be underspecified (cf. Lahiri 2018 and references therein) in all languages.

Table 6: Phonological features of Bengali vowels based on FUL (Featurally Underspecified Lexicon)

ARTICULATORS							
	i	u	e	o	æ	ɔ	ɑ
CORONAL	√		√		√		
DORSAL							√
LABIAL		√		√		√	

TONGUE HEIGHT							
	i	u	e	o	æ	ɔ	ɑ
HIGH	√	√					
LOW					√	√	

As we have seen in the verbal paradigms, /æ e ɔ o/ are raised when /i/ follows. The raising involves the addition of [HIGH] for /e, o/ and the loss of [LOW] for /æ, ɔ/. Note, that the vowel /ɑ/ has no TH node and thus, it is unaffected by the raising rule. Even in modern Bengali, this raising continues in the PRES TENSE and we can conclude that *Pertinacity A* prevails.

(5) Vowel Raising (VR)

V	(C)	V			V	(C)	V
TH		TH	—>		TH		TH
[—]		[HIGH]			[HIGH]		[HIGH]

V	(C)	V			V	(C)	V
TH		TH	—>		TH		TH
[LOW]		[HIGH]			[—]		[HIGH]

After the non-PRES trigger [i] was syncopated, in a few generations, the only evidence of the medial /-i-/ was the raised vowel of the root. We can see from the current spoken language that the CVC root vowels (except /ɑ/) of all the PAST & FUT forms are one step higher than the verbal noun; the alternation is no longer transparent and simplest solution is root allomorphy: CVC roots PRES /æ, ɔ, e, o/ ~ PAST & FUT /e, o, u/.

However, the more interesting change is the difference between the CVC and the CV roots. The CV roots with /ɔ, e/ (there are none with /æ/), are raised, patterning with their CVC counterparts, in the PAST but <u>not</u> in the FUTURE, particularly with respect to the root vowel /ɑ/ which becomes /e/ in the context of the PAST TENSE suffixes /-<u>t̪</u>-/ and /-l-/ <u>after</u> the medial /i/ has been deleted, but remains unchanged before the FUTURE suffix /-b/.

The only viable explanation is that there has been a reanalysis of the rule of raising in the non-present tenses for CV roots. And this applies to all the vowels including /a/ which has never showed a tendency to raise. To reiterate, the alternations are as follows: /hɔ-/ [holam], [hoʈam] but [hɔbo]; /ne-/ [nilam], [niʈam] but [nebo], and /ʃo-/ [ʃulam], [ʃuʈam] but [ʃobo]. The most dramatic change is with the /Cɑ/ roots where for the first time we see a vowel alternation: /pɑ-/ [pelam], [peʈam] but [pɑbo]. The critical forms are repeated in Table 7

Table 7			verbal noun	PRES 1P	SIMPLE PAST /-l-/	HABITUAL PAST /- ʈ-/	FUTURE
C/ɑ/	pɑ-	*get*	pɑ-o̱-ɑ	pɑ-i	pe-l-am	pe-ʈ-am	pɑ-b-o
C/e/	ɖe-	*give*	ɖe-o̱-ɑ	ɖi-i > ɖi	ɖi-l-am	ɖi-ʈ-am	ɖe-b-o
C/o/	ʃo-	*lie down*	ʃo-o̱-ɑ	ʃu-i	ʃu-l-am	ʃu-ʈ-am	ʃo-b-o

The light grey shaded cells show the raised vowels for underlying CV roots with /e o/. The blue cells show the original vowels which are all retained in the FUTURE which has a /-b-/ marker. The two PAST tenses (/-l-/ and /-ʈ-/) indicate a distinctly different pattern. The CV roots with underlying+6 /e, o/ are all raised, while the original /-a/ root which has as yet shown no tendency to change, is fronted and raised to /e/. Why?

Our conclusion is that once the medial non-present /-i-/ was syncopated, the CV roots are immediately adjacent to the consonantal suffixes of the PAST (/-l-/ and /-ʈ-/) and the FUTURE /-b/. This provoked an assimilation rule of a different sort:

(6) New rule of vowel raising in current Bengali
- Raise the root vowel of C/e, o/ roots one step if a [CORONAL] consonantal suffix (/-t, -l/) follows
- Delete [DORSAL] for /Cɑ/ roots before a [CORONAL] consonantal suffix (/-t, -l/)

The change involves the introduction of a new phonological rule. Not reanalysis of the stem, but the deletion of medial /-i-/ has made the root vowels adjacent to a consonantal suffix, which of course, can influence the preceding vowel. Regressive phonological processes are not uncommon.

The introduction of a new phonological process does not come under the rubric of *Pertinacity* which is about the continuation or loss of a rule or reanalysis of a stem. The *Life Cycle* model of change (Bermúdez-Otero & Trousdale 2012, Bermúdez-Otero 2015a) assumes that a phonological rule begins by being grounded in a phonological process: *ban cream* can become *bang* [ŋ] *cream*. Assimilations of this type can of course lead to a reanlysis of the stem but usually, if the context is available, this will not happen. Early Chaucer manuscripts show that scribes differ in their writing of words like *impatient:* either *inpatient* or *impatient,* both are possible. The prefix /in-/ was perceived as [im-] before /p/ and of course without well extablished prescriptive spelling rules, scribes could have written the nasal as [m] before labials. But even now, the morpheme /in-/ seems easy to retrieve — it is always written as [m] befor labials and even if we pronounce the nasal as [ŋ] before a dorsal, the lack of a dedicated grapheme keeps the 'n' unaffected.

4. **Encliticisation & metrical structure — *Pertinacity* of native phonology**

We address three issues in this section, related to the phonological change and synchronic language processing using empirical experimental evidence. We begin with encliticisation and prosodic word formation. Encliticisation is rather frequent in languages and these are often reanalysed later as affixes (Lahiri 2000, Lahiri & Plank 2010). We have argued in earlier work that encliticisation is

recursive phonological word formation (Lahiri & Plank 2010, Wynne et al. 2018, Lahiri et al. 2005, Lahiri & Sytsema 2018). A classic case of encliticisation leading to suffixation is the dental preterite of Germanic. All Germanic languages have a past tense morpheme beginning with a [CORONAL] obstruent: e.g., English /d/, German /t/. The native verbs altered the root vowels systematically in different tenses (past, past participle etc.), some of which have survived: E *sing, sang, sung;* G *singen, sang, gesungen.* However, many new verbs were derived from nouns and adjectives with a causative or incohative suffix /j/ triggering umlaut: OE *fēdan '*to feed', *cemban* 'to comb', *cyssan* 'to kiss', *fyllan* 'to fill' etc. These verbs did not fit into the ablaut grades easily, particularly with umlaut vowels like /y/, which were all derived from /u/. The simplest manner of making a past tense was thus encliticisation of a preterite or participial form of 'do';[5] e.g., *fall-j did* (umlaut) > *fell=did* (enclticisation, phonological word formation) > *fell-d* (reinterpreted as an affix) > [fɛld]. All Germanic languages have the 'weak preterite' which has now become the 'regular' past morpheme.

Note that umlaut is of course not productive any longer, and the alternation *fall~fell* is synchronically root allomorphy, but the pattern of umlaut in the derived form remains consistent. This example is now part of history, but encliticisation continues to be a productive phonological process on the phrasal domain. Our focus here is on the *pertinacity* of enclitcisation when it comes to native speakers. We will further draw attention to the way non-native but fluent speakers treat a prosodic process.

All function words in English and Dutch tend to be encliticised; i.e., they attach leftwards to become a single phonological word: *Drink a pint of milk a day* becomes [drɪŋkə paɪntə mɪlkə deɪ] with all function words attached to the left (Lahiri & Plank 2022). Historical developments also provide us with evidence of prosodic word formation ignoring syntactic structure (e.g., German *zu der* 'to the' PREPOSITION + DETERMINER > *zur*). Evidence of prosodic word formation also comes from production experiments. Wynne (et al. 2018) showed that in production planning, the size of the first phonological word (PWd) affects the time it takes for a native speaker to begin production. Compounds, phrases and simple words were compared in a production experiment. Participants are shown one of the five possible items (*nightgowns, nice gowns, napkins, nets*) and are asked a question *What is fine*? They are required to immediately respond using the word/phrase they have seen: e.g., *nightgowns are fine* etc. The hypothesis was that the size of the first prosodic word would determine the time it took to begin the utterance.

Table 8

Question: What is fine?	Responses (e.g.) *nets are fine*				Reaction Time prediction
	1st Pwd (cliticised)	2nd Pwd	**Size** of the **1st Pwd** after encliticisation	Total no. of Pwds assuming encliticisation	
Compound (σ́ σ̀)$_{ω}$ *nightgowns*	nightgowns=are	fine	3 σ	1	Slow
Phrases (σ̀)$_{ω}$ (σ́)$_{ω}$ *nice gowns*	nice gowns=are		1 σ	2	V. fast
Disyllabic (σ́ σ)$_{ω}$ *napkins*	napkins=are		3 σ	1	Slow

[5] There is considerable debate about which precise forms of the verb were involved. For our purposes the fact remains that the consonantal onset of the 'do' form was a dental /d/. This later became /t/ in German following the High German Consonant Shift.

Monosyllabic $(\acute{\sigma})_{\omega}$ *nets*	nets=are		2 σ	1	Medium

If the production planning is dependent on the encliticisation, then we expect that *nice gowns are fine* will take the least time to plan because the first PWd is the adjective alone 'nice'. In fact it is expected to be *faster* than the monosyllabic word *nets* because the auxiliary *are* will encliticise and become *nets=are* which is two syllables. The results matched our hypothesis (Wynne et al. 2018). For our purposes it is critical to note that not only do the native speakers show this pattern, but the phonological encliticisation is also a marker of native fluency. We found exactly the same pattern with native speakers for Bengali, who are fluent in English (Wynne et al. 2020). In these production experiments, native Bengali speakers treated prosodic word formation just like native English speakers, but the one difference was lexical stress. In one experiment, the disyllabic words were divided into two groups: initial stress *gadget* vs. final stress *gazelle.* The size of the prosodic word (viz. two syllables) was treated exactly the same way by the Bengali speakers, but they had trouble with the articulation of the second syllable stress. Why? Because their own native phonology requires initial stress and thus this caused errors. Note, the time to plan the production did not differ; the stress was produced incorrectly some of the time. We have two pieces of evidence concerning the way in which *Pertinacity* affected the adaptation and survival of foreign metrical patterns.

4.1 Metrical structure in Arabic

The simplest way to account for metrical stress is to separate the individual parameters: Foot Type (Moraic Trochee (MT), Iamb), Parsing Direction (End Rule: Right/Left), and extrametricality (Consonant/Syllable). Within a single language family, parameters can vary, but usually related dialects bear a certain level of consistency. We see evidence of this in16 Arabic dialects (Lindsay-Smith 2021).

Table 9: Metrical parameters in Arabic dialects: MT = Moraic Trochee, L–R = Left-to-Right Parsing, R–L = Right-to-Left Parsing, ERR = End Rule Right, — No Data Available

Arabic dialects	Foot Type	Direction of parsing	End Rule *position of main stress*	Extrametricality
Palestinian	MT	L > R	ERR	Syllable
Algerian				
Rufaidah				
Lebanese		R > L		
Iraqi		—		
Mak:an				
Muscat				
Quatari				
Sˁanʃa:ni:		L > R		
Cairene				Consonant
Tunisian				
Moroccan Casablanca		R > L		None
Libyan Tripoli				None
Wadi Ram:	Iamb	L > R		Syllable
Rwaili				
Ha:yil				

Of the 13 dialects, only 3 have iambs. Crucially, despite the fact that the direction of parsing differs across dialects, main stress always falls on the right edge — i.e., end rule is right. This has remained consistent across the dialects. It is difficult to determine the extent to which the foot type has changed from older Arabic. We do now that the morphology did refer to iambs (e.g. the broken plurals), but little is known about metrical stress. As for the correlation between and direction of parsing, it has been claimed that clashes are not preferred (van der Hulst 2020). Arabic seems to have maintained main stress right, even if they differ in their direction of parsing. But we will see below that English (and other Germanic languages) have shifted both the direction of parsing (L>R to R>L) and position of main stress (Left vs. Right).

4.2 The role of metrical structure in loan retention and L2 processing

The perseverance of the metrical structure in Germanic has been described at length in Dresher & Lahiri (2022) and Lahiri (2015). The proposed stages of change in metrical structure has been first a shift in the direction of parsing (L>R to R>L) and much later around the 1600 a shift of main stress to the right edge. There is no doubt that the shift of stress from the left edge to the right edge in most Germanic languages is due to the massive influx of Romance loans. We have argued that (Lahiri & Kennard 2019, Kennard & Lahiri 2020) native phonology is very conservative (Pertinacity A) and continues to constrain loans for hundreds of years. Despite the influx of loans in the 11th century, the shift in English from left to right took place in the 17th century. Even then, there is a preference for the left edge if a word has two feet — *hurricane, discipline* etc.

However, although Romance loans into Germanic have caused havoc with the metrical patterns, although pertinaciously the foot structure has remained consistently trochaic. We see effects of adaptation of loans with different stress patterns throughout history. We will address two different issues. First, medieval poets in Dutch and German have consistently borrowed Romance words, particularly if they fit better into their iambic poetry (Sytsema & Lahiri 2018; Booth 2023). More recently, we have been investigating the survival of the loans. It is not uncommon to assume that a word is lost if there are better semantic or pragmatic competitors. We focused, instead, on the *pertinacity* of the metrical structure. Would the pertinacious trochee play a role in the retention or loss of loans? Would it be more likely that if loans were not retained, that a dispreferred metrical pattern (such as words with final stress) be responsible for their loss?

The loans we examined include the following. For Middle Dutch (Middelnederlands MNL) we used the Ms Marshall 29, Oxford, (20,000 lines) also known as Boendale manuscript, which is dated to around 1375. It contains 14th century texts, including *Mellibeus* (1342) and *Jan's Teesteye* (1330-1334) both ascribed to Jan van Boendale, and *Saladijn* (1299) by Hein van Aken (Van Anrooij 2002; Sytsema, 2014). We aslo looked at *Vanden Vos Reynaerde* (VosR) (3500 lines), and the *Leven van Sinte Lutgart* (20,000 lines), written by Willem van Afflighem in 1274. Finally, a poem about courtly love, *Die Rose* (14,400 lines), was translated by Hein van Aken into Brabantic and dates back to around 1280–1300 (Bork & Verkruijsse, 1985: 41). For our Middle English (ME) case study, we looked at Chaucer's *Wife of Bath's Prologue* and Tale (1200 lines) using the Riverside edition from the Harvard Chaucer website (Systema and Lahiri manuscript).

From the verses, we could observe the percentage of loans that were initially or finally stressed by the medieval poets. But the question is what is the survival rate? In both ME and MNL we found that finally stressed loans are more often lost than retained. Overall, about half of the total loans in Dutch have survived in the modern language. In contrast, about 80% of the loans in Chaucer survived. However, the crucial point is the foot structure. In MNL, of the words that were lost, more than 70% had final stress. Only very few words with initial stress were lost. Equally in Chaucer, of the 80% words which survived, most bore initial stress. The Germanic trochaic pattern with

overwhelmingly initial stress preference seemed to have been the dominating force in deciding whether the loans used by the medieval poets survived or not.

Let us now turn to modern Germanic speakers. To what extent do individual foot structures (all trochaic but with individual differences) play a role in comprehension in modern speakers? Below we list Romance loans in Dutch, English and German. Although German and English original stress are very similar, that is not the case for loans as we see below.

Table 10	Dutch	English	German	Similarity in stress placement
GMC	bruidgam	bridegroom	Braut	D=E=G
	mandag	monday	Montag	D=E=G
LOANS				
a)	vend**é**tta	vend**é**tta	Vend**é**tta	D=E=G
b)	kol**ó**nie	c**ó**lony	Kolon**íe**	D≠G≠E
c)	krokod**íl**	cr**ó**codile	Krokod**íl**	D=G≠E
d)	inf**é**ctie	inf**é**ction	Infekti**ó**n	D=E≠G
e)	pan**íe**k	p**á**nic	P**á**nik	E=G≠D
f)	nation**áa**l	n**á**tional	nation**á**l	D=G≠E
g)	nationalit**éi**t	nation**á**lity	Nationalit**ä**t	D=G≠E

Currently, English is probably the most popular L2 language in the world and both German and Dutch native speakers are often very fluent in English. But *Pertinacity* assumes that one's own native phonology will play a constraining role in lexical access. A recent experimental study involving fragment priming examined this issue (Fritz et al. 2023). On listening to the initial fragment of a word, the listener is presented with a matching word or an unrelated word. Along with the test words, there are control items where the fragment does not match what they see and then there are two sets of items where the visual item is a pseudoword ([rop] > **ropine*). The task is that the participants have to decide whether the word they see is a real word or not (lexical decision task with fragment priming). As mentioned earlier, there are equal sets of pseudowords, with related and unrelated fragments.

Table 11	Lexical decision with fragment priming	
Auditory	Visual	
[rɛp]	reptile	*matching word*
[lɔn]		*control fragment*
[rop]	*ropine	*related nonword*
[sɔm]		*control fragment for nonword*

The hypothesis is that the matching fragment will activate the real word faster than the unrelated fragment. However, we were interested whether German speakers, fluent in English, would be influenced by the metrical stress of corresponding words in their language. All words chosen were loans because Germanic inherited cognates would all bear intial stress.

Three sets of words were chosen (see Table 12). The words were all English disyllabic words with initial stress, either with one foot (e.g., *pigeon*) or two feet (*réptile*). There were three conditions: Words in Condition A did not have parallels in German; words in Condition B were also disyllabic in German but with final stress, and in Condition C, the corresponding words in German were trisyllabic with penultimate stress. The results indicate that L2 German speakers successfully

recognised all English words. But there were differences across conditions. They were far faster in activating English words if there were no corresponding loans (e.g., *pigeon, curfew*). This meant that their native vocabulary provided no competition. There were no significant differences when the corresponding words had final or penultimate stress with respect to reaction time. However, when we measured ERP differences (i.e., event related potentials from electroencephalogram data, measuring electrical activity of the brain), we found that existence of corresponding words in German substantially affected processing. For example, in a two foot word like *reptile,* where German almost always has final stress, the L2 speakers showed increased processing costs (Fritz et al. 2023). These results have been in replicated in Dutch as well as in Bengali.

Table 12: Priming effects - German L2 speakers comprehension of English

ERP EFFECTS	***Degree of priming*** = √		
	CONDITION A *NON-EXISTENT IN GERMAN*	CONDITION B *DISYLLABIC IN GERMAN*	CONDITION C *TRISYLLABIC IN GERMAN*
1FOOT WORDS 2FEET WORDS	pigeon [ˈpɪdʒn] curfew [ˈkəːfjuː]	signal [ˈsɪgnl] reptile [ˈrɛptʌɪl] Reptil [rɛp'tiːl] Signal [sɪg'naːl]	method [ˈmɛθəd] nomad [ˈnəʊmad] Methode [mɛ'toːdə] Nomade [no'maːdə]
1FOOT WORDS	√√	√	√
2FEET WORDS	√	√	√

Thus, the native metrical phonology pertinaciously constrains the way in which an L2 speaker processes a second language even if they are very fluent. Recall that the participants had no difficulties recognising any of the conditions. Nevertheless, they were affected when they had competion. Here we see it was not just the existence of a corresponding word but the type of word which existed in German. Particularly for the words with two feet such as *reptile,* where corresponding loans in German almost all have final stress, there were significant processing delays. Again, synchronically the pertinacity of the native metrical pattern constrains lexical access.

Conclusion

Pertinacity has both a diachronic and a synchronic perspective. We began by talking about pertinacity in change, differentiting between pertinacity A and B. Our assumption has been that the default is Pertinacity A, where nothing changes. However, generation to generation, changes do occur, through new grammars being built on data which perhaps is not very clear. We provided two examples: umlaut (vowel fronting) and vowel raising in Germanic and Bengali. Where umlaut was concerned, it applied wherever it could in English, such that paradigmatic alternations were rare (e.g. *foor~feet*). One principle of pertinacity is that the new generation builds their grammar in the simplest way possible; we saw that in Old English, despite certain opacities, there was enough evidence from paradimatic alternations to deduce underlying phonological structures of stems and the rules of gemination, HVD and UML could still actively apply synchronically. However, when the phonological properties of inflectional suffixes—which provided the information for umlaut and high vowel deletion—were neutralised (e.g. final high vowels were reduced to schwa), the evidence for underlying DORSAL vowels was lost. The following generation reanalysed the non-alternating umlauted CORONAL vowels as underlyingly CORONAL. There was no 'phonologisation' of a rule as

such, but the reanalysis of the stem vowels, which substantially increased the number of CORONAL vowels in the language (*Pertinacity B*). German, on the other hand, had substantially more DORSAL~CORONAL alternation, due to the ordering of UML and HVD. Middle High German also neutralised full vowels in unstressed positions, such that the umlaut rule was no longer phonologically motivated, but nevertheless it prevailed, thus *Pertinacity A*. The context of the rule became morphological.

The Bengali vowel raising context was very similar to that of umlaut. Like English, in closed syllables, after syncope, there was no evidence of raising and since all the root vowels were raised, the underlying vowels were reanalysed in the non-PRESENT paradigms leading to root allomorphy. The rule of vowel raising, however, continued to exist productively in current Bengali in the PRESENT TENSE (*Pertinacity A*). The most interesting new development was the reanalysis of the context of the original vowel raising rule for CV roots. The C/ɑ/ roots had never been raised. But once the aspectual /i/ was deleted, all CV roots came in direct contact with the PAST /-t, -l/ and FUT /-b/ suffixes. We see that the [CORONAL] feature of the deleted vowel /i/ continues to have an effect, now transferred to the consonant. The raising rule was extended to CV syllables, no longer referring to the presence of a HIGH CORONAL vowel, but rather the coronality of the consonantal past morpheme.

Prosodic word formation, loan adaptations and non-native phonology all show significant effects of *Pertinacity.* Encliticisation through time continues to pertinaciously show prosodic word formation. Similarly, metrical patterns are very pertinacious even when faced with vast amounts of loans. Survival and loss of particular words are governed by preferred metrical structures. In processing, fluent L2 speakers can adapt phonological word formation in encliticisation, but their own fixed word initial stress inhibits production of finally stressed words (Bengali L2 speakers). Similarly, different metrical patterns of Romance loans lead to processing cost in accessing words on hearing a fragment (German L2 speakers). Thus, the principle of Pertinacity prevails all through the phonological systems.

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