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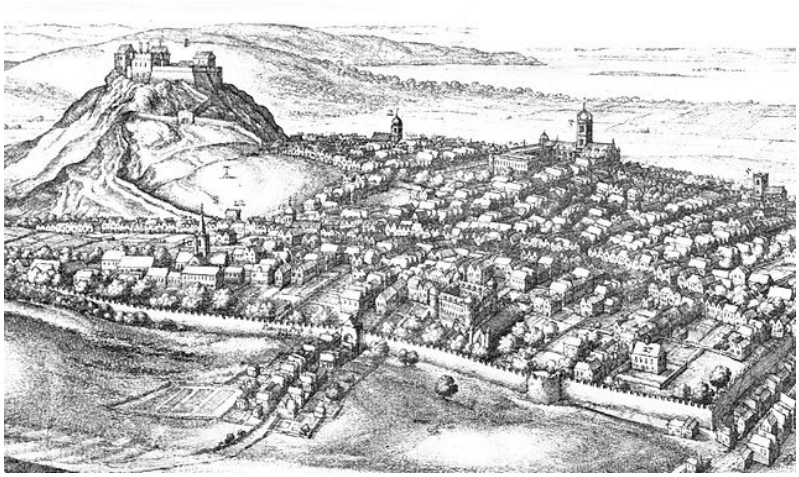

ABSTRACTS BOOKLET

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TALKS

The listener as a source of sound change: between theory and experiment

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This talk revisits "the listener as a source of sound change" model advanced by Ohala (1989, 1993a), which postulates that sound change is initiated when a listener misperceives speech variations and copies the error in production. I give a few interpretations of the model in explaining tonogenesis/tone split induced by onset voicing (hereafter tonogenesis), which gives rise to a high vs. low lexical tonal contrast. I summarise some challenges in experimental predictions, and review experimental evidence that may be considered inconsistent with the model, possibly in part due to terminological vagueness (e.g. "error") and conceptual immaturity (e.g. "parsing").

Ohala (1993b: 157) has hypothesised that tonogenesis arises from **hypocorrection**, a parsing error that attaches F0 perturbation to the vowel as an inherent property rather than attributing it to the contextual effect, similarly to [ut] hypocorrected as [y(t)]. Misperceptions are assumed to be abrupt and language-independent thus they can be tested in the laboratory with any listener (Ohala 1993a: 266). For example, velar palatalisation is supported by the evidence that [ki] is frequently misheard as [ti] but the reverse is less true (Winitz et al. 1972).

Tonogenesis involves changes in two features: creation of a tonal contrast and merger of a consonantal contrast. What is then the *unit of (mis)perception*? If we analyse the two features as separate, two predictions are that listeners tend to perceive (1) the consonant voicing of the two series as identical; and (2) a lower pitch after a voiced than voiceless stop. Some studies (e.g. Gao et al. 2019) may be interpreted as inconsistent with prediction (1). Abramson & Erickson's (1978) studies may challenge (2), where Thai-speaking listeners are instructed to identify the tone in [pa] vs. [ba]. When F0 offset is in the higher range, listeners indeed tend to hear low tones in [ba] compared to [pa], consistent with (2). However, the opposite results obtain when F0 offset is in the higher range, that is, they adjust their pitch perception to the contextual effect. This asymmetry suggests that consonant-pitch (mis)perception may depend on the pitch range, requiring further research and a refinement of (2). Now, assuming that hypocorrection occurs in the low pitch range, it would support a sound change pattern whereby tonogenesis first starts in the low pitch range. Unfortunately, this does not match observations in Middle Chinese (Zhou 1324) or Lalo (Yang et al. 2015) where tone split actually starts in the highest tone. Therefore, **a parsing error, defined here as perceiving F0 perturbation as an inherent property of the vowel, may not explain tonogenesis**.

Alternatively, if we analyse tonogenesis as a cue re-weighting process within a coarticulatory pattern (Beddor 2009), cue alternation from the consonant to the vowel pitch may not affect the identification of the sequence as a cohesive unit, but the perceptual weight given to these cues within the sequence (see Kuang & Cui 2018, Harrington et al. 2019). The experimental question thus becomes how cue alternations lead to perceptual similarities. Gao & Kirby (2021) examined this question using nonce syllables and found first that in a same-different discrimination test, French-speaking listeners tend to confuse between a low-rising pitched syllable with no closure voicing (VOT=0) (here symbolised as [pâ]) and a high-flat pitched syllable with closure voicing ([bà]); and second that in an identification test, [bà] is predominantly identified as /ba/ whilst [pâ] as ambiguous between /pa/ and /ba/. Ohala (2012: 27) explains two processes leading to hypocorrection: a listener's (i) failure to detect the coarticulatory source, or (ii) failure to make use of the coarticulation knowledge. Gao & Kirby's results show that listeners *do not* (ii) fail to attribute F0 perturbation to consonant voicing. On the contrary, even when closure voicing is absent, the coarticulation knowledge helps them recover a low-pitched syllable as [ba]. Therefore, **an identification error at the phonemic level** (as in [ki] identified as [ti]) **may not explain tonogenesis**.

However, when in (i) a listener fails to detect closure voicing auditorily (maybe due to its low auditory salience or the speaker's devoicing), it does not lead to an identification error (= what is said) but to a shift of attention to another perceptually similar cue (= **how it is said**) (see "what-mode" vs. "how-mode" in Lindblom et al. 1995). Such a perception "error" is in fact a fine phonetic attunement. It is not the mismatch between the abstract linguistic categories a speaker intends to convey and what a listener recovers/interprets, but the **difference between the articulation/auditory *target* of the speaker/listener** (shaped by the norm of the community but *possibly unachieved*) **and the acoustic/auditory signal received by the listener**. The target, in the case illustrated here, may not be featural or segmental, but is instead the coarticulatory pattern. Finally, it is vital that theorists and experimentalists have back-and-forth dialogue in the light of new evidence and knowledge, so that problems can be broken down into components that have more accurate definitions and predictions, and the explanatory power of theoretical models can be improved.

Iterated learning models of language change: A case study of Sino-Korean accent

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Since the invention of its alphabet (Hangul) in 1446, the Korean language has been documented in many texts. In Middle Korean (15-16th century) texts, not only segmentals but also suprasegmentals (pitch accent; High/Rise/Low tones) were recorded. This information provides accurate and consistent phonological detail on this stage of the language (Lee & Ramsey, 2011), and shows that Middle Korean had a lexically distinctive pitch accent. This distinctive pitch accent in Middle Korean was lost in most of the contemporary Korean dialects including standard Korean (the Seoul dialect) but is still retained in some dialects.

In this paper, we use iterated learning models to investigate the attested diachronic changes from Middle Korean to two dialects of contemporary Korean (South Kyengsang in south-eastern region of South Korea and Yanbian Korean in north-eastern area of China). Our data is composed of 8,564 disyllabic Sino-Korean nouns, which is one of the major word classes in the Korean lexicon. The data was collected from two South Kyengsang speakers (born in the 1980's) and one Yanbian speaker (born in the 1970's). The corresponding Middle Korean accent for our data was reconstructed based on a study by Ito (2007).

In Middle Korean and the two contemporary Korean dialects, nouns are classified based on accent classes. The accent systems themselves are different between Middle Korean and these contemporary dialects, but as a rule, the locus and associated pitch pattern of a Middle Korean word's accent regularly corresponds with the accent of the cognate word in the contemporary dialects: e.g. Middle Korean *kú.rum* 'cloud' > Kyengsang *kú.rím*, Yanbian *kú.rɨm*; Middle Korean *ma.nʌ́l* 'garlic' > Kyengsang *má.nɨl*, Yanbian *ma.nɨ́l*. Nevertheless, the distribution of the accents in the lexicons of the two Korean dialects indicates that there was a substantial amount of irregular analogical change that deviates from these regular correspondences.

We demonstrate that diachronic analogical changes from Middle Korean to the two dialects of contemporary Korean can be accurately captured by iterated learning models in which each generation learns the phonotactics—i.e., the probabilistic restrictions on sound patterns—of each pitch accent class. We specifically investigate four aspects in the historical accent change: (a) overall accent correspondence, in particular a high regularity when the coda of the initial syllable is –p/l/k; (b) correlations between the regular development rate and the frequency of each morpheme; (c) dialectal differences with regard to a certain tonal type; (d) perceptual similarity among different accent classes.

While iterated learning models of language evolution have typically been used to study the emergence of language rather than historical language change (see S. Kirby et al., 2014 for a review), our simulations reveal that many of the patterns of historical analogical change can be explained as resulting from successive generations of phonotactic learning. Comparisons between different iterated learning models also suggest that Korean learners' phonotactic generalizations are guided by storage of entire syllable-sized units, and provide evidence that perceptual confusions between different forms substantially impacted historical change. This suggests that in addition to accounting for the evolution of broad general characteristics of language, iterated learning models can also provide insight into more detailed patterns of historical language change.

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Foot-Segment Interactions in Middle High German Schwa Apocope

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The issue. An ongoing issue in historical phonology relates to how the synchronic structure of a language can influence its diachronic development, at the segmental (e.g. Honeybone 2019) or prosodic level (e.g. Salmons & Zhuang 2018). This paper follows suit by studying interactions between foot and segmental structure in Middle High German (MHG) schwa apocope. We argue that schwa apocope was blocked after lenis obstruents in certain word classes between MHG and New High German (NHG), resulting in two types of trochaic templates, with monosyllabic (bimoraic) feet favored in items with originally word-medial fortis obstruents and disyllabic feet favored in items with originally word-medial lenis obstruents. We compare these data to related templatic effects found in West Germanic.

Data MHG → NHG. As Raffelsiefen (2003) notes, schwas found word-finally in MHG tended to be lost by NHG in some lexical classes, e.g., collective neuter nouns of the shape *ge-X-e* and uninflected adjectives, after fortis obstruents and sonorants (stress in bold), e.g., MHG *ge**müet*[ə] → NHG *Ge**müt* 'mind', MHG *ge**stirn*[ə] → NHG *Ge**stirn*** 'stars, MHG ***dick***[ə] → NHG ***dick*** 'thick', MHG ***rein***[ə] → NHG ***rein*** 'clean'. Conversely, schwas were typically retained following lenis obstruents, e.g., MHG *ge**lend***[ə] → NHG *Ge**länd***[ə] 'terrain', MHG *ge**birg***[ə] → NHG *Ge**birg***[ə] 'mountains, MHG ***bœ***[zə] → ***bö***[zə] 'mad'.

A foot-based analysis. While Raffelsiefen assumes that post-lenis schwas were retained in these contexts to preserve the fortis-lenis contrast (threatened by final devoicing), we argue that foot structure is responsible for the patterns. We build on the observation that foot-medial onsets in Germanic varieties are preferably lenis, rather than fortis (Holsinger 2001, Honeybone 2012); D = lenis, T = fortis; Green = preferred; Red = dispreferred:

(1) Preferred foot: (CVV.DV); dispreferred foot: (CVV.TV) → (CVVT)

As such, the foot structure in lenis items, e.g., NHG *Ge*(***län***.*d*[ə]) is unmarked while items like **Ge*(***mü***.***t***[ə]) would have a dispreferred foot-medial fortis obstruent, hence *Ge*(***müt***). We concur with Raffelsiefen that schwa-loss in lenis items like MHG **ge**gend[ə] → NHG **Ge**gen[t] resulted from a preference for disyllabic feet, although apocope did lead to a devoiced lenis obstruent: In our approach, retaining schwa would not preserve a preferable foot structure since the lenis consonant is not foot-medial, *(***Ge***.*gen*).*d*[ə]. The patterning of sonorants with voiceless obstruents may contradict a sonority-based perspective, but such patternings have been observed elsewhere, e.g., as in the distribution of Low German overlength (Prehn 2013), Karo stress (Gabas 1999), or Bade H-spread (Schuh 1974).

Comparable interactions. In some Franconian dialects (e.g. Cologne), items with lenis post-tonic onsets always receive Accent 1 (=disyllabic feet in Köhnlein & Cameron 2020; e.g. [(ri:[1].zən) 'to travel'], while items with corresponding fortis onsets preferably receive Accent 2, (=monosyllabic feet; e.g. [(ri:[2]).sən 'to tear'). Furthermore, it has been claimed for some varieties of West Germanic that word-final underlyingly voiced obstruents are parsed as onsets of empty-headed syllables in disyllabic feet (e.g., Van Oostendorp 2017 for Moresnet Franconian, Köhnlein 2018 for High Prussian), which again leads to foot structures comparable to those we propose as active in the change from MHG → NHG.

Bigger Picture. This study underscores the foot's important role in shaping the grammatical and representational structure of the Germanic languages via metrical templates (Smith 2020 for overview). In sum, not only can these templates affect specific lexical classes or morphological operations (e.g., disyllabic Dutch/German plurals, cf. Smith 2020) but they can also be influenced by segmental structure, i.e., the 'bottom-up counterpart' of lenition.

Unstable trees: The challenge of frequency and phonology in phylogenetics

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In this paper, I present a cautionary tale of phylogenetic tree inference gone awry. The study is an attempt to infer a phylogeny of the western branch of the Pama-Nyungan family with a combination of lexical data (binary cognates) and phonotactic data (biphone frequencies). Although the study largely fails to produce stable results, it is illustrative of the challenges of incorporating data beyond lexical cognates in linguistic phylogenetics. Here, I elucidate why this challenge is important and outline a path forward for the field.

Background. Computationally inferred language phylogenies have become a regular feature of mainstream historical linguistics (e.g. Yanovich 2020; Savelyev & Robbeets 2020; Jacques & Pellard 2020). A limitation of phylogenetic tree inference at present, however, is an overreliance on lexical cognate data. There is thus some interest in expanding phylogenetic datasets to be more encompassing of other parts of human language (e.g. Greenhill et al. 2017). As this study demonstrates, however, this is a bigger challenge than one might assume, particularly when matters of frequency are considered.

Earlier research has found phylogenetic signal in statistical phonotactic data, namely the frequencies of transitions between adjacent phonemes and sound classes, indicating possible utility in tree inference (Dockum 2018; Macklin-Cordes, Bowern & Round 2021). This study puts that indication to the test, attempting the actual task of phylogenetic tree inference using statistical phonotactic data and lexical cognate data combined.

Methodology. To test whether phonotactic data strengthens tree inference, I compare the relative fits of two models, a 'linked' model in which a tree is inferred from cognate data and phonotactic data together and a 'separate' model in which trees are inferred from phonotactic data and cognate data separately. The language sample consists of 44 Pama-Nyungan languages from the major western clade identified by Bowern & Atkinson (2012). Cognate data comes from from Bouckaert, Bowern & Atkinson (2018) and phonotactic data was extracted from the Ausphon-Lexicon database (Round 2017). Trees are inferred using a Bayesian Markov Chain Monte Carlo (MCMC) approach in BEAST software (Suchard et al. 2018). For each model, I infer marginal likelihood estimates (MLEs) which give an indication of model fit. The MLEs are compared to one another to indicate relative fit. If the hypothesis that phonotactic data strengthens tree inference is true, the fit of the linked model should be relatively better than the separate model.

Results. The results of the study are indeterminate, due to a lack of stable MCMC convergence. Essentially, when the MCMC process is repeated multiple times on each model, it produces inconsistent results. MLEs ostensibly favour the linked model, which would give support to the study's hypothesis, but these values are revealed to be unreliable upon further interrogation. It is also illustrative to compare the phylogeny produced by the linked model to a baseline tree inferred from cognate data only. The addition of phonotactic data has the undesirable effect of flattening the internal structure of the tree into more of a 'star' (a.k.a. 'rake') phylogeny, and certain specific phonological changes in proto-Arandic have an outsized effect on subgroup placement.

Discussion. Is this the end of the road for phonotactic data in phylogenetics or just a hiccup in experimental design? I present a more nuanced interpretation. There are real computational challenges to modelling the evolution of frequency variables. The model in this study was drastically simplified to make the study computationally feasible, but this rendered it an unrealistic abstraction of real language change. There are technical solutions (most straightforwardly, greater computational power) that might help. More importantly, however, I propose a step-by-step framework for evaluating new types of data other than lexical cognates in linguistic tree inference and advocate for a more careful linkage between real-world diachronic processes and the statistical architecture of these methods.

Khmer onset voicing at the end of the 13th century: *Zhenla Fengtu Ji* revisited

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Khmer is considered to be *innovative* among Mon-Khmer languages (Huffman 1976) because of the extensive phonological restructuring. Particularly important changes occurred in the realization of initial stops, including the devoicing and merger of voiced and voiceless stops (*b, *d, *g > p, t, k) and the emergence of implosives from pre-vocalic voiceless stops (*p, *t > ɓ, ɗ / _V). The historical changes targeting Khmer initial stops (Ferlus 1992) are summarized below:

a.	Proto-Khmer (500 AD)	kaa	gaa	**p**aa	baa	
b.	Pre-registrogenesis (1200-1300 AD)	kaa	**g**aa	**ɓ**aa	**b**aa	*(implosivization)*
c.	Register (1500 AD)	káa	**k**a̤a	ɓáa	**p**a̤a	*(devoicing)*
d.	Contemporary Standard Khmer	kaa	kiə	ɓaa	piə	*(diphthongization)*

However, the details, even the relative chronology of these changes remain in many respects unclear. In this paper, I study the Chinese transcriptions of Khmer words in the *Zhenla Fengtu Ji* (ZFTJ), the work of the Chinese envoy Zhou Daguan, who was sent to Southeast Asia in the late 13th century. Previous research on *ZFTJ* by Pelliot (1951) suggested that by the 13th century Khmer implosives had already emerged, while the merger of voiced and voiceless stops had at least started. This is at odds with the general views outlined above, which assign devoicing to some three centuries later. I motivate a revised analysis of the Khmer transcriptions in the *ZFTJ* and show that the devoicing and merger of voiced and voiceless stops in fact had not yet occurred at the end of the 13th century. There is, however, not enough evidence from *ZFTJ* to confirm whether implosives had already emerged. ***Research question and hypothesis.*** The main question is whether Khmer stops at the end of 13th century had already undergone (i) implosivization, and (ii) devoicing and merger of voiced and voiceless stops. Based on previous research, we expect pre-vocalic voiceless stops to have already become implosive, while voiced stops remain as a separate category. Hence, we expect a three-way distinction of stops – p, ɓ, and b – in 13th century Khmer. ***Methodology.*** I take as my point of departure the hypothesis that Zhou did not rely on Early Mandarin (C.13-14) pronunciation, as Pelliot assumed, but on some variety of Southern Guanhua, a widely used southern Chinese koine that maintained the voicing distinctions of Middle Chinese (Coblin 2009). This is justified by the fact that Pelliot's assumption predicts unrealistic realizations in Old Khmer (OK) and Contemporary Standard Khmer (CSK) for some lexical items. I studied the correspondences between the Khmer pronunciations of transcribed words in *ZFTJ* and the pronunciations of the transcribed characters from a pronunciation in which voicing is *not* contrastive: (i) Early Mandarin, and pronunciations in which voicing is still contrastive: (ii) Middle Chinese (C.6-12) and (iii) modern Shanghai Wu pronunciation, which is the modern descendant of the native Wu variety of Zhou. I also consulted (iv) the *Hongwu Zhengyun* (HWZY), an official rhyme dictionary in the 14th century, which preserves the voicing characteristic of onset stops. ***Result.*** The correspondences found in the transcriptions in *ZFTJ* reveal a two-way distinction: the OK voiceless stops, including those that became implosives in CSK, correspond to voiceless consonants in Middle Chinese, *HWZY*, and Shanghai. OK voiced stops, on the other hand, correspond to voiced consonants. ***Discussion.*** (i) The uncovered two-way distinction supports the idea that the basis for the *ZFTJ* transcription was Guanhua, and that 13th century Khmer still had a voicing distinction. (ii) There is, however, not enough evidence to ascertain whether implosives had already emerged by 13th century. The absence of distinction in the transcription of voiceless stops and implosives can be interpreted in two ways. It is possible that the formation of implosives had not yet occurred; however, it is also possible that the transcriptions did not record the contrast, as foreign implosives (e.g., in Old Thai) were also transcribed with characters representing Middle Chinese voiceless stops.

The role of foot structure in the development of non-concatenative morphology of Nuer

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Nuer and closely related Western Nilotic languages like Dinka and Shilluk, manifest radical non-concatenative morphology: most grammatical information is expressed through modification of the stem – the length and the quality of its vowel, its tone, and the properties of the stem-final consonant. These mutations reflect phonological processes (vowel harmony, intervocalic lenition, etc.) that were triggered by segmental suffixes in Proto-Western-Nilotic (PWN). The suffixes themselves have since disappeared in the languages of Nuer-Dinka group but their cognates still persist in some more distant WN languages (Surkum, Mabaan, Anywa, etc). In this talk, I argue that patterns of modification of the root vowel quality and quantity in Nuer suggest that the metric system of the ancestral language was based on weight-sensitive iamb.

Although Nuer is one of the few world's languages that have a three-way length contrast in vowels, root vowels are specified as short or long only, while vowel overlength is always a product of morphological manipulation. The length of the root vowel is the main factor determining the morphological behavior of the lexical item.

First, roots with short and long vowels follow different patterns of vowel quantity modification. Consistently, in morphological contexts where long roots lengthen to overlong, short roots do not lengthen at all; while in those contexts where short roots lengthen by two degrees of length (to overlong), roots with long vowels shorten to short. For example, the noun *lù̱k* 'court' (short) has a Gen Sg form *lù̱ɔ̱k* (also short) and a Pl Nom form *lú̱ɔ̱::k* (overlong), while the noun *rú̱:p* 'forest' (long) has a Gen Sg form *ru̱ɔ̱̌::p* (overlong) and a Pl Nom form *rú̱ɔ̱p* (shortened). Although vowel lengthening in Nuer-Dinka languages has long been linked to presence of vowel-initial suffixes in the ancestral language (Andersen 1990), the mechanism responsible for the observed patterns has not been identified. I suggest that differences in the behavior of roots with long and short vowels are linked the metric structure of the ancestral language, which constructed feet based on weight-sensitive iamb. Eventually, all feet contracted into a single syllable through loss of suffixal material: even feet (two short syllables) yielded dimoraic syllables (V + moraic coda or V: + non-moraic coda), uneven feet (long + short or short + long syllable sequences) yielded trimoraic (overlong) syllables; monosyllabic feet developed into monomoraic (shortened) syllables. Roots with short and long vowels follow different patterns of length alternations in Nuer because they initiated a different foot structure in the ancestral language. Thus, a short root followed by a single suffix formed an even foot, a long root followed by a single suffix formed an uneven foot, while a long root followed by two suffixal syllables formed a monosyllabic foot. In Nuer, these original configurations yielded a dimoraic, a trimoraic, and a monomoraic syllables correspondingly.

Second, the pattern of vowel quality modification may also depend on the length of the root vowel. For example, the stem vowel in gerunds has a different quality depending on whether the root vowel is short or long. Thus, the vowel in the gerund *nɑ̱́k* 'killing.NOM' derived from the root *nʌ̱k-* 'kill' has a different quality that the vowel in the gerund *bɑ̱̌:r* 'shooting.NOM' derived from the root *bʌ̱:r-* 'shoot'. To explain this and similar patterns I propose that suffixal material in the ancestral language was subject to vowel syncope and other processes that interfered with the regular metaphonic relationships between suffixal vowels and the root – relationships that are presently reflected in vowel quality. Crucially, these phonological processes affected vowels based on their metric position – strong vs weak – and therefore were indirectly conditioned by the length of the root vowel due to the weight-sensitivity of the metric system.

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Phonetics and phonology in contact-induced change: The case of Yucatan Spanish

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Language contact has long occupied a key role in phonological theory and in theorizing phonological change. Work from Weinreich (1953) to van Coetsem (1988, 2000) and since has made substantial progress in modelling top-down, phonological effects of one language on the sound patterns of another. Other work (e.g., Flege 1995) draws on phonetic properties, particularly in terms of establishing equivalent categories across languages and conditions under which those categories may converge toward or diverge from each other. Related models of sound change (e.g., Ohala 1993, Blevins 2004) emphasize the perception of changes in the phonetic signal as the locus for phonological change. We investigate a situation with asymmetrical phonological and phonetic outcomes that supports the case for systematic integration of phonetic and phonological accounts in sound change and contact (Natvig 2021, Salmons 2021). Specifically, we examine Yucatan Spanish, which on the surface has developed a mixed contrast with a class of voiced stops from Spanish and aspirated stops from Mayan.

We employ laryngeal realism and dimensional feature theory (Avery & Idsardi 2001), and privativity, where active properties of natural classes are specified in the phonology and contrast with phonologically inert, unspecified classes (phonologically Ø). Following dimensional theory, the phonology operates not on features as such, but on nodes that organize mutually exclusive articulatory gestures, 'dimensions.' Dimensions are then 'completed' with one of the opposing pairs of gestures (Avery & Idsardi 2001). On this view, Spanish voiced obstruents are specified for Glottal Tension (GT), completed with slack vocal folds, while the voiceless series is Ø. At least many Mayan languages have a Glottal Width (GW)-Ø distinction (Bennett 2016), where GW is completed with constricted glottis and the plain class is phonetically aspirated (Michnowicz & Carpenter 2013), i.e., completed with the opposing spread glottis gesture.

Yucatan Spanish speakers, including monolinguals, produce Spanish /p, t, k/ with aspiration. Michnowicz & Carpenter (2013) report, e.g., VOTs of 34 ms vs 26 ms in Castilian on /k/. This is not the result of either full imposition of phonological categories or phonetic features from one language on the other, but, we argue, an integration of Spanish phonology with Mayan phonetics. We understand aspiration as the outcome of an integrated system of Spanish and Mayan laryngeal contrasts, brought into Yucatan Spanish via Mayan-Spanish bilingualism.

For these bilinguals, the acquisition of Mayan and Spanish representations creates a system where both Spanish GT and Mayan GW contrast with a single unspecified series by language. We argue that this shared Ø category provides *phonological* equivalence across languages, which may then be variably completed using procedures from both languages and is accordingly a catalyst for aspiration in Yucatan Spanish. For monolingual Yucatan Spanish speakers, aspiration occurs by diffusion of features from a bilingual community into a monolingual phonology, resulting in a GT-Ø laryngeal system with varying degrees of voiced-aspirated distinctions in the phonetics. Lack of phonological specification has been argued to correlate with greater phonetic variation (Dresher 2005) and we find that here as well, with a (surface) change of the unspecified series.

These patterns contribute to our understanding of how contact leads to new phonological and phonetic systems, including the introduction of novel variants (Salmons & Purnell 2020, Natvig 2021) and how contrastive representations constrain the scope of potential changes.

Defying aerodynamics: The plain voiceless bilabial trill in Malekula languages

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Bilabial trills are typologically rare sounds. They are found in languages clustered in only very few geographic areas, one of which is the island of Malekula in Vanuatu, where 40+ Southern Oceanic languages are spoken. Globally, and on Malekula Island, the prenasalized ᵐʙ is the most common type of bilabial trill. ᵐʙ has been documented in 23 Malekula languages. Recently collected data show that 11 Malekula languages also have a plain voiceless bilabial trill ʙ̥. In at least two of these languages – Ahamb and Lamap (Port Sandwich) – both ᵐʙ and ʙ̥ are phonemic.

Maddieson (1989) analyzed ᵐʙ in a number of languages and concluded that cross-linguistically ᵐʙ developed from a [mbu] sequence. This was supported by an account of the aerodynamic principles involved. In short, the initial nasal portion allows for air to escape through the nose, which keeps intraoral pressure low during the bilabial occlusion; the closed rounded vowel that follows means that the lips are in a protruded position at the time of release. Together, these two factors make it possible for Bernoulli forces to occur, thus allowing the lips to oscillate spontaneously.

In this paper, we re-examine Maddieson's aerodynamic hypothesis against the Malekula data by employing both a synchronic and a diachronic analysis.

Comparisons of cognate sets from Malekula languages and Proto North Central Vanuatu and Proto Oceanic reconstructions show that in Malekula languages, ᵐʙ developed from *ᵐbu sequences (in line with Maddieson's hypothesis) and ʙ̥ developed from *βu sequences. Despite the lack of an initial nasal portion, [βu] sequences arguably adhere to Maddieson's aerodynamic scenario, because intraoral pressure is maintained low during β, due to its fricative nature.

One key characteristic of Maddieson's hypothesis for ᵐʙ is that the aerodynamic conditions are met both for the original sequence [mbu] as well as for the resulting synchronic ᵐʙV sequence, where V is most commonly a closed rounded vowel. However, this appears not to be the case in the resulting synchronic ʙ̥V sequences (where V is most commonly a closed rounded vowel). Measurements from Ahamb show that ʙ̥ is characterised by a relatively long average total closure of 125 ms, while the average total closure in ᵐʙ is 33 ms (preceded by 78 ms bilabial closure with nasal airflow). Although no intraoral pressure measurements are available, the long total closure in ʙ̥ suggests relatively high intraoral pressure, which means that the aerodynamic conditions proposed by Maddieson are less likely to be met.

In this paper, we conclude that the emergence of ʙ̥ and, more importantly, its persistence in some Malekula languages is most likely linked to the presence of ᵐʙ in those languages' sound systems: only languages with ᵐʙ have ʙ̥; ʙ̥ is contrastive only in languages where ᵐʙ is also contrastive. It is possible that ʙ̥ persists in these languages in order to balance their phonemic inventory, where prenasalization is already the main contrast in plosives, as well as in another pair of trills at the coronal place of articulation.

On the historical evolution and trade-off dynamics of functional load

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Function Load (FL) quantifies the contribution of specific phonological contrasts to distinctions made across the lexicon (Martinet 1952, Hockett 1967). Here we examine FL from a phylogenetic, statistical perspective, and thus our contribution is to the quantitative typology of sound change, and methods for its investigation. In the Pama-Nyungan language family of Australia we find (1) a high degree of phylogenetic signal in FL, and (2) a historical trade-off dynamic, between the FL of vowel length and of the following consonant, mirroring known synchronic allophony and compensatory sound changes (Fletcher & Butcher 2014, Hale 1976).

Background Martinet speculated that phonological contrasts with low FL were particularly prone to subsequent historical loss, a hypothesis which has been confirmed in multiple studies in the past decade (Silverman 2010, Bouchard-Côté et al. 2013, Wedel et al. 2013, Babinski & Bowern 2018). As we know, when one contrast collapses (e.g. vowel length), its neutralisation can often trigger another, previously allophonic, distinction to become contrastive (e.g. post-vocalic consonant strength). In terms of FL, this connection would manifest as a trade-off—a negative correlation—between the FL of the two contrasts: as one falls, the other rises. Previously, the focus on FL has been on the transition from very low FL, just before phonemic neutralisation, to zero, upon neutralisation. However, logically, trade-off dynamics should be possible at any values of FL. These dynamics, at *any* value of FL, are our focus here.

Methods & Materials Hockett demonstrates that FL is most naturally operationalised in terms of entropy (Shannon 1948). The procedure requires selecting substrings of interest (be it words, roots, V+C substrings, single phonemes, etc.) and asking how their entropy changes when certain contrasts are neutralised. Here, we focus on V+C substrings, where V is the vowel of the first syllable of a word and C the following consonant. We examine contrasts between long vs short vowels (FL_V), and among consonants (FL_C) according to manner/length/voicing/ fortition, but not place of articulation. We assess the phylogenetic signal of FL_V and FL_C in 123 Pama-Nyungan languages as described in Macklin-Cordes et al. (2021). Phylogenetic signal is a measure of genealogical structure in data: how well does the distribution of observed FL values match the hypothesis that they evolved along the Pama-Nyungan family tree? Next we assess the presence of a historical trade-off relationship by calculating the phylogenetic Pearson's correlation (Matrins & Garland 1991) between FL_V and FL_C. This is a measure of correlation which takes the genealogical relationships between languages into account.

Results PHYLOGENETIC SIGNAL as measured by Blomberg's *K* (Blomberg et al. 2003) was high (FL_V 0.97±0.04, FL_C 0.96±0.03). By comparison, this is even higher than was found for phonotactic biphones (two-segment sequences) in Pama-Nyungan (Macklin-Cordes et al. 2021). This suggests that *all* values of FL, not only those close to zero, exhibit interesting historical dynamics deserving more investigation. PHYLOGENETIC PEARSON'S CORRELATION between FL_V and FL_C was significant and negative ($r = -0.28$, $p = 0.006$), as hypothesised (compare: nonsignificant between FL_V and the FL of consonant *place,* $r = 0.02$, $p = 0.778$).

Discussion Studies such as ours examine diachrony at a statistical level, and so contribute to the quantitative characterisation of diachronic typology. Recent research has found significant statistical genealogical structure (phylogenetic signal) in phonotactics, that is, in the phonological *substance* that languages use. Here we find it also in FL, in the *contrastive function* that the substance fulfils. We find evidence of a deep historical trade-off dynamic, which has shifted FL between parts of Pama-Nyungan phonological systems. This result suggests the potential of investigating the dynamic *flow* of contrastive-ness through phonological systems as they evolve over time. Future applications include other, major questions of diachronic trade-offs, such as the rise of phonemic tone and register (such as contrastive phonation) in Southeast Asia, tied to losses of consonantal laryngeal distinctions (Mattisoff 1973, Dockum &Gehrmann 2021).

Frequency-predicted shifts don't require word-specific phonetic details

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Some sound changes seem to proceed at different rates depending on lexical frequency. This is sometimes interpreted as reflecting phonetically detailed exemplar memories, with changes spreading via lexical diffusion (Pierrehumbert 2002, Bybee 2012). However, it can also be explained by frequency-conditioned reduction later in processing. Work on synchronic variation proposes that higher frequency and contextual predictability facilitate activation, causing faster and more reduced productions (Kahn & Arnold 2012, Jurafsky et al 2001). Under this analysis, frequency-predicted changes need not reflect word-specific phonetic details.

This work presents a study of how repeated exposure to particular lexical items influences listeners' category boundary between aspirated and unaspirated stops, and what the effects suggest about frequency-related sound change. Listeners' VOT category boundary is lowered both after exposure to shortened VOT stimuli and after lengthened VOT stimuli, suggesting that the VOT differences are caused not by word-specific exemplars but by frequency influencing reduction processes in phonetic implementation and similarly in perceptual access.

96 native speakers of English completed a perceptual task with two phases: exposure and testing. The test phase examined 24 target pairs of words differing only in aspiration of the initial stop (e.g. *town, down*). The two words in each case had comparable lexical frequency.

The exposure phase was a task categorizing vowel duration, intended just to ensure that participants listened closely to the exposure items. There were three exposure conditions for the aspirated words of each pair: (a) lengthened VOT (mean 137 ms), (b) shortened VOT (mean 51 ms), (c) no exposure (control). Participants heard 4 words with lengthened VOT and 4 with shortened VOT, each appearing 9 times. For each participant, the manipulation was consistent for all instances of a word, e.g. *town, pan, pet, could* with long VOT, and *tomb, peep, cob, cull* with short VOT. No unaspirated ('voiced') words appeared during exposure.

During testing, participants heard 24 items manipulated along a 3-step VOT continuum (72 total stimuli); the small number of steps was used to reduce the possibility that additional exposure might obscure effects of the exposure manipulation. Participants identified each stimulus as matching one of two response options differing only in the aspiration of the initial stop. Results are from a logistic mixed effects model for responses selecting the voiceless aspirated item of each pair (e.g. *town* vs *down*).

Listeners were more likely to select responses with aspirated initial stops (e.g. *town*) after being exposed to that word in the exposure phase, either with a shortened VOT ($\beta = 0.546$, $z = 4.79$ $p < 0.0001$) or a lengthened VOT ($\beta = 0.299$, $z = 2.58$, $p = 0.00986$). That is, listeners accepted the aspirated stop as having a shorter VOT when they had recently been exposed to that word, regardless of the VOT in the exposure items.

The category boundary is lowered in both VOT manipulation conditions, indicating that the shift is due to recent exposure increasing the frequency of these words in the local context. Differences in VOT are based on this predictability; salient words are accessed more easily and thus have shorter expected duration. Words do not have their own distinct VOT targets, but lexical frequency impacts the realization of VOT and expectations in perceptual access. Apparent frequency-sensitive sound changes can be explained similarly. Reduction-driven shifts may first be apparent in high-frequency words, but the prototype for the entire category is shifted based on these items, rather than the target phonetic details of specific words.

Cross-generational variability of laryngeal contrasts in Shuangfeng Xiang Chinese

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Laryngeal contrasts across the world's languages show diverse patterns. Cross-linguistically, languages differ in the phonetic properties that are employed to signal laryngeal contrasts (Cho et al., 2019). Within a language, the relative weighting of phonetic properties for the same laryngeal contrasts can also vary across speakers (e.g., Coetzee et al., 2018). Most studies thus far have examined non-tonal languages with a binary system of laryngeal contrasts. However, Pittayaporn and Kirby (2017) show that in some Southeast Asian tonal languages (Cao Bằng Tai), both the quantity of laryngeal contrasts and their phonetic realizations can be much more complicated than that in non-tonal languages. Results reported in this study show that the phonetic realizations of multiple laryngeal contrasts can vary across speakers of different generations within a Sinitic tonal language. Furthermore, such variations provide insights into potential pathways of diachronic sound changes.

Shuangfeng Xiang Chinese features a three-way laryngeal contrast in obstruents (unaspirated, aspirated, and voiced), which interacts with a five-way lexical tonal contrast (h-level, l-rising, h-falling, h-rising, and l-level, T1 to T5 hereafter). T1, T3, and T4 only co-occur with voiceless onsets, while T5 occurs exclusively with voiced onsets. T2, howerve, can co-occur with all three-way onsets. In addition, phonation has been argued to serve as an important cue for signaling the voiced onsets (Zhu & Zou, 2017). We designed an experiment to understand further the phonetic realization of laryngeal contrasts and their potential sound changes. A total of 20 morphemes with two tokens under each laryngeal condition of the five lexical tones were produced by speakers of two generations with two repetitions (22 old speakers with an average age of 58 yr vs. 15 young speakers with 35 yr). Acoustic and the electroglottograph (EGG) signals were recorded simultaneously. Three parameters – voice onset time (VOT) of the onset as well as fundamental frequency (*f0*) and laryngeal contact quotient (CQ) of the following vowel were analyzed. Multilevel regression models (i.e., GCA, GLMMs, and LMMs) and principal component analysis (PCA) were applied to data analyses.

Results show that the *f0* contours following aspirated onsets were consistently lowered relative to those following unaspirated onsets. Furthermore, the unaspirated onsets were consistently realized with shorter VOT and higher CQ in comparison to that after aspirated onsets. The voiced onsets consistently co-occurred with low *f0* contours but showed varied relationships between VOT and CQ across the two generations of speakers. Specifically, the old-generation speakers produced predominately negative VOT without significant differences in the following vowel's CQ. The young-generation speakers, however, showed fewer negative-VOT tokens and decreased CQ over the vowel. The PCA results further show that *f0*-related cues (e.g., *f0* height, slope and curvature) were mostly correlated with PC1, while VOT and CQ with PC2. While these patterns hold across generations, the young-generation speakers seem to rely more on CQ (less on VOT) to signal the onsets from the voiced category, as reflected by contribution ratios of the two cues in PC2. Taken together, the changing relationship between laryngeal timing and phonatory state suggests a possible pathway for cue weighting in the phonetic implementation of the voiced category in Shuangfeng Xiang Chinese, a tonal language with complex laryngeal contrasts.

Stability drivers in the emergence of Portuguese-based creoles

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Most research on language stability departs from a sample of mother-daughter languages (e.g. Greenhill et al. 2017; Moran et al. 2021). However, the phonological stability in creoles are still almost unexplored. In this study, we seek to answer the question: "Which linguistic and non-linguistic factors influence the stability of the lexifier's phonological system in the creolization process?".

First, we collected 592 phonetically transcribed words from Swadesh lists (Swadesh, 1955) of 16 Portuguese-based creoles. The words are of Portuguese origin and represent all segments in all possible word-positions of the lexifier. Second, we compared each lexifier's segment with its creole's segment and assigned stability values for manner and place of articulation (0 if there was a change, 1 if there was no change), using features encoded in the International Phonetic Alphabet. Finally, we measured the stability of each creole and each segment, as well as the correlation between stability and other non-linguistic factors (e.g. conditions of contact) and linguistic factors (e.g. word-position) by calculating the arithmetic mean (Honeybone, 2019).

We confirm that creoles formed under slavery conditions tend to be less stable and more heterogeneous (e.g. Fa D'Ambô, stability = 0.68) than creoles born from commercial contact (e.g. Kannur = 0.92), regardless of the period and the number of languages involved in the contact situation (Faraclas et al., 2007). Regarding the lexifier's influence, we verify that some of the consonants whose stability is below the average value in the sampled creoles, e.g. /v ʎ ʒ ɲ r ɾ t͡ʃ/, match some of the consonants that went through a change in Portuguese between the 16th century until today, i.e. /v s z t͡ʃ ʁ/. We also find that the highly stable segments /p t m n f/ correspond to the most frequent typologically (Moran & McCloy, 2019). On the contrary, a high degree of borrowability does not guarantee segment stability during the creolization process. Lastly, we find that word-initial position promotes stability in the majority of the cases.

Our results have important implications for historical phonology and for second language learning. Firstly, the data suggest that quality is more important than quantity in contact situations. Secondly, we show that typological frequency is a major stability driver (rather than borrowability). Therefore, instability appears to be motivated for both typological rarity and for instability within the lexifier language (which explains apparent outliers like /v/). We believe that these findings take us one step closer for reconstructing these languages, which have no orthographic or sound records of their early history.

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Adults' adoption of a novel allophone category: phonetics, phonology, or both?

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The received view on sound change, in part founded on a critical period for the acquisition of phonological structure, is that an adult speaker may only originate, actuate, and transmit *superficial changes*, and it is the language-learning child that must perform the final reanalysis (Labov 2007). In this view, adult individuals are perfectly capable of taking a community-level sound change and integrating it into their own grammars (a process that I term *adoption*), but they are predicted to do so based only on phonetic-implementation rules, and not to mutate their phonological categories.

I provide data from two sets of laboratory experiments that are in accordance with this account in the short term (<=9 months), but pose a problem for it in the long term (years–decades). The phenomenon of study concerns a vowel shift in Netherlandic Dutch, whereby the tense mid vowels /eː,øː,oː/ have undergone an allophone split into phonologically-conditioned diphthongs [ei,øy,ou]. This causes them to have the same distribution as the original diphthongs /ɛi,œy,ɑu/: all six vowels lose their upglide before, among others, a coda /l/. However, in Flemish Dutch, this allophone split has not occurred, and hence Flemish Dutch retains the original single-allophone realizations [eː,øː,oː]. The resulting equivalence between diachronic changes and synchronic variation make it possible to study either process experimentally.

Experiments to interrogate the received view on sound change were set up in the same way as Evans & Iverson (2007), studying two populations of Flemish ('conservative') individuals who had migrated to the ('innovative') Netherlands post-adolescence. The first experiment was a longitudinal or panel study, following 20 participants (10 Flemish migrants, 10 Netherlandic controls) for nine months. Production and perception experiments were held 1, 4, and 9 months after arrival of the migrant group in the Netherlands, eliciting productions and perceptual judgments of these three vowels (among others) both before coda /l/ and elsewhere. Results show persistent differences between the Flemish migrants ([eː,øː,oː]) and the Netherlandic controls ([ei,øy,ou]), which did not abate over time. This suggests that the migrant participants simply did not change, phonetically or phonologically. Therefore, a second experiment was performed with 106 participants: 45 Netherlandic controls in the Netherlands, 43 Flemish controls in Flanders, and 18 migrant participants who had lived in the Netherlands for a much longer time (years to decades). At the group level, these migrants were found to be in between the two control groups on both perception and production: on average, they had partially adopted the changes. However, at the individual level, there turned out to be an important difference between perception and production: the group-level production effect turned out to be driven by some highly innovative migrant speakers and some highly conservative ones, which a cluster analysis on the by-speaker random-effect coefficients confirmed. In perception, no such inter-individual differences were borne out, although the individual differences in perception did correlate with those in production.

These results show that, when given enough time (i.e. >9 months), adult speakers *can* adopt novel allophones, at least in production. What's more, the observation that the individual differences split out into two clear categories suggests that this is a (partially) discrete process. Implications for both the received view of sound change as well as general phonological theory will be discussed: for scholars like Flemming (1999) or Fruehwald (2013), such categoricity would be evidence for the adoption of a phonological allophone distinction, while others would equally unequivocally see this as evidence for well-functioning phonetic-implementation rules. A resolution is offered in terms of Bermúdez-Otero's (2015) scattered rules.

POSTERS

Historical Optimality Theoretic Typology of the Treatment of Word-internal Potential Super-heavy Syllables in Arabic Dialects

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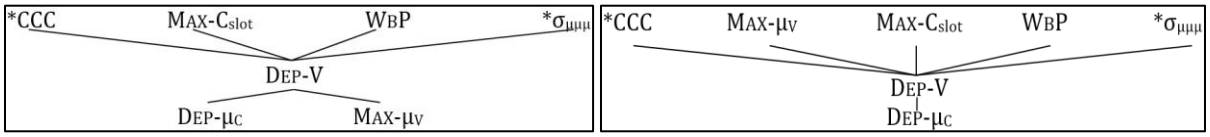
This study provides a historical typological Optimality Theory analysis of the treatment of potential super-heavy syllables in six Arabic varieties: Hijazi, Egyptian, Emirati, Kuwaiti, Algerian, and Palestinian. The analysis of this study will use the same violable OT constraints, and the differences between the grammars will be represented by the order in which the constraints are ranked relative to one another. The similarities and differences between these varieties are examined from the point of view of one approach to historical OT (Cho, 1998), which states that individual pairs of constraints may be ranked or unranked in relation to one another, one operation at a time, meaning that switching the order of two constraints takes two steps historically. According to Cho (1998:45), "each step of a sound change should be viewed as a change in the ranking of constraints." As shown in the Hasse diagrams below, which provide one example of a historical typological change from one Arabic dialect to another, the ranking of the constraints for Egyptian Arabic is pretty similar to Hijazi Arabic, except for the relation between DEP-V and MAX-μ_V. The main difference between the two dialects is that in Hijazi Arabic, MAX-μ_V dominates DEP-V, but in Egyptian Arabic, DEP-V dominates MAX-μ_V. This means that two steps are necessary to get from the Hijazi grammar to the Egyptian Arabic grammar. First, MAX-μ_V and DEP-V become unranked with each other. The second step involves DEP-V dominating MAX-μ_V. These steps result in /naːr-na/ surfacing as [ˈnar.na] with vowel shortening and no epenthesis in Egyptian Arabic, as opposed to [ˈnaː.ra.na] with epenthesis and no vowel shortening in Hijazi Arabic. Furthermore, both dialects witness vowel epenthesis to break up a sequence of three consonants as in /bint-na/ being realized as [bin.ˈti.na] in Egyptian Arabic and as [ˈbin.ta.na] in Hijazi.



Egyptian Arabic **Hijazi Arabic**

Furthermore, Cho's approach can be linked to Wichmann et al's (2010) approach which provides a quantitative method for determining the geographic homeland of a group of related languages. Wichmann et al's approach takes into account a simple linguistic difference metric and the geographic distance between the languages. Using the constraint reranking in place of Wichmann et al.'s linguistic difference metric to calculate the homeland of Arabic dialects where a two-step constraint reranking process between DEP-V and MAX-μ_V results in a change from [ˈnaː.ra.na] in Hijazi to [ˈnar.na] in Egyptian Arabic. This means that the phonological change of vowel epenthesis and vowel shortening in both dialects can be achieved by two constraint reranking steps. This implies a close historical geographical connection between the two dialects.

A phonological and sociolinguistic analysis of affrication in Moroccan Arabic: The case of Casablanca

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Abstract

This paper reports the findings of an investigation conducted on the speech of young Moroccans in the city of Casablanca. The aim of this research is to mainly analyze the youngsters' production of the phoneme /t/ both phonologically and sociolinguistically. The work identifies and describes the production of three main allophones of /t/: 1) a plain [t], being a naturally-existing sound in Moroccan Arabic, 2) an aspirated t [tʰ] as in *tʰanʃəkruu* 'I thank him', and 3) an affricate [tʃ] which is newly observed as in *ttəbliitʃ* 'I got addicted'. In addition to investigating the phonological context of these allophones, this paper attempts to provide a constraint-based approach using Optimality Theory to account for the affrication and aspiration processes observed in the variety of Moroccan Arabic spoken in Casablanca through the selection of a sample of short tv-interviews. In line with this phonological analysis, it presents a quantitative sociolinguistic analysis of the allophones in question considering their frequency of occurrence. Preliminary results show that the sound /t/ does not get affricated or aspirated before liquids /l/ and /r/ as in *katlqaah* 'you find him' and *stərha* 'he covered for her', and when adjacent to sibilants /s/, /z/, /ʃ/ and /ʒ/ as in *katsənna* 'she is waiting', *tzʕəm* 's/he takes initiative'; *tʃəhraat* 'she became famous' and *ntʒuwwəʒ* 'I get married'. Furthermore, emphatic sounds are also found to block the affrication process as in *tXaaSəM* 'he was in an argument'. The obstruction of affrication is explained by the higher ranking of the IDENT constraint over the OCP-coronal markedness constraint in order to avoid assimilation. On the other hand, the allophonic realization [tʃ] as a new variant of the existing sound [t] suggests some sort of historical phonological shift in the language.

Not all sound changes are created equal: a reassessment of Functional Load

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Introduction. The Functional Load Hypothesis states that the likelihood of a merger between two sounds depends on their contrastiveness in the lexicon (Martinet 1955). Mergers that do not introduce homonymy in the lexicon are more likely to occur than those which would yield homonymy. Some attempts to test the hypothesis showed that sound changes that cause homonymy are common (King 1967, Labov 1994, Surendran and Niyogi 2006, Sampson 2019). Conversely, a number of works showed that sound changes that generate homonymy are less common than those avoiding it (Gurevich 2006, Silverman 2010, Wedel et al. 2013, Kaplan 2015). I show that functional load is relevant in the case of unconditioned mergers, but irrelevant when the mergers are phonetically conditioned, and I argue that this asymmetry sheds light on the psychological mechanisms that underlie functional load.

Methods. I estimate the number of homonyms generated by ongoing mergers in the languages covered in Wedel et al. 2013, and compare them to the number of homonyms that would have resulted had similar sound changes occurred in the same environment, using CHILDES corpora. I define low-homonymy mergers (i.e., below one standard deviation from the mean of the pairs compared) as 'functional', and high-homonymy mergers (i.e., above one standard deviation from the mean) as 'anti-functional'.

Results. Half of the mergers examined are 'functional' (14/27), while only five mergers are 'anti-functional', in line with the results by Wedel et al. (2013). The majority of the 'functional' mergers (11/14) are unconditioned. On the contrary, the 'anti-functional' mergers are all conditioned on a phonetic environment (see Table 1).

Explanation. This asymmetry is explained with reference to language acquisition. Experimental evidence shows that the development of the phonological inventory must begin in infancy (Werker et al. 1984, Kuhl et al. 2006), but allophonic rules are learned only at a later stage (Klein and Altman 2002, Richter 2018). Unconditioned mergers occur when a child fails to acquire a phonological boundary between two phonemic categories, possibly because of the lack of evidence for their contrast in their early lexicon (Cui 2020), and therefore we expect to see a functional load effect in this case. Conditioned mergers, on the other hand, result from the restructuring of allophonic rules. Since children go through a prolonged period in which allophonic rules are not in place, a conditioned merger can also surface at a later stage of development, and at this stage lexical contrast might not be as relevant as acoustic cues or morphonological alternations when deciding to form an allophonic rule. This explains why functional load is a factor that affects unconditioned mergers, but is not relevant for conditioned mergers.

Language	Functional	Anti-Functional	Reference
English (UK)	aɪ-ɔɪ	ɪə-ɛə(_r)	Wells (1982), Lass (1992)
English (US)	ɑ-ɔ, ɔɪ-ɛr, ʊ-ɔ (_l), ʊ-oʊ (_l), ʊ-u (_l)	ɪ-i (_l), ɛ-eɪ (_l), t-d (V́_V)	Labov et al. (2007)
Dutch	s-z, f-v, χ-ʏ		Kissine et al. (2003)
French	œ-ø, o-ɔ		Fagyal et al. (2006)
Spanish	ʎ-j		Harris (1967)
Slovak	æ-ɛ		Horák et al. (2004)
Cantonese		n-l (#_)	Zee (1999)

Table 1. The mergers investigated in this work which are classified as 'functional' or 'anti-functional'.

Sociophonological Contact-Induced Change in Khorat Thai Negative Markers

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Khorat Thai is a variety of Thai spoken by the Khorat people in an area that lies at the border between the old Thai Kingdom, Laos, and Khmer, where historically different ethnicities coexisted together. Korat Thai shares its segmental inventory with Standard Thai, but it features, due to its socio-geographical context, contact-induced changes at several linguistic levels. Notable differences in Khorat Thai, when compared with Standard Thai, concern suprasegmental features like tone variations and lack of consonant clusters, different vowel qualities in Thai cognate words, lexicalization and syntactic grammaticalization of a variety of construction, and lexical semantic changes.

This paper attempts to investigate one of these changes, namely the change of negative markers, as illustrated by Khorat Thai จ๊ก [t͡ɕák] ‘do not know’, cognate with Thai จัก [t͡ɕàk] ‘to know’ or ‘to recognize’ (Pittayaporn, 2009: 353), and with บ่จ๊ก [bɔ̀ː.t͡ɕák] ‘do not know’ found in some North-Eastern Thai (Lao) dialects, where บ่ [bɔ̀ː] means ‘not’. This study set out to investigate why affirmative words have acquired a negative meaning in Khorat Thai as a function of phonological contact-induced changes.

The North-Eastern Thai form บ่จ๊ก [bɔ̀ː.t͡ɕák] ‘do not know’ suggests that the Khorat Thai word จ๊ก [t͡ɕák] is the outcome of tone interaction between a now lost negative marker and the tone of the verb. In Standard Thai, the negative marker is ไม่ [mâj], which historically derives from the coalescence of มิ [mi] ‘not’ and ได้ [dâj] (Jampathip, 2014). The coalesced negative marker ไม่ [mâj] did not reach the Korat Thai speaking area. The reconstructed negative form for จัก [t͡ɕàk] in Khorat Thai is ‘มิจ๊ก’ [mí.t͡ɕák], where the high tone of มิ [mí] spread to จัก [t͡ɕàk]. I conjecture that the presence of the TAM markers แล้ว [lɛ̀w] ‘finished’ or เด่ [dè] ‘intensifier’ (in forms like มิจ๊กแหล่ว [mí.t͡ɕák.lɛ̀w] and มิจ๊กเด่ [mí.t͡ɕák.dè]) favoured the ellipses of มิ [mí] (resulting in จ๊กแหล่ว [t͡ɕák.lɛ̀w] and จ๊กเด่ [t͡ɕák.dè]). Given that TAM markers do not bear lexical stress, this was maintained on [t͡ɕák] despite these languages preferring lexical stress in final lightweight syllables. For comparison, the marker ‘แล้ว’ [lɛ́ːw], with high levelled tone in current Standard Thai, is ‘แล่ว’ [lɛ̂ːw] with a falling contour tone, but when it is แหล่ว [lɛ̀w] after the word จ๊ก [t͡ɕák]. Altogether, this suggests that the development of the suprasegmental negative marker of Khorat Tai was fueled by the interaction between tone assimilation and lexical stress placement.

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The Faifi Arabic [st] cognate of Old Arabic /sˤ/ as the Historic Breaking of an Ejective

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One of the most stable phonemes in and across Arabic dialects is the coronal emphatic (i.e. pharyngealized) fricative /sˤ/. This phoneme occurs as such in most modern dialects of Arabic, with the exception of some peripheral dialects like Maltese where pharyngealization has been lost, and historic *sˤ is realized as [s]. Furthermore, /sˤ/ shows very little allophonic or morphophonemic alternation in most dialects. As a consequence, one can with some confidence reconstruct *sˤ for Old Arabic, which, following Owens (2009, 2013) is distinguished from Proto-Arabic.

With this as background, we focus on an unusual cognate of Old Arabic *sˤ found in Faifi Arabic, a historically isolated dialect of Arabic spoken in the mountainous area of Saudi Arabia's Jizan Province along the border of Yemen. The dialect has many unusual features as initially observed in Behnstedt (1987) and detailed in Alfaifi & Behnstedt (2010). They specifically note that one of the most unusual features of the dialect is the realization of common Arabic *sˤ as non-pharyngealized [st]. These authors make the claim that this [st] is monophonemic and propose that Faifi Arabic [st] should not be looked at as a reflex of *[sˤ], but that of an older (proto-)Semitic pronunciation *[ts'], a voiceless dental ejective or glottalized affricate, whose Hebrew reflex is the affricate [t͡s], and that the Faifi Arabic reflex is merely a metathesized (monosegmental) version of this affricate. In this paper we first show that Faifi Arabic [st], cognate with Old Arabic *sˤ, patterns as a bisegmental sequence in the contemporary language. We then posit that [st] derives from a glottalized or ejective *s', a substrate feature, by breaking or splitting into the sequence [st]. There are several arguments for [st] being a sequence and not a complex segment in Faifi Arabic. Two arguments are, first, that [st] syllabifies as heterosyllabic when it is intervocalic as in [ʕas.ta] 'a stick'; and second, while all consonantal phonemes undergo gemination including affricates ([zad͡ʒd͡ʒara] 'he scolded'), [st] never geminates even when required by the morphology (as in causative verb forms) as seen by the Faifi causative [was.ta.la] 'he delivered' (cognate with Classical Arabic [wasˤsˤala]). This suggests that [st] cannot geminate because it is already two segments. After presenting the argumentation that the Faifi Arabic [st] cognate with /sˤ/ in most other Arabic varieties is bisegmental, we maintain that this [st] sequence derives from an ejective or glottalized *s', which we argue to be a substrate feature. Evidence for ejective *s' being a substrate feature is that it is still found in some present-day South Arabian languages of the Arabian Peninsula (Ridouane & Giderot, 2017). These languages are part of the South Semitic branch along with Ethiopian Semitic languages that preserve ejectives (cognate with Arabic emphatics).

It is historically known that ejectives can split into two consonants. Examples of ejective splitting are mentioned in Blevins (2003) for the Algic language Yurok and in Maddieson (1997: 3135) for the Austronesian language Yapese. In Yurok, intervocalic pre-glottalized sonorants are split into a glottal stop coda followed by a sonorant onset for syllabification reasons. In Yapese, post-glottalized fricatives are split into a consonant followed by a glottal stop. Splitting of ejective fricatives in Yapese is perhaps caused by two conflicting demands: 1) the continuous air flow required for frication, and 2) the increase in air pressure in the oral cavity required for ejectivity. We posit that Faifi Arabic had a similar conflict that was resolved by splitting the ejective *s' into two segments; but unlike Yapese, the stop component of the ejective fricative was interpreted as [t] in Faifi Arabic, reflecting the homorganicity with the fricative [s], resulting in bisegmental [st].

Historical Phonological Change in the Coosan Language Family: The Complications of Multilingualism and Languages Going Silent

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Situated on the Southwestern Oregon Coast in the United States is Coos Bay. Home to the Hanis and Miluk peoples, Coos Bay had long been a center of linguistic and cultural diversity. The languages of the Hanis and Miluk people, *hanis kuukwiis* (Hanis) and *miluk kuukwiis* (Miluk), have historically had their relationship described in a number of different ways. Early ethnolinguists described them as dialects of the 'Coos' language, with Hanis described as the principle dialect and Miluk deemed minor and nearly incomprehensible (Frachtenburg 1914). Others have described the two languages as mutually unintelligible and with Miluk having its own dialects (Jacobs 1940). Still others have tried to link the languages to Oregon Coast Penutian and the Penutian Hypothesis (Sapir 1921; Delancey and Golla 1997) and another to the Salishan language family (Doty 2012). However, none of these previous works utilized the Comparative Method to find cognates and establish regular sound correspondences. More recent work has sought to correct this, with the most recent study examining 364 potential cognates to establish regular sound correspondences and reconstruct 56 phonemes in Proto-Coosan, many of which are rare typologically (Douglas-Tavani 2021). This finding affirms the long held belief of the Hanis and Miluk people that they are related, yet distinct, people with related, yet distinct, languages. In addition to more typologically common sound changes, such as debuccalization and syllable reduction, the Coosan languages show many uncommon sound changes of interest. Among these:

- Dorsal consonant harmony (*k > g; *kw > k'w; *q > k; *ɢ > g; *ɢw > gw; *x > xw)
- Uvulars changing to velars before *ə (*G > g; *qw > kw; *ɢw > gw; *q'w > k'w)
- Degemination before *a (*m: > m; *n: > n) and low vowels (*l: > l)

However, this analysis is complicated by the history of these languages and how they were made to go silent by a number of factors, including conquest, forced migration, and internment in military camps run by the United States, among others. Because of this, by the time Hanis and Miluk were documented, there were only a few speakers left. The majority of documentation happened with Mrs. Annie Miner Peterson, a multilingual English, Miluk, and Hanis speaker. She was also the last natively fluent Miluk speaker. While the majority of revitalization must be based one her transcriptions because she is the best documented, there are some transcriptions of other speakers. Through comparison of words transcribed from her and from earlier speakers, it is clear that there was a rapid change in both Hanis and Miluk that occurred within the multilingual brain of Mrs. Peterson. Some of her Hanis has clear changes that come from Miluk. Some of her Miluk has clear changes that come from Hanis. In some cases, the same cognates will have the Hanis word changing to make it more like Miluk word and vice versa. Finally, she also applied independent changes to cognates in both languages to make them similar to each other. All of these were not seen in older speakers who were recorded. Put together, this serves as a complex case study of what this author calls 'late language contact'; an entirely understudied phenomenon in which languages undergo massive changes due to multilingualism in the final natively fluent speakers of the language who no longer have fellow speakers to check or correct any idiosyncrasies that they may have: a fairly common situation historically. This leads to a number of questions, both philosophical and methodological, as to how historical linguists and communities should engage with materials for reconstructions and for language revitalization.

The « fear of emptiness » : the palatalization trend from Vulgar Latin to Old French

Guillaume Enguehard (Orléans/LLL)

In the evolution from Vulgar Latin to Old French, a tendency towards palatalization can be observed in various phenomena affecting consonants and vowels (Zink 1986): **i.** palatalization of coda velars, **ii.** palatalization of velars before /a/, **iii.** development of the vowel /y/, and **iv.** development of diphthongs. These palatalizations are spontaneous.

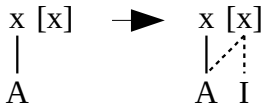
I propose to adopt a theoretical approach whose merit is to bring to light a coherence between these phenomena which are sometimes several centuries apart. Although these palatalizations affect very distinct segments (velars, accented vowels, long vowels), the theoretical approach reveals a link between them.

Government Phonology (Kaye et al. 1985, 1990) is based on the assumption that there are representational 'voids': empty positions and neutral elements which require to be filled under certain conditions. Stress, length and velarity are all represented with these voids. Stress is an empty position that is inserted into an open tonic syllable (Chierchia 1986, Larsen 1994, Scheer 2004); length is an empty position that makes it possible to spread an adjacent segment (McCarthy 1979); and velars contain a default place element |@| (Harris & Lindsey 1995). I suggest that these voids are responsible for the different types of palatalization discussed above. It is accepted that these voids are subject to the occurrence of a predictable element under certain circumstances (e.g. V/Ø alternation in modern French). According to Nasukawa & Backley (2015), the epenthetic element can vary but necessarily relates to A, I or U.

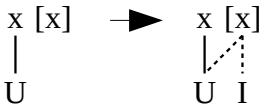
A phenomenon comparable to the V/Ø alternation of modern French appears in Vulgar Latin as early as the 1st century: the prosthetic vowel /i/ (later reduced to /e/), which prevents initial consonantal clusters of the sC type. In the terms of the theory, this prosthesis is an |I| element filling an empty initial position (Lowenstamm 1999). Hence the following hypothesis: *"the voids of archaic French are progressively realized with an |I| element"*.

This generalization allows us to better understand the coherence of the palatalizations that affect vowels. We know that diphthongization affects tonic vowels in open syllables, i.e. the configuration in which an empty position is inserted. Now applying the operation Ø → |I|, we predict the diphthongization in (1a) (unfortunately, the opening diphthongs cannot be discussed due to lack of space). More interestingly, the application of these same principles to vowels escaping diphthongization (1b) predicts the transition from /u/ to /y/.

(1) a. [a] > [a͡e] (> Mod. Fr. [ɛ])

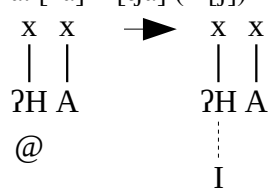


b. [u] > [u͡y] (> Mod. Fr. [y])

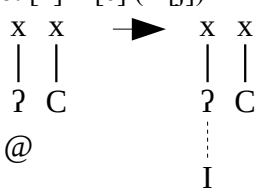


The palatalization of velars out of assimilative context (i.e. I or U) (2a-b) follows the same principles: the replacement of |@| by |I| results in [t͡ʃ] in the presence of the noise element |H| in onsets, and in a weak palatal in the absence of |H| in codas (Harris 1990).

(2) a. [ka] > [t͡ʃa] (> [ʃ])



b. [k] > [c] (> [j])



In summary, the few theoretical principles adopted in this presentation are intended to explain what can be described as a general trend towards palatalization due to void avoidance.

Lexical and sublexical effects on diachronic stability and instability of phonological systems

Frederik Hartmann (University of Konstanz)

Lexical and sublexical conditions such as a word's phonological contrast to other words in a lexicon or the informativity of a segment in its context can influence the likelihood that certain linguistic changes occur (cf. Wedel, Kaplan, and Jackson, 2013). This investigation sets out to examine whether the effects of segment informativity and segment contrast apply to larger sets of phonological units, thus contributing to the diachronic stability or instability of natural classes or phonological series in a language. Recent phonological investigations have uncovered quantifiable and language-internal sublexical properties that influence whether individual segments are more prone to be changed than others. Such work has identified individual changes and sounds that are more likely/unlikely to change due to their properties regarding these effects (Winter and Wedel, 2016; Wedel, Jackson, and Kaplan, 2013). However, often we see considerable large-scale changes to a phonological system that delete, introduce or merge entire natural classes or consonantal/vowel series, thus effectively reshaping the phonological inventory. Since such changes often apply to specific phonological classes while leaving other series intact, we can speak of certain series being more or less diachronically stable. The test case for this analysis are the Proto-Indo-European (PIE) dorsal stops and laryngeal series which underwent iconic changes in many daughter languages. The investigation replicates previous findings and shows that phonological contrast and segment informativity have contributed to the changes and pathways of these PIE consonant series. Specifically, multilevel linear models were used on lexical corpora derived from Wiktionary to determine whether the diachronically unstable consonant series in PIE show specific properties regarding their informativity and contrast that have previously been linked to higher susceptibility to phonological changes. The results indicate that those series that would later undergo significant changes were highly associated with low informativity and less encoded phonological contrast, two measures that have been identified to enhance a segment's probability to change.

The findings from this analysis suggest that lexical and sublexical effects can contribute in part to the diachronic stability of larger phonological units in a language. As a result, there are identifiable consonant series in PIE that show a behaviour found in segments that are generally more prone to undergo changes. Further, the observable changes to the PIE consonantal system can be mapped onto structural differences between the series regarding their role in the lexicon. The differences in their role are exemplified by imbalances in their discriminatory power and informativity. Moreover, the structural differences pattern in a way that would predict those changes that we in fact observe.

Foot structure and lenition in North Germanic

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In this paper I argue that the lenition of singleton |fortis| stops in North Germanic did not simply occur in postvocalic position (cf. standard references such as Haugen 1976), but instead was proceeded in multiple stages. I suggest it is best understood in terms of foot structure, bringing the Nordic languages in line with our understanding of lenition in the rest of Germanic. Further, I argue that lenition of postvocalic |fortis| stops in North Germanic is best understood as shortening of preaspiration, and in particular that this understanding explains systematic differences in lenition outcomes across varieties.

Proto-Nordic |fortis| stops are generally agreed to have undergone lenition in many current varieties in the south and west of the area. Thisi is pervasive in Danish and adjacent dialects in Sweden and Norway, as demonstrated by examples like *gade* 'street' from ON *gata*, with secondary development of the *d* to a fricative or approximant in Denmark. This process is also found in Icelandic and Faroese, where the outcome of lenition is often an unaspirated, voiceless stop. Further examples are found in Norwegian dialects in southern Helgeland (Riksheim 1921; Øksendal 1970; Engen 1975) and mid Trøndelag (Larsen 1908; Endresen 1980).

The process is generally described as a single lenition of postvocalic singleton stops. However, at least three different varieties show evidence of it proceeding in at least two stages. In all cases, lenition happens after shorter vowels before it happens after longer vowels. The examples are Northern Faroese (Pétur Helgason 2002; Höskuldur Thráinsson et al. 2012), in which lenition occurs after high, but not after non-high vowels (['ʊiːkɐ] for ON *vika* 'week' but ['eːʰtɐ] for *eta* 'eat'); some dialects of Norwegian in Aust-Agder (Hannaas 1911; Haslum 2004; Kristoffersen 2020), where lenition happens after unlengthened short vowels (as in [sjɪbːə] from *skipa* 'create'), but not after long vowels, whether original (['biːtə] from *bíta* 'bite') or lengthened (['bɑːkə] from *baka* 'bake'); and Idd Norwegian (Myhre 1952; Kristoffersen 2020), with vestiges of a similar pattern to the one just described for Agder.

This asymmetry between lenition after short and long vowels is common in Germanic (Honeybone 2019), including in English, Dutch, High German, and Frisian. I suggest, following Kristoffersen (2020), that the best explanation involves two separate waves of lenition, first foot-internally and then postvocalically by *rule generalization* (Vennemann 1972; Bermúdez-Otero 2015). Thus, Nordic evidence supports the foot-based view of Germanic lenition.

I further suggest that North Germanic lenition is best understood as the shortening of preaspiration, which I argue, following Gunnar Ólafur Hansson (2004); Pétur Helgason (2002), to be an important cue to |fortis| specification in stops. If the shortening of preaspiration is considered a variety of lenition (in line with a modulated-carrier model of speech [Harris & Urua 2001]), then other asymmetries in the laryngeal phonology of the North Germanic languages receive an explanation. I exemplify this via a discussion of 'non-neutralizing' lenition. This is the pattern found in Helgeland and Trøndelag, where the outcomes of |fortis| stop lenition are described as distinct from |lenis| stops produced by occlusion of ON fricatives ([tɑːb̥ə] from ON *tapa* 'lose' but [drɑːgə] from ON *draga* 'drag' with [ɣ]). I suggest the lack of neutralization is due to the fact that, unlike in Icelandic or Danish, in dialects like Helgeland |lenis| /b d g/ are not categorically voiceless, and therefore shortening of preaspiration on /p t k/ did not lead to neutralization. This perspective on lenition provides an account of cases like Härjedalen Swedish (Westin 1897; Reitan 1930): these are not generally recognized as having lenition, but nevertheless distinguish original non-preaspirated stops (as in [vɞkːɞ] from *vika* 'week') from original |lenis| obstruents (as in [lɛgː] from *leggr* 'lays' or [dugːu] from *duga* 'suffice'). These conclusions further support the applicability of a foot-based approach to lenition across the Germanic languages.

On the reconstruction of the secondary palatalization contrast in Slavic

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Contrastive secondary palatalization is a feature typically associated with Slavic. However, this contrast is present only in several contemporary Slavic languages, such as Ukrainian, Eastern Bulgarian, Russian, and Upper and Lower Sorbian (Issatschenko 1929/40, Stadnik 2002). Thus, a question arises as to whether the secondary palatalization contrast represents a Common Slavic heritage, and how it should be reconstructed.

By considering the sound changes that could potentially have given rise to a secondary palatalization contrast in Common Slavic, we argue that yod palatalization, which operated in the sequences PSl **tj*, **dj*, **sj*, **zj*, **lj*, **nj*, **rj*, is the only plausible candidate for producing this contrast. Furthermore, even for the yod palatalization reflexes, we can reliably reconstruct the secondary palatalization contrast only for the rhotics, such as /r/ : /r^{j}/. All other contrastive pairs that result from yod palatalization involve the shift in the place of articulation of the original consonant, e.g. PSl **sj* > [ʃ]/[ʂ]: **nasjā* 'load, burden' > Ru *no*[ʂ]*a*, Cz *nů*[ʃ]*e*, Sln *nó*[ʃ]*a* 'attire' etc.; PSl **zj* > [ʒ]: **kazjā* 'skin, leather' > Ru *ko*[ʐ]*a*, Cz *ků*[ʒ]*e*, Sln *kó*[ʒ]*a,* etc. (Shevelov 1964, Carlton 1991).

Provided that the contrast /r/ : /r^{j}/ is phonetically unstable and rare, we explore the phonetic and functional reasons for its preservation or loss in the individual Slavic languages. It has been proposed that the palatalization contrast in Slavic is preserved due to various phonetic stabilization strategies (Iskarous & Kavitskaya 2018, Jaworski 2018). Yet another potential explanation for the retention of the contrast in rhotics is the phonetic impossibility of the palatal rhotic (Hall 2000). However, we find that the /r/ : /r^{j}/ contrast in Slavic has been preserved only in languages that acquired additional palatalization contrasts in positions other than the yod palatalization context. We argue that this correlation is not coincidental and that, in addition to the phonetic strategies, there are functional pressures that are crucial for the for the contrast preservation (Hockett 1967, Wedel et al. 2013).

By providing a thorough analysis of the Slavic palatalization data, we aim to contribute to the study of the factors involved in the preservation and loss of contrast beyond Slavic. The proposed analysis has relevance to the theories of contrast preservation and consequences for the theory of sound change.

A Reassessment of Old English Breaking

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This paper gives an Optimality Theoretic account of the diachronic phonology of diphthongization, also known as *Breaking*, of Proto-Germanic words in Old English (OE). The diphthongization involves inserting a harmonized vowel in between the underlying nucleus vowel and its immediately following coda [r], [l] and [x] (Stockwell 2011): schematically, $XV_1CY > XV_1V_2CY$. The height of the epenthetic vowel (V_2) aligns with the height of the underlying vowel (V_1), but at the same time such a harmonized vowel becomes [+back] under the influence of the feature of the following coda (Jones 1989).

The attested words in (1) show that the height of an epenthetic vowel in (1a) aligns with the underlying mid vowel, and that the height of a harmonized vowel in (1b) aligns with the underlying low vowel /æ/ (Anderson and Jones 1977; Dresher 1985; Jones 1989). OE phonology, in this respect, should contain markedness constraints ALIGN-R (+ mid, word) and ALIGN-R(+low, word). ALIGN-R(+mid, word) encourages the presence of a mid vowel toward the end of the word.

1. a

Old High German		OE	gloss
herta	→	*heord*	'herd'
erda	→	*eorþe*	'earth'
erl	→	*eorl*	'earl'
lernēn	→	*leornian*	'learn'
ferr	→	*feorr*	'far'
ernust	→	*eornost*	'earnest'

b

Old High German		OE	gloss
arm	→	*earm*	'arm'
alt	→	*eald*	'old'
hart	→	*heard*	'hard'
harm	→	*hearm*	harm
stark	→	*steark*	'stark'
wartēn	→	*weardian*	'ward'

Obviously, OE phonology had some sort of context sensitive constraint which could enable the coda consonant to harmonize the preceding epenthetic vowel in terms of [+back]. It can be posited that the markedness constraint $^{*}\text{NUCLEUS}^{[-back]}\text{CODA}^{[+back]}$ ($^{*}\text{N}^{[-back]}\text{C}^{[+back]}$ for short), when undominated, successfully enables OE Breaking to occur in between the underlying vowel and coda in the attested words. The faithfulness constraint INTEGRITY (McCarthy 2008), when crucially dominated, allows for the breaking of the underlying vowel to occur in OE. Tableau 1 shows that candidate (d) prevails over others, satisfying the two high ranked constraints. The non-epenthetic output (a) and misaligned output (e) conflict with the stipulation of $^{*}\text{N}^{[-back]}\text{C}^{[+back]}$.

Tableau 1

Input /erl/	ALIGN-R(+mid, word)	$^{*}\text{N}^{[-back]}\text{C}^{[+back]}$	INTEGRITY
a. erl		*!	
b. earl	*!		*
c. eærl	*!		*
d. ☞eorl			*
e. oerl		*!	*

Acoustic Analysis of Entering Tone Changes in Chinese Xinbo Wu Dialect

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The entering tone (a short tone that exists only in Chinese dialects) in southern Anhui province is in the process of change, and it varies in different ways in different areas (Zhu. L, 2011; Zhu. X, 2008; Cao, 2002; Jiang, 2000). Xinbo is a small town in southern Anhui province, whose dialect is in the process of changing with entering tones to normal tones like that of Chinese mandarin, but the mode of change has not yet been clarified. In order to increase knowledge of how the Wu dialect in southern Anhui is changing, and to help complete the history of Wu dialect change, it is necessary to further investigate and research into the entering tones in different areas of southern Anhui.

Previous studies have concentrated on the pitch contour, duration, and glottal coda of the entering tones. However, the entering tones can not only show these features but also may possess distinct vowels (Chen, 2008). Therefore, it is necessary to focus on the difference between the vowels of the entering tones and that of other normal tones.

This paper presents a comprehensive acoustic study of the entering tones in the Xinbo dialect based on the first-hand recorded material and the classification of tones in middle Chinese. This paper focuses on four acoustic parameters of entering tones (duration, fundamental frequency, vowel formants frequency and breaks at the vowel endings on the spectrum), which correspond to four aspects of entering tones (duration, tone pattern, vowel quality and glottal coda). Furthermore, the order of change of the acoustic parameters is inferred from individual differences among speakers and the comparisons with Northern Wu (a dialect older than Southern Anhui Wu) and neighbouring dialects. In addition, statistical analysis methods, such as growth curve analysis and mixed linear regression analysis, are applied to determine statistically significant differences between entering tones and obtaining visual results.

Finally, the paper illustrates the current status and the place of the Xinbo entering tones in the history of change:

- The degree of changes in the entering tones varies across the consonant categories.
- The tone contour of the entering tones is the first to merge with other normal tones.
- The duration of the entering tones is longer than the typical entering tones in the Northern Wu dialect.
- The glottal coda has largely lost and played no role in the distinction.
- The vowel quality may be an essential factor to identify the entering tones from other normal tones.

A Corpus-based Study of Vowel Sequences in Old Japanese

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Introduction: This paper investigates vowel sequences in Old Japanese from a corpus-based approach. Open syllables, CV and V, have been acknowledged as the basic structures in Old Japanese (Vovin 2005, Fellesvig 2010), and a sequence like CV.VC would become possible in Old Japanese. However, vowel sequences are uncommon in Old Japanese, but they do occur in phonological alternation, as in *makai* ~ *makadi* 'paired oars', in morphological process, such as compound (*opo-isi* 'big-stone') or in grammatical element, infinitive marker *-i-* for instance, as in *k-i-iri* 'come-INF-enter'. To probe into the actual distribution of V_1V_2 sequences in Old Japanese, this paper adopts a corpus-based approach by collecting data from an online database, the Oxford-NINJAL Corpus of Old Japanese (ONCOJ).

Corpus and data selection criteria: The data are collected from ONCOJ, which contains seven major resources in Old Japanese: *Kojiki kayō*, *Nihon shoki kayō*, *Fudoki kayō*, *Bussokuseki-ka*, *Man'yōshū*, *Shoku nihongi kayō*, and *Jōgū shōtoku hōō teisetsu*. The steps of data selection are as follows. First, data in Old Japanese are represented by Chinese characters, which can be phonographic or logographic, and only the phonographic usages are included in this paper. In the online corpus, the transliterations of the vowels are *a*, *e*, *o*, *i*, *u*, *wo*, *wi* and *ye*. In the corpus, vowels are general vowels, and *i*/*wi*, *ye*/*e,* and *wo*/*o* as pair vowels. The former in the pairs is known as *kōrui* vowels and the latter as *otsurui* vowels. With eight vowels, there are 64 possible combinations for V_1V_2 sequence. Later, the collected data are divided into three types depending on how the V_1V_2 sequence is recognized. The three types are (a) within a phonological word, *kai* 'rudder' for example; (b) compound, *opo-isi* 'big-stone' for instance; (c) others such as affixes and grammatical elements, e.g. *k-**i**-iri* 'come-INF-enter'. As most of the data in Old Japanese are poems, this paper focuses on the V_1V_2 sequence in which the vowel contact occurs within a line (5 or 7 syllables).

Results: The corpus includes 627 V_1V_2 sequences: 277 examples from type I (within a phonological word), 131 examples from type II (compound), and 219 examples from type III (others). The distributions in the three types show that about 68% of the examples cluster in the combinations of the general and *kōrui* vowels, *a*, *u*, *i*, *ye*, and *wo* (69% for type I, 72% for type II, and 65% for type III). In type I, the 277 examples are found in 52 words. In type II, the 131 examples are in 72 sets; in type III, the 219 examples are in 118 sets.

Discussion: The three types of vowel sequences in the corpus show different limitations in Old Japanese. First, the vowel sequences within phonological words suggest that in disyllabic words, low vowel *a* tends to be the first vowel, and mid vowels tend to be the second vowel. The exception is *kai* in Old Japanese. Second, there is no *wi* in the first word in the vowel sequences in compounds, and the *otsurui* vowels appear less frequent than the *kōrui* vowels in the second vowels. Most of the vowel sequences in type III are found in the infinitive marker *i* or *wi*. When there is no vowel *-i-*, there is a tendency that the second vowels are *ye*, *wo,* or *wi*.

Conclusion: This paper has discussed the vowel sequences in Old Japanese from the distribution in the corpus. The results have shown that the vowels sequences do not randomly appear. In the three types of vowels sequences, the different constraints are related to the vowel types in the vowel sequences.

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Vowel shift in Zophei, an under-resourced Tibeto-Burman language

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Zophei is a previously undocumented Tibeto-Burman language which has undergone dramatic syllable structure simplification and attendant vowel inventory expansion. We present comparative primary data from three dialects of Zophei which together shed light on a number of vowel change phenomena, including front and back chain shifts, diphthongization, diphthong coalescence, and what Faytak (2014) refers to as High Vowel Fricativization (HVF). We also comment on the ways in which the Zophei data do and do not align with well-documented vowel change phenomena in English (e.g. Labov, Yaeger, & Steiner, 1972; Labov, 1994, 2001, 2010).

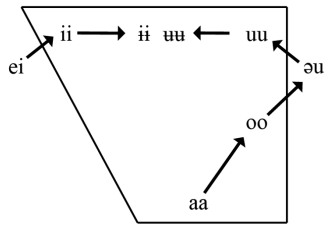
Zophei (ISO 639-3 zyp) is spoken by 20,000 or more people, originally in Burma/Myanmar and now in a number of diaspora communities. This research was conducted in Indiana, which is home to >25,000 Burmese refugees, including several thousand Zophei speakers. Zophei is part of the Maraic sub-branch of South Central Tibeto-Burman (SC, also Kuki-Chin). Maraic languages share a number of phonological innovations, including a reduction in the inventory of permitted syllable shapes when compared to other SC languages. The more phonologically conservative Hakha Lai, from a different sub-branch of SC, allows not only stop consonants but also plain and glottalized sonorants as codas. It also retains vowel length contrasts in closed syllables. Zophei dialects, by contrast, allow four syllable shapes: long open syllables (CVV), short open syllables (CV), syllables closed in a velar nasal (CVŋ), and minor syllables in weak prosodic positions (Cə).

While Hakha Lai has retained a more conservative vowel inventory, comparative analysis of cognate lexical items (see sample data in Table 1) and convergent evidence from verb stem alternation reveal numerous vowel change phenomena in Zophei. Notable are the parallel shifts in the front and back vowel spaces that are illustrated in Figure 1.

Table 1. Sample of comparative data offering evidence of the vowel changes Figure 1.

	Most Conservative ◄ ——— ► Most Innovative				
	Hakha Lai	**Tlawngrang Zophei**	**Nuitah Zophei**	**Lawngtlang Zophei**	**Gloss**
a)	thâa	thóó	thóó	thɘ́ú	*strength*
b)	òo	ə́ú	úú	úú	*voice*
c)	thə̂u	thəu	thúú	thuu	*get up*
d)	zùu	pá zúú	pa z~~úú~~	pá z~~uu~~	*mouse*
e)	bêel	bei	bii	bii	*pot*
f)	triʔ	tsíí	tsíí	tsíí	*fear*

Figure 1. Long Vowel Shift in Zophei



In Zophei vowel shift, long vowels pattern as expected typologically, tending to rise in the vowel space. In this talk, we discuss these and other developments in Zophei rhymes, including: (1) diphthong coalescence, which has led to front rounded vowels /yy øø/ in some dialects, (2) diphthongization of */oo/ to /au/, which has occurred twice in the history of Zophei; (3) */e/ raising to /i/, which contrasts with the typological tendency for short vowels to fall; and (4) centralization of */ii/ and */uu/ to /~~ɨɨ~~/ and /~~ʉʉ~~/, the latter attended by lip frication.

In addition to establishing complex patterns of vowel change in a previously undocumented language, this paper also emphasizes one possible model for conducting scholarship in a changing world. Covid-19 and an ongoing military coup in Myanmar render fieldwork there impossible for the foreseeable future. Like many other diaspora communities, however, Indiana's Burmese refugee community is home to robust cultural and linguistic diversity. Forty or more un- and under-documented South Central Tibeto-Burman languages are spoken in the state, meaning that the language-related needs and opportunities for scholarship are numerous.

In Search for the Biblical Rhotic – Identifying Biblical Hebrew's *Resh*

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In our study, we reconstruct the Biblical Hebrew rhotic, *resh*, basing the analysis on its phonological behavior. We examine the phonological phenomena related to *resh* on a quantitative basis, and argue that it is best identified as the alveolar tap – ɾ.

Rhotics are a very diverse class of segments that are present in 85% of the world's languages (Ladefoged and Maddieson 1996). This class contains sounds with different places and manners of articulation, and thus cannot be defined solely by articulatory or acoustic properties. Nonetheless, these sounds tend to be represented by a small set of graphic symbols, without regard to their heterogeneity.

In light of their different nature, it can be difficult to identify a rhotic's phonetic realization in an unrecorded language, such as Latin and Ancient Greek. The same holds for the Biblical Hebrew rhotic. According to some accounts (Gesenius and Kautzsch 1910; Blau 2010), it should be categorized as some kind of back consonant, while other accounts (Luzzatto 1853; Harper 1912; Joüon and Muraoka 2006) classify it as an alveolar or dental segment. Others still, as Khan (2020), relying on Early Hebrew grammarians, reached the conclusion that *resh* had a twofold pronunciation depending on its phonological environment. These accounts were not based on a systematic examination of the phonological phenomena related to *resh*, which suggest that it should be grouped in the natural class of the coronals.

In order to reconcile our account and the grammarians' accounts, we assume a diachronic transition, during which an original alveolar trill lenited to a transitional alveolar tap, which in turn changed into the back consonant described by the grammarians. This assumption is supported by a typological review of the rhotics' diachronic changes. Moreover, we propose a possible timeline for this diachronic change, basing it on extra-Biblical sources, such as transcriptions of Hebrew words in cuneiform characters and in the Greek alphabet, and a comparative examination of the rhotics in the Semitic languages.

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"Stylised contours" or grammatical tone? – A possible phonological change in German

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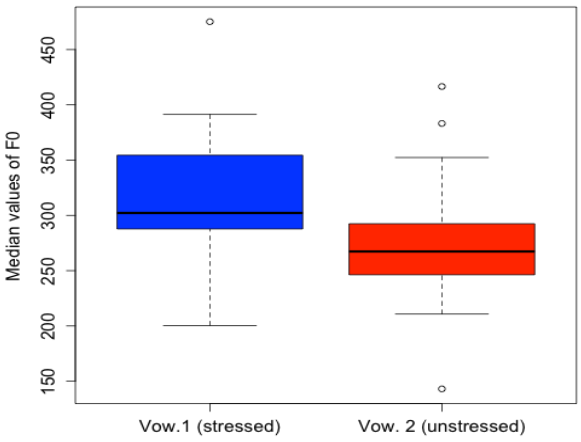
A language with tone is one "in which an indication of pitch enters into the lexical realization of at least some morphemes" (Hyman 2001). If one accepts this definition, Standard German has tone.

Nevertheless, pitch phenomena in calls as well as tonally disambiguated discourse particles and sentence-final general extenders are not discussed as instances of grammatical tone but as "stylized contours" (e.g. Ladd 1978, Gussenhoven 2004, Day-O'Connell 2013). This, in turn, means a static instead of dynamic perspective on a possible change in progress, i.e. intonation-based tonogenesis.

Figure 1. Pitch contour of Standard German calls: Median values of F0.



All cases which will be presented are grammaticalized and evolved on the basis of sentence intonation. They provide evidence of a conventionalisation continuum in German. With respect to the "tonal result", they show pitch signalling meaning (see Figure 1 for a study of calls with 31 test persons). The issue of stylised contours vs. grammatical tone adds to the theoretical discussion of what counts as evidence for change.

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One source to many changes

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This study addresses diachronic changes triggered by a single vowel, Proto-Mundurukú *i, in the history of the Mundurukú branch, which belongs to the Tupi family, in Brazil. From the two former languages of the branch, Mundurukú and Kuruaya, only Mundurukú survives; Kuruaya became extinct in 2008, with the death of its last speaker.

A diachronic phonological analysis of Proto-Mundurukú has recently been proposed (Picanço, 2019), and shows that many changes on proto-consonants have a source in common, the high vowel *i, but with different outcomes. Picanço reconstructs 18 consonants for Proto-Mundurukú, *p *b *t *ʧ *ʤ *k *kʲ *ʔ *m *n *ŋ *ð *s *ʃ *h *r *w *j, and *i was directly involved in sound changes affecting at least 8 of them: *p, *ʧ *ʤ *kʲ *ʔ *n *s *ʃ *r *j. These changes can be grouped as follows:

i) Changes affecting phonological contrasts or sequences

*piV > psV	New sequences Vp.sV
*iʔV / *VʔiV > *V̰	New contrast between creaky and modal vowels

ii) Changes affecting sound distribution

*Vi > Vj	New sequences Vj
*kʲi > ʃi / *ki > ki	
*rɨ̃ > rĩ > nĩ [ɲĩ]	

iii) Changes producing phonotactic restrictions

(*c >) *ʧi > ʃi	Absence of sequences ʧi, ʤi and ɲi
*si > Øi	Absence of sequences si

iv) Changes producing allophonic variations

(*c>) *ʤi > ʤi / ɲi	Palatal allophones (Kuruaya)

This study shows that the changes in (i) resulted from phonologization of phonetic effects; those in (ii-iii) resulted mainly from mergers and had a strong effect on distributional patterns, leaving gaps or asymmetries behind; and those in (iv) simply reflect previous allophonic variations.

Coalescence in child Greek: A repair strategy as a precursor to cluster acquisition

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This case study investigates the acquisition of [OBSTRUENT + SONORANT] clusters and provides new insights regarding the role of coalescence in child Greek. Coalescence is attested cross-linguistically as a marginal simplification strategy in child speech (e.g., European Portuguese: Ramalho & Freitas 2018; Greek: Kappa 2004; Polish: Łukaszewicz 2007, a.o.). Coalescence of a consonant cluster results in a single segment combining features of both cluster members ($C_1C_2V \rightarrow C_{1,2}V$); in the case of child Greek, only the unmarked features of input clusters are realized in output single segments (Kappa 2004).

In this case study, we examine longitudinal data from one typically developing child acquiring Greek as L1 (ages: 2;01.24-3;04.11/intermediate phase of phonological development) and we address the following research question: *'Does coalescence serve as a precursor to the acquisition of clusters?'*. The analysis is couched in the framework of OPTIMALITY THEORY (Prince & Smolensky 1993/2004), which holds that, in the initial phase of acquisition, the MARKEDNESS constraints (e.g., against complex onsets and coalesced segments) dominate the FAITHFULNESS ones (e.g., against segment deletions) and that the phonological development proceeds through their reranking. This study provides strong evidence of a stage-like acquisition of [OBSTRUENT + SONORANT] consonant clusters. We argue that cluster acquisition proceeds in three STAGES. In STAGE 1, cluster reduction is the dominant simplification strategy ($C_1C_2V \rightarrow C_1V$) and is attested in (un)stressed syllables, word-initially/-medially. The child shows a clear preference for the cross-linguistically attested sonority pattern, i.e., preservation of the less sonorous member of the cluster and deletion of the most sonorous one (e.g., /ble/→[be] '*blue'*-Neu.Nom.SG, age:2;02.04). In STAGE 2, the child's grammar does not permit complex onsets yet. Therefore, various strategies are employed, i.e., cluster reduction (as in the first stage) and coalescence ($C_1C_2V \rightarrow C_{1,2}V$, e.g., /ble/→[de] 'blue'-Neu.Nom.SG, age:2;05.16). The featural composition of [$C_{1,2}$] is determined by the ranking of FAITHFULNESS constraints. The parallel use of both strategies provides evidence for *co-phonologies/multiple grammars* (Tzakosta 2004). We argue that the child has available distinct grammars in his system, namely the CLUSTER REDUCTION GRAMMAR (CRG) and the COALESCENCE GRAMMAR (COALG), which conspire, resulting in the realization of simple onsets. We claim that the activated COALG, whose outcome is "closer" to the input cluster, further signals the transition to STAGE 3, namely to one in which the clusters are faithfully realized (e.g., /ble/→[ble] 'blue'-Neu.Nom.SG, age:2;08.08). In the course of development, both grammars fade gradually and they are fully suppressed in STAGE 3.

We provide evidence that in the developing phonological system of this child, coalescence serves not only as a repair strategy of avoiding the realization of complex onsets and of resulting in simple ones but also that it reflects, as a precursor, a transitional grammar towards the gradual acquisition of adult-like consonant clusters.

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Modern Standard Danish stop gradation explained diachronically

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In certain morphophonological contexts, modern Standard Danish displays the stop gradation patterns seen in (1–4) (e.g. Uldall 1936; Rischel 1970; Basbøll 2005). With certain caveats, 'strong' form here refers to simple onset position in word-initial or stressed syllables, while 'weak' form refers to syllable-final position or simple onset before schwa (or [i] in a select group of morphemes).

	strong	weak
(1)	[pʰ tʰ kʰ]	[p t k]
(2)	[p]	[p ~ o̯]
(3)	[t]	[ð̩ ~ Ø]
(4)	[k]	[ɪ̯ ~ o̯ ~ Ø]

Evidence for the patterns in (1–4) are limited to a few morphological contexts: strong verb conjugations, derivations of Graeco-Latinate loanwords, and noun+noun compounds. The alternations are seemingly productive to varying degrees (Pharao 2004), but there is little indication that the most problematic alternation (4) is productive. Nonetheless, the patterns are often taken as evidence that the 'strong' and 'weak' counterparts in (1–4) are synchronically allophones. We argue elsewhere that an analysis of Danish phonology should not be overly reliant on these alternations for a number of reasons. Importantly, some proposed allophones have no phonetic or phonological common ground in modern Standard Danish, and weak [ɪ̯, o̯] also alternate with strong [j] and [ʊ] respectively, leading to many neutralizations which cannot be dissolved. Hence, we argue that the subset of words showing the alternations in particularly (2) and (4) have suppletive roots, and that the sounds can no longer be considered allophonic.

However, if the alternations play no role in systematic synchronic Danish (morpho-) phonology, that leaves the question of why they are there. Here, we follow Blevins' (2004) Evolutionary Phonology approach in assuming that sound patterns with well-motivated diachronic explanations do not also require synchronic explanation. We outline how well-motivated historical developments may have led to the synchronic stop gradation patterns.

In the past millennium, Danish has undergone well-documented related chains of obstruent weakening (e.g. Brøndum-Nielsen 1928–1973). In the spirant weakening chain, syllable-final voiced fricatives turned into approximants or were lost; in the plosive weakening chain, after several intermediate steps, syllable-final voiceless stops met the same fate. In a relatively recent previous stage of Danish, the 'weak allophones' of stops were voiced fricatives [β ð ɣ]. Our main contribution with this paper is to show how the multiple developments leading to Standard Danish stop gradation follow directly from well-known phonetic pressures. The development of a syllable-initial aspiration contrast in stops and the loss of syllable-final voiced fricatives are different reactions to the same phonetic-phonological pressure: speakers need to maintain laryngeal contrasts, but maintaining obstruent voicing is problematic due to rapid intraoral pressure buildup (Westbury & Keating 1986; Botma & van 't Veer 2013). The difference in syllable-initial and syllable-final strategies is likely due to a general tendency for syllable-final segments to be shorter, which in turn leads to gestural undershoot (Keating et al. 2004). The eclectic velar patterns follow from known facts about tongue control: fine control of the tongue body is more difficult than the tongue tip, leading to more extensive vowel-to-consonant coarticulation in dorsal consonants (Vilain et al. 1998; Ouni 2014). These established facts about historical Danish phonology and cross-linguistic phonetic pressure provide a diachronic description and explanation of Standard Danish stop gradation, which (following Blevins 2004) removes the need for a synchronic explanation.

On /l/-insertion in Hindi causative verbs

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Causative derivations in Hindi trigger a complex set of synchronic phonological processes. As shown in (1), affixation of the first causative suffix, /-ɑ/, to bases containing lax vowels causes no alternations to the vowel quality of the base. However, bases containing tense vowels, as in (2), display laxing in causative derivations; and causatives formed on bases containing /e/ and /o/, as in (3a–b), show raising to [ɪ] and [ʊ], respectively.

The focus of this paper is the causative forms in (4). In cases like these, an epenthetic /l/ occurs between the final vowel of the base—to which laxing and raising can also apply—and the causative /-ɑ/ suffix.

(1) Non-alternating stems in /ɪ, ʊ, ʌ/

a.	lɪkʰ	'write'	lɪkʰ-ɑ	'dictate'
b.	sʊn	'hear'	sʊn-ɑ	'tell, cause to hear'
c.	ʧʌl	'move, go'	ʧʌl-ɑ	'drive'

(2) Laxing: stems in /i, u, ɑ/

a.	ʧʰ**i**n	'snatch'	ʧʰ**ɪ**n-ɑ	'cause to snatch'
b.	gʱ**u**m	'turn, tour'	gʱ**ʊ**m-ɑ	'cause to turn'
c.	m**ɑ**n	'accept'	m**ʌ**n-ɑ	'persuade'

(3) Vowel raising: stems in /e, o/

a.	l**e**ʈ	'lie down'	l**ɪ**ʈ-ɑ	'make lie down'
b.	b**o**l	'speak'	b**ʊ**l-ɑ	'call, invite'

(4) /l/-insertion after vowel-final bases

a.	p**i**	'drink'	p**ɪ-l**ɑ	'water, irrigate'
b.	d**e**	'give'	d**ɪ-l**ɑ	'cause to be given'
c.	r**o**	'cry'	r**ʊ-l**ɑ	'cause to cry'

Within the tradition of Indo-Aryan philology, scholars have generally attributed the origin of this pattern to the Sanskrit form *pālayati*. This is a dialectal variant of more common *pārayati* 'crosses over, saves', i.e. a causative formation on *pār-* 'cross' exhibiting /r/-lateralisation (Jamieson 1983; Sen 1960). The argument follows that the occurrence of an /l/ in this form led to the development of an allomorph of /-ɑ/ through analogy. Nevertheless, beyond this single, dialect-particular form, there is no evidence of /l/-causatives in Old or Middle Indo-Aryan: as Bloch (1965: 141) notes, "the real history of these suffixes is hidden from us".

Whilst /l/-insertion in these causative forms presents the problem of apparent 'unnatural' epenthesis (Blevins 2008; Vaux 2001), at least with regard to synchronic analysis, the assumption that this pattern simply reflects levelling of /l/ from a single, variable Sanskrit verb form is of questionable explanatory value. I pursue an alternative approach, which firstly situates the Hindi /lɑ/-causatives within the broader microtypology of synchronic Indo-Aryan languages. Whereas /lɑ/-causatives emerged only in a small set of Western varieties, previous work has not made the connection between these forms and other morpho-phonological patterns that occur in varieties on the dialect continuum with Standard Hindi: for example, (non-causative) perfective forms with /l/ (e.g. Bhojpuri *dekhal*, Marathi *dekhila*, vs Hindi *dekha* 'seen').

Secondly, I argue that all causative forms in /-ɑ/ and /-lɑ/ are ultimately traceable to Old Indo-Aryan /-aja/. More specifically, I explore the possibility that Hindi /l/-insertion may originate in historical reanalysis of /j/-deletion in causatives, i.e. via rule inversion (Vennemann 1972). This may reflect a compromise between preserving the sonorancy of historical /j/ and providing an onset in forms like [dɪ.la] that is phonotactically optimising with regard to markedness hierarchies for onset sonority (Gopal 2018; Gouskova 2004).

Sibilant devoicing in 16th century Spanish: A hearing problem?

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The diachronic evolution of Spanish sibilants involves a complex set of processes which implied an important reorganization of the system. This work is particularly concerned with the devoicing of Medieval sibilants in the 16th century, which probably began in the dentoalveolar affricate pair, and would have concluded with the alveolar segments (Lapesa 1981: 283, Pensado 1993, Torrens 2018: 71-72).

There have been different proposals to explain this topic. The most traditional approaches invoked Basque influence (Martinet 1951-1952, Lloyd 1993) or a structural readjustment in search for a more balanced and efficient phonological system (Alarcos 1988, Ariza 2012: 223). However, other scholars have pointed out that the change may have a phonetic basis, and that it could be accounted for in aerodynamic and perceptual terms (Pensado 1993, Widdison 1997).

Our aim is to provide evidence in favour of a phonetically based sound change. To this end, we assume that synchronic variation may draw a parallel to diachronic sound changes and, therefore, that experimental analysis of speech in the present can shed light on the historical evolution of phonological units (Blevins 2004, Harrington 2012, Ohala 2017). We also consider comparative linguistics a good method to reconstruct past stages in the phonological system. In this particular case, we deemed it interesting an approach from Catalan phonetics, since this language displays a sibilant system very similar to Medieval Spanish (Wheeler 2005, Recasens 2014).

With these ideas on mind, we carried out a perceptive identification test. Since research on sibilant devoicing demonstrate that voiced sibilants are not always produced with full vocal fold vibration and that duration is an important cue in their identification (Smith 1997, Widdison 1995, Bradley and Delforge 2006), we wanted to check whether utterances with different degrees of voicing were recognized as voiced or as unvoiced sibilants. For this purpose, we have recorded and acoustically analysed with Praat tokens of /s, z, ʃ, ʒ, t͡s, d͡z, t͡ʃ, d͡ʒ/ in intervocalic context in 16 Catalan speakers. We selected 74 cases which matched different degrees of vocal folds vibration according to the Voice Report available in Praat. 25 participants, all of them Catalan speakers, had to classify the stimuli as voiced or devoiced.

First results show that phonological voiceless segments are consistently recognized as such, but that phonological voiced items are more prone to confusion. It would demonstrate, thus, that devoicing of sibilants may be related to perceptual factors.

Centralised KIT Marking National Identity in New Zealand English

Abstract

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The pronunciation of the New Zealand English (NZE) short front vowels, particularly the KIT vowel is one of the most salient features of NZE. Being a fruitful research area, the NZE short front vowels have received considerable attention, therefore literature is abundant about this topic. It has been suggested (Gordon, 2009; Trudgill et al., 1998), that there is a connection between the KIT vowel and New Zealand national identity, however, few studies (perhaps Bell, 1997 and Starks, 2008 only) have investigated it in a systematic way, and direct evidence has not been provided yet. Thus, the goal of the present study is to fill this gap and investigate the significance of KIT centralisation from a sociolinguistic point of view and prove that the role of the KIT vowel is threefold in NZE.

After providing a brief historical and theoretical background, the paper attempts to prove that the KIT vowel is a national identity marker because centralised KIT evolved as an innovation in the period when New Zealand gained independence and became a newly born nation in the 1900s. In this respect, the most important events of the 1900s were when New Zealand became a dominion in 1907 then reached full independence in 1947. Therefore, from a strictly linguistic point of view, the emerging centralised KIT vowel is a means of expression of New Zealand national identity. Furthermore, we also claim that the KIT vowel has a crucial role in distinguishing NZE from Australian English, the two varieties being strikingly similar in other respects, and it is also an ethnicity marker within New Zealand regarding Maori English. After proving the above-mentioned points, we aim to demonstrate that the pronunciation of the KIT vowel is not marked but positively valued in NZE by carrying out a comparative analysis of the formant values of the KIT vowel in different speech styles. Last but not least, the most surprising aspect of the data is the difference in the extent of lowering and centralisation between male and female speakers in NZE.

In our research, we partly rely on the literature especially on Schneider's dynamic model (Schneider, 2003) and Trudgill's new-dialect formation (Trudgill, 2004) stating that these theories perfectly complement each other and serve as a solid base for our hypotheses. To support this claim, an acoustic analysis of speech samples, collected from New Zealanders as well as from existing archives, was carried out using Praat. Formant values of New Zealand, Australian and Maori speakers are provided as direct evidence to prove our hypotheses. Historical facts about New Zealand also constitute valuable information as external factors. The contribution of this study has been to confirm the assumptions proposed by previous studies, and its empirical findings provide a new understanding of the complex role of the KIT vowel in NZE.

Rule crossing in the variation period and the neogrammarian controversy

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The neogrammarians had no access to evidence from ongoing change, which was only adduced since the 1960s by Labov (1963) and subsequent work. Thus they did not know that change may be gradient when spreading through the lexical body (lexical diffusion, which they actually opposed) and always is when spreading through the community of speakers (which gradually implements the innovation depending on age, sex and other social parameters).

Having been able to study ongoing change, we know today that an innovation may be active in a language for several generations, or more than a century, before it is completed, i.e. before it has affected all words concerned and all instances of production of all speakers (variation period). Both the critique of the neogrammarian position (sound laws are not exceptionless, initiated by Curtius 1885 and Schuchardt 1886) and the analytic absurdities that the neogrammarians were driven into because of this position were carried from generation to generation of linguists down to the present day. They may well evaporate when relevant consequences are drawn from the period of intrinsic variation.

Consider the case where during the variation period two rules apply successively in bleeding order: rule 1 has only yet transformed a subset of words that it is competent for when rule 2, freshly innovated, destroys its context of application. Thus in the evolution from Latin to Old French, intervocalic voicing applies to the t of cōg(i)tāre > *cuidier* (mod. *cuider*), but not to the t of com(i)te > *comte*. These exceptions are only found when the vowel preceding the voiceless intervocalic obstruent is subject to syncope (indicated by brackets). Application of syncope bleeds voicing since it removes the obstruent from its intervocalic position, freezing its current evolutionary stage in strong post-coda position. Thus what has happened is simply that syncope has acted on a lexical body that was not yet fully affected by voicing. It thus produced a photography of the ongoing change by freezing its then current state.

Generations of neogrammarian-inspired analysts have tried to hammer the exceptions into the neogrammarian box, to no avail. The full spectrum of neogrammarian tools when facing variation was put to use: analogy, learned vocabulary, loans, dialectal forms. None of these being any plausible, the variation had to be predictable from the environment. Thus a generalization known as Neumann's Law held that pre-tonic syncope (cōg(i)tāre > *cuidier*) occurs later than post-tonic syncope (com(i)te > *comte*) and thus leaves the consonant for a longer time in intervocalic position: consonants in the pre-tonic environment have enough time to undergo voicing (Neumann 1890: 559f). But alas there are as many words conforming to this generalization as there are that contravene: both post-tonic voiced results (male-hab(i)tu > *malade*) and pre-tonic voiceless cases (sub(i)tānu > *sotain* (mod. soudain)) enjoy a massive record. It took decades to conclude that Neumann's Law does not work: examples are just as numerous as counter-examples, and both are randomly distributed (Rheinfelder 1953: §456).

This abuse of neogrammarian tools of course fueld anti-neogrammarian critique: see, they are wrong, sound laws are not exceptionless. The solution based on rule crossing during the variation period makes both the analytic absurdities and their critique pointless: yes, sound laws apply without exception, but they need some time to do that. Their application may be disturbed by other processes that are innovated during the variation period. This period intrinsic to (sound) change was not on the neogrammarian radar, and it seems to me that since we know about it, its consequences for the exceptionlessness debate have not been drawn. In the talk I submit that rule crossing in the variation period may obliterate the neogrammarian controversy altogether (Labov 1981, 1994: 16-25, 472-476 is along the same lines, but for other reasons): when amended with rule crossing, the neogrammarian position is correct. That is, all cases of exceptions to sound laws that cannot be explained by the regular tools (analogy, loans, etc., which of course are real) may be cases of rule crossing. It is shown in the talk that rule crossing is absolutely massive in French diachrony, from which many examples will be drawn (originating in the recently published Grande Grammaire Historique du Français GGHF).

The role of acquisition in phonologization: Infants can shape the pool of variation

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The role of infants in phonological change has been much debated. One position is articulated by Paul's (1886: 34; tr. Weinreich et al. 1968: 108) claim that 'the processes of learning language are of supreme importance for the explanation of changes'. The opposite approach can be summarised by Aitchison's (2003: 739) 'babies do not initiate changes'. I argue that infants condition phonological change in three capacities: as speakers, as listeners, and as organisers.

Foulkes & Vihman (2015) argue that infants do not play a role in sound change based on the observations that typical child-language patterns (e.g. consonant harmony) are rare in sound changes, typical sound changes mismatch with child patterns (e.g. CV interactions), repair strategies for the same structures are different in infancy and diachrony, and the child vocal tract is not a scaled-down adult tract. They attribute peaks in error types at certain ages to phases of articulatory experimentation where children 'eventually dispens[e] with phonetic forms that are not sufficiently good matches to adult usage'. But what occurs when matches to adult forms *are* 'sufficiently good'? We might predict that as infants develop a stricter observance to contrasts in production, child patterns which are problematic in communicating contrast will be lost, but unproblematic ones may be retained. This prediction appears to be borne out in the palatalization data in Foulkes & Vihman (2015). Palatal contact when articulating dentals/alveolars is more likely for young children than for adults, leading to palatalization being one of the most common errors in the age range 2;4 to 4;2, particularly when adjacent to a close(-mid) vowel, e.g. *that is beans* = [daçɪçbiːç]. However, unlike 'peaking' errors which fall away, palatalization remains relatively stable across the age ranges in the study (4-5% from 2;6 onwards). This could be precisely because the modified production is a sufficiently good perceptual match to adult usage without compromising contrast. Therefore, despite this error originating in an immature vocal tract, it persists into later childhood and plausibly forms the basis for extremely common diachronic palatalization.

Therefore, not only child-language production but also perception plays a role in which modifications are 'non-peaking'. The notion of a match is akin to Hura et al's (1992) 'perceptually tolerable articulatory simplification', where modifications arising from gestural compression (magnitude and time) may be retained if they are deemed perceptually similar enough to the target form. Such an approach could also explain why θ > f is a very common diachronic change, whereas f > θ is practically unknown. θ > f is common in infants (Vihman 1982) and has its roots in immature vocal apparatus and control, whereas f > θ does not have a comparable acquisitional basis. The two sounds are however perceptually similar, and show few minimal pairs in early acquired words in English (at any rate), rendering the change a perceptually tolerable articulatory simplification.

Finally, infants may contribute to phonological change as 'organisers', i.e. creators of phonological structures and systems. Imperceptible reanalyses might originate in infancy, but only become apparent if another sound change occurs which reveals the original reanalysis, e.g. adult intended /kwuː/, infant perceived /kʷuː/; all say [kʷuː], until a hypothetical u-fronting occurs, resulting in variants /kwuː/ > [kwʉː] vs. /kʷuː/ > [kʉː]. Alternatively, infants may reanalyse through input restructuring, rendering for example a phrase-level output as a word-level output in a life-cycle model of phonological change (Bermúdez-Otero 2015), based on the input frequency of morpheme variants in different environments.

Prelateral vowel change in Australian English

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In the Interactive Phonetic (IP) model of sound change (Harrington et al., 2018), the prerequisite for mergers may be satisfied when coarticulated realisations of a phoneme skew its distribution, thus reducing contrast between phonological categories. In Australian English (AusE), /ʉː/ GOOSE and /ʊ/ FOOT are typically distinct, with /ʉː/ being fronter than /ʊ/. However, in the prelateral environment, they show acoustic and perceptual contrast reduction through /ʉː/ retraction caused by coarticulation with coda /l/ (*pool-pull*) (Szalay et al., 2021a; 2021b). The IP model would predict that coarticulation between fronted /ʉː/ and retracted /l/ could provide the preconditions for sound change and merger by skewing the distribution of /ʉː/ towards /ʊ/. We test predictions of the IP model that coarticulation with coda /l/ may lead to sound change through greater retraction over time in AusE. We hypothesised that sound change would be evident in younger speakers producing larger F2 decrease in prelateral relative to preobstruent /ʉː/ compared to older speakers.

Data were extracted from AusTalk, an AusE speech corpus collected from 2011 to 2015 (Burnham, et al., 2021). Eight younger (ages = 20 – 29, mean = 24) and nine older (ages = 54 – 80, mean = 61) female native speakers of AusE were selected. Each speaker produced /ʉː/ and /ʊ/ in the /hVd, pVd/, and /hVl, pVl/ contexts (*who'd-hood, pool-pull*), producing each word up to three times, giving 200 tokens in total. Formant trajectories were extracted automatically and corrected manually in Praat. F2 targets for /ʉː/ were identified at F2 maxima in both contexts. F2 targets for /ʊ/ were identified at F2 minima in the /d/-, and at 25% of the rime in the /l/-context.

We constructed two Linear Mixed Models with the dependent variable F2 TARGET, and the independent variables VOWEL, CODA, and AGE (contrast coded, comparing /ʉː/ to baseline /ʊ/, /l/ to /d/, younger to older), one with the three-way interaction and one without it. Models included a random intercept for SPEAKER and random slope for CODA. Model comparison shows significantly better fit with the three-way interaction *($p < 0.005$);* the three-way interaction shows that the F2 decrease associated with /l/ in /ʉː/ is larger for younger than older speakers (*$\beta = -300$, SD = 78, $p < 0.0001$*). Planned comparisons with Bonferroni-correction indicate that there is a significant F2 lowering in prelateral /ʉː/ from older to younger speakers (*$\beta = -337$, SE = 39, $p < 0.0001$*); however, pre-/d/ /ʉː/ and /ʊ/ do not differ significantly between older and younger speakers (Figure 1). Collectively, these data provide evidence for sound change in prelateral /ʉː/ through F2 reduction, but not for language change in the pre-/d/ context or in /ʊ/. Our results are consistent with a contextual *pool-pull* merger in AusE, as predicted by the IP model of sound change.

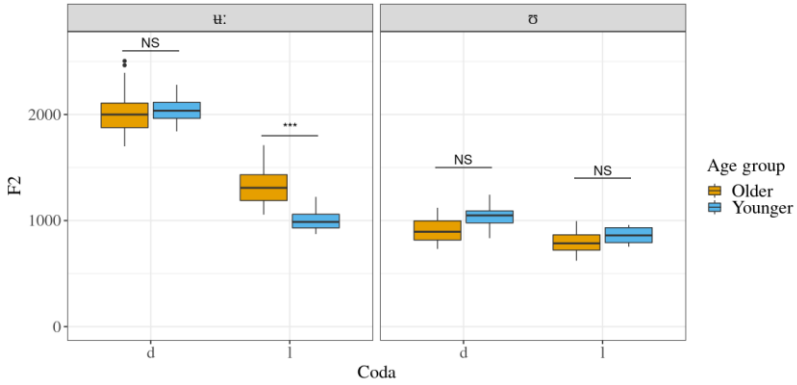

Figure 1: F2 target frequencies (Hz). Significance symbols show results of planned comparison.

On the evolving type of Spanish pronouns.

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In this paper I will present the history of the Spanish pronoun system as the unfolding of an abstract design over time. The Spanish system continues the spell-out instructions of the Latin ancestor, but the output must satisfy a small set of language-specific conditions in the best possible way. The major point is that the evolution of the Spanish pronoun system is guided by the formal pattern which is first found in a consistent way only in the third person, both singular and plural, during the formative period of the Iberian romance languages in medieval times.

	nominative	oblique	object (clitic)
3 sg masc.	él	(a) él	lo
3 sg fem.	ella	(a) ella	la
3 pl masc.	ellos	(a) ellos	los
3 pl fem.	ellas	(a) ellas	las

In the Renaissance, first and second plural undergo a series of changes that comply with the same set of conditions that shaped the microsystem of third person pronouns. The renewed second singular of formal address also conforms to the same ideal.

	nominative	oblique	object (clitic)
1 pl masc.	nosotros	(a) nosotros	nos
1 pl fem.	nosotras	(a) nosotras	nos
2 pl mas.	vosotros	(a) vosotros	os
2 pl fem.	vosotras	(a) vosotras	os
2 sg formal address	vos	(a) vos	os

A new set of formal address pronouns emerged at the end of the classical period, abiding by the same set of abstract shape conditions.

	nominative	oblique	object (clitic)
2 sg masc. formal address	usted	(a) usted	lo
2 sg fem. formal address	usted	(a) usted	la
2 pl masc. formal address	ustedes	(a) ustedes	los
2 pl fem. formal address	ustedes	(a) ustedes	las

In modern Spanish, only first and second singular resist the trend. However, *voseo tuteante,* the new pronoun for second person singular appearing in Latin American Spanish, follows the same abstract ideal that had shaped any pronoun that entered the language since the Middle Ages.

	nominative	oblique	object (clitic)
2 sg (alternative)	vos	(con) vos	te
2 sg	tú	(a) ti	te
1 sg	yo	(a) mí	me

The set of conditions that give and have given shape to Spanish pronouns is as follows:

a. Maximize prosodic and phonematic distinctions between clitic and full pronouns.
b. Stressed pronouns have a full binary foot, either moraic or syllabic.
c. Clitics are all open light syllables: a Ce template, if singular, and CVs, if plural.
d. Nominative and Oblique are identical.

Thus, an important corollary of this study is that the hazardous phonological history of the Spanish pronoun system is easy to model as the outcome of a few mutations in a reduced set of very simple and natural output conditions regulating the whole system.

An information-theoretic approach to the emergence of Portuguese nasal diphthong /ɐ̃w̃/

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One of the most controversial and yet-to-be-resolved issues in the historical phonology of Portuguese refers to the emergence of its word-final nasal diphthong /ɐ̃w̃/, spelled *-ão* (e.g. *mão* [mɐ̃w̃] 'hand') or *-am* (e.g. *amam* [ˈɐmɐ̃w̃] 'they love') in the modern language. The intense debate over this issue has centered on the two phonological mergers that gave rise to this diphthong. Until the 1300s, it is hypothesized that Old Portuguese had the following three distinct word-final nasal sequences: /ɐ̃ⁿo/, /ɐ̃ⁿ/, and /õⁿ/, e.g. *mão* [ˈmɐ̃ⁿo] 'hand', *pam* [ˈpɐ̃ⁿ] 'bread', *razom* [rɐˈd͡zõⁿ] 'reason'. By the early 1400s, however, these three sequences had developed a labial-velar offglide, which led the first two sequences to merge in /ɐ̃w̃/, i.e. /ɐ̃ⁿ/, /ɐ̃ⁿo/ > /ɐ̃w̃/, but /õⁿ/ > /õw̃/. Finally, by the early 1500s, words with final /õw̃/ had joined those ending in /ɐ̃w̃/, thus completing the merger of the three original nasal sequences and rendering modern forms such as *mão*, *pão*, and *razão*, all pronounced with final [ɐ̃w̃] in the standard variety of the language. The origins of /ɐ̃w̃/ in Portuguese have received much philological scrutiny since at least the end of the 1800s (cf. Meyer-Lübke 1890). Throughout the 20th century, however, multiple scholars have attempted to provide an explanation for the aforementioned mergers. To date, proposals have followed mainly two perspectives: one based on analogy (e.g. Williams 1933, 1962; Tilander 1959) and the other based on phonetic and phonological principles (e.g. Nobiling 1903; Sampson 1983, 1999; Carvalho 1989; Fagan 1992). While the former provide implausible diachronic pathways given the available evidence for the changes in question, studies which adopt the latter perspective have at best only described the mergers through ad hoc lists of rules of glide insertion and vowel dissimilation, thus failing to provide a principled explanation as to *why* such rules would have come about in the first place. While sound change has been studied from several perspectives throughout the years, a fundamental principle of language as a communication system has often been overlooked, namely, the information conveyed by language sounds in a given message during spoken communication. Thus, an increasing number of studies have focused on exploring the role that information plays in the shaping of sound patterns (Hume & Mailhot 2013; Hall et al 2018; Cohen Priva 2017, 2018; etc.). Specifically, the theoretical tools of *probability*, *entropy*, and *surprisal*, as defined under the tenets of Information Theory (Shannon 1948), are crucial to understanding the motivation behind phonological changes, as they shed light upon the nature of the change targeting unstable language patterns (Hume & Mailhot 2013: 44). The goals of the present study are, thus, twofold: (i) to present a unified account of the changes that led to the emergence of final /ɐ̃w̃/ in the history of Portuguese, consistent with a quantifiable theory of phonological change; and (ii) to apply information-theoretic tools as a contribution to the advancement of theoretical approaches to sound change. By analyzing data from a corpus of historical Portuguese (Davies & Ferreira 2006-), this study proposes that the change events incurred by the Old Portuguese word-final nasal sequences derive not only from a likely phonetic ambiguity that characterized each nasal subsystem in the different historical periods in question, but also—and decisively—from the instability of low- and high-frequency sounds in those subsystems. In information-theoretic terms, sounds with a higher surprisal—and, thus, lower entropy—are biased to change toward a similar element with lower surprisal, preserving the structures with which the speaker-listener is already familiar. This is proposed for the nasals /ɐ̃ⁿ/ and /õⁿ/, both of which developed a final labial-velar offglide while preserving their first vowel. On the other hand, changes in patterns with lower surprisal—and, thus, higher entropy—are usually prone to production-based processes. This is shown to be the case for /õw̃/, the first vowel of which was centralized to [ɐ̃], leading to the eventual merger of all original sequences in /ɐ̃w̃/ at the start of the 16th century.