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Redeployment in language contact: the case of phonological emphasis

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This article applies the notion of redeployment in second language acquisition to contact-induced diachronic changes. Of special interest are cases where a marked phonological contrast has spread across neighboring languages. Such cases suggest that listeners can re-weight and re-map phonetic cues onto novel phonological structures. On the redeployment view, cues can indeed be re-weighted, but phonological structures which underlie a new contrast are not expected to be fully novel; rather, they must be assembled from preexisting phonological structures. Emphatics are an instructive case. These are (mostly) coronal consonants articulated with tongue-root retraction. Phonological emphasis is rare among the world's languages but it is famously endogenous in Arabic and in Interior Salish and it has spread from these to not a few neighboring languages. The present study describes and analyzes the genesis of phonological emphasis and its exogenous spread to a dozen mostly unrelated languages—from Arabic to Iranian and Caucasian languages, among others, and from Interior Salish to Athabaskan and Wakashan languages. This research shows that most languages acquire emphatics by redeploying the phonological feature [RTR] (retracted tongue root) from preexisting uvulars. On the other hand, some languages acquire imitations of emphatics by redeploying the consonantal use of [low] from preexisting pharyngeals. Phonological emphasis is apparently not borrowed by neighboring languages where consonants lack a phonological feature fit for redeployment. The overall impression is that a language in contact with emphatics may newly adopt these sounds as [RTR] or [low] only if the relevant feature is already in use in its consonant system. This pattern of adoption in language contact supports the redeployment construct in second language acquisition theory.

KEYWORDS

Afroasiatic languages, Caucasian languages, Pacific Northwest Plateau, language contact, emphasis (phonological), uvularization, pharyngealization, redeployment

1 Introduction

The retracted coronal consonants known as emphatics (/ṭ ḍ ṣ …/) are found only in a few languages that have innovated them, notably Arabic (Wallin, 1855) and Interior Salish (Shahin, 1996), and in neighboring languages that have borrowed them (e.g., Cook, 1978; Anonby, 2020). A cross-linguistic diachronic study of these sounds may therefore sound niche, even quaint, but in practice the present study validates several complementary ideas that could hardly be broader. The first is Kabak's (2019) dictum that "second-language learning... mimics language change through language contact" (p. 221). On this view, it makes sense to study contact-induced sound shifts using a construct that has proven valuable in second-language acquisition theory, viz. Archibald's (2003; 2005; 2009; 2018; 2021; 2022; 2023) redeployment dictum that, as a rule, "new structures" are never fully so, but are rather "assembled out of the building blocks found in the L1" (2018, p. 15).

A classic example of redeployment in second-language acquisition concerns the English /l–ɹ/ contrast. This distinction is notoriously difficult for adult learners whose L1s have only one liquid phoneme, such as Japanese and Korean (Brown, 2000). Of special

interest is that native speakers of Standard Chinese are relatively successful at learning English /l–ɹ/, in spite of their L1 having just one liquid phoneme (Brown, 2000). Brown suggests that these learners derive benefit from the fact that unlike Japanese and Korean, Standard Chinese distinguishes multiple series of [strident, coronal] sibilants: plain /ts tsʰ s z/ vs. [posterior] /tʂ tʂʰ ʂ ʐ/ vs. [front] /tɕ tɕʰ ɕ (ʑ)/.[1] Setting aside the details of Brown's analysis, the basic idea is that native speakers of Chinese are able to recycle a distinctive feature from their rich sibilant system to learn English liquids. In particular, the [posterior] feature of the retroflex sibilant series may be repurposed to distinguish /ɹ/ from /l/ in L2 English. Note that [posterior] is used for /ɹ/ in L1 English (Nelson and Flynn, 2022, and references therein), but this phonological feature is not used to distinguish liquids in Standard Chinese (Duanmu, 2007).

In some cases a redeployed structure may be a poor imitation of the target structure, but succeed nonetheless at distinguishing many lexical items in the L2. For instance, Japanese and Korean do not use [posterior], so adult native speakers of these languages cannot redeploy that distinctive feature when learning the /l–ɹ/ contrast in English (cf. Brown, 2000). Paradoxically, however, they appear to be successful at learning the /s–ʃ/ contrast in most (but not all) English words (Eckman and Iverson, 2013). This is surprising because the /s–ʃ/ contrast is based on [posterior] in English (Atkey, 2002; Son, 2005; Clements, 2009, p. 50; Nelson and Flynn, 2022). This paradox is resolved not by rejecting the redeployment dictum, but by leaning into it: "learners are not really successful in acquiring E/š/. In fact, they perceive and produce E[š] by utilizing the feature [front] in their system" (Son, 2005, p. 192). That is, native speakers of Japanese and Korean learn English /ʃ/ as [front] /ɕ/. This strategy is straightforward in the case of Japanese, where [front] /ɕ/ already exists as "a palatalized consonant (Cy)" (Labrune, 2012, p. 68). In Korean, however, only the [front] affricates /tɕ tɕ* tɕʰ/ are well-established (Shin et al., 2012, p. 76–78, 195–196); the fricative [ɕ] is strictly an allophone of /s/ "when followed by the vowels /i/ or /j/ or the diphthong /wi/" (Shin et al., 2012, p. 70).[2] In this case, then, redeploying [front] entails a newly assembled phoneme in L2 English, e.g., *push* /pʰʊɕ/.[3] What is redeployed here is the phonological use of [front] in a sibilant, not simply the feature [front], which occurs in most languages, notably in front vowels.

As these examples illustrate, phonological redeployment is akin to Lardiere's (2009) feature re-assembly model of second-language morphology. As such, a redeployment analysis can only be as strong as the evidence that a particular phonological structure is present or absent in the L1 (e.g., [posterior] in Chinese vs. Japanese) and that this structure can play a particular function in a re-assembled representation (e.g., [front] /ɕ/ in L2 English). Accordingly, the present article dwells at some length on the representation of emphatics and related sounds. The upshot is that, as McCarthy (1988) famously put it, "if the representations are right, the rules will follow" (p. 84)—a third dictum validated in the present study. That is, if one assumes the most agreed upon phonological representations for emphatics and related sounds, the redeployment construct helps to make sense of how and why emphatics have developed in and across languages.

Specifically, I will show that Interior Salish and Arabic innovated a series of coronal consonants specified [retracted tongue root] ([RTR]) and that these emphatics were borrowed as such in many neighboring languages (Tsilhqot'in, Kumzari, etc.) by redeploying the feature [RTR] from preexisting uvulars. Importantly, neighboring languages without uvulars (and without any other [RTR] consonant) did not and arguably could not participate in such redeployment. On the other hand, I will show that certain languages with pharyngeals have developed approximate imitations of emphatics. Pharyngeal consonants entail a constriction in the epilarynx and lower pharynx, traditionally represented by the phonological feature [low]. This feature can apparently be used for secondary pharyngealization in consonants, too. For example, the [RTR] emphatic consonants of Arabic were evidently borrowed into Tigre as [low] instead, by redeploying [low] from preexisting pharyngeal consonants to ejectives. The phonological use of [low] in consonants is disputable, if traditional; it is discussed at the end of this article, alongside possible alternatives.

2 The dissemination of phonological emphasis in the Pacific Northwest

This first major section describes how "Salish emphatics" (Shahin, 1996) originated in the Pacific Northwest Plateau (Section 2.1) and then spread via redeployment (Archibald, 2003 *et seq.*) to a string of unrelated languages—Tsilhqot'in (Section 2.2), Nedut'en-Witsuwit'en (Section 2.3), and X̄a'islak̓ala-X̄enaksialak̓ala (Section 2.4).

2.1 Emphasis genesis: Interior Salish

Interior Salish, located in the Pacific Northwest Plateau, is one of two major branches of the Salish family of languages (Czaykowska-Higgins and Kinkade, 1998; Cook and Flynn, 2020; Davis, 2020). Interior Salish consists of a northern branch, which includes Secwepemctsín (Shuswap), St'át'imcets (Lillooet), and Nłeʔkepmxcín (Thompson), and a southern branch, which includes Snchitsu'umshtsn (Coeur d'Alene) and Nxaʔamxcín (Columbia-Moses), among others. These languages have long been reported as having retracted coronal consonants and vowels (Kinkade, 1967; Sloat, 1968; Kuipers, 1974; Johnson, 1975; Cook, 1978, 1981, 1984; etc.). The sounds in question are standardly analyzed with the phonological feature [retracted tongue root] ([RTR] or [TR]) in the Interior Salish literature (Cook, 1978, 1985, 1987; Cole, 1987; Czaykowska-Higgins, 1987, 1990; Bessell and Czaykowska-Higgins,

1 These features reflect Duanmu's (2007) analysis, rather than Brown's. However, I use privative features throughout the present article, e.g., [strident], [posterior], and [front] for Duanmu's [+fricative], [−anterior], and [−back], respectively. Duanmu tentatively suggests that the laryngeal feature [aspirated] (i.e., [spread glottis]), rather than [voice], may be constrastive in the fricatives (/sʰ ʂʰ ɕʰ/ vs. /s ʂ (ɕ)/), just as it is in the affricates (/tsʰ tʂʰ tɕʲʰ/ vs. /ts tʂ tɕʲ/), e.g. /sʰʂ/ "die" [sz ∼ ss]; /ʂʰʂ́/ "history" [ʂz ∼ ʂs] (p. 24). The latter suggestion is consequential for redeployment, as discussed in Archibald (2023).

2 Thus "Korean and Japanese native speakers often mispronounce the English word 'see', as they apply the allophonic rules of their native language to the pronunciation of the English word" (Shin et al., 2012, p. 71).

3 Son (2005) suggests that beginners may approximate English /ʃ/ by "using their available L1 resources to mimic it with the *sequence* /s/ + [front]" (p. 137; emphasis in original). Thanks to Bill Idsardi (p.c.) for this example.

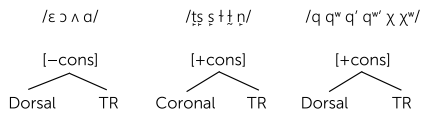

FIGURE 1
Representations of retracted vowels, retracted coronals, and uvulars adapted from Czaykowska-Higgins (1990, p. 3). TR, Tongue Root.

1991; Bessell, 1993, 1998a,b; Shahin, 1996, 2002; Ananian and Nevins, 2001; McDowell, 2004; Namdaran, 2005, 2006; etc.).

For example, Czaykowska-Higgins (1990, p. 2) reports that in Nxaʔamxcín the vowels /i u ə a/ and the coronal consonants /ts s l l̪ n/ "all have retracted counterparts," viz. /ɛ ɔ ʌ ɑ/ and /t̪s̪ ʂ ɬ ɮ n̪/; that "the "darkened" timbre of these sounds is due to uvularization," i.e., "retraction of the tongue root"; and that, "[w]hile retracted vowels and consonants may appear in morphemes or words which contain no back consonants, it is interesting to note that they may also be found (directly) adjacent to uvular segments" (Czaykowska-Higgins, 1990). That is, uvulars cause adjacent /i u ə a/ and /ts s l l̪ n/ to become retracted as [ɛ ɔ ʌ ɑ] and [t̪s̪ ʂ ɬ ɮ n̪], like the underlyingly retracted vowels and coronals. She concludes that retracted vowels, retracted coronals, and uvulars uniquely share a tongue-root retraction feature, as shown in Figure 1.[4]

> Both retracted vowels and retracted consonants are produced by retracting the root of the tongue. Since uvular consonants trigger retraction of adjacent vowels or coronal consonants, then one may assume that uvulars also involve tongue root retraction. (Czaykowska-Higgins, 1990, p. 2)

Indeed, ultrasound studies suggest that "the articulation of uvular consonants universally includes a retracted tongue root position" (Namdaran, 2006, p. 14). In particular, several ultrasound studies of the neighboring Interior Salish language Sťáťimcets confirm that retracted coronals share a distinct tongue-root retraction gesture with uvulars (Namdaran, 2005, 2006; Hudu, 2008; Allen et al., 2013, p. 199–200). These studies also confirm the consensus view among phonologists that "uvulars are, in fact, dorsal as well as tongue root segments" (Czaykowska-Higgins, 1990, p. 3),[5] e.g.,

> Sťáťimcets uvular consonants possess a raised and retracted tongue dorsum articulation toward the upper-pharyngeal/posterior-uvula region of the vocal tract, as well as a tongue root constriction toward the lower pharynx. (Namdaran, 2006, p. 153)

Tongue-dorsum raising is far less consistent in the retracted coronals (Namdaran, 2006). This, too, conforms with some phonologists' claim that [coronal] emphatics are [RTR], but not necessarily [dorsal] (as in Figure 1).[6]

As an important aside, Nxaʔamxcín appears to be unique among Interior Salish languages in having true pharyngeals, including voiceless /ħ ħʷ/ (Bessell, 1993, p. 93). The phonetic effect of these pharyngeals on adjacent vowels is different from that of retracted coronals and uvulars. The unrounded pharyngeal consonants /ħ ʕ ʢ/ cause /i u ə/ to lower as [e o a], and /a/ to be "slightly fronted" (Czaykowska-Higgins, 1990, p. 2, fn. 4). The latter effect was first reported by Kinkade (1967, p. 232): "Pharyngeals may have some effect on neighboring vowels. The most notable is a marked fronting of /a/ in immediate proximity to /ḥ/ or /ʕ/ (e.g., Cm ḥácəm *tie*)." This effect has also been reported for the pharyngeals /ħ ʕ/ in other languages such as Akkadian and Arabic (Harrell, 1957; Colarusso, 1985, p. 366; Hayward and Hayward, 1989, p. 187; Herzallah, 1990, p. 29, 59; McCarthy, 1994, p. 197; Rose, 1996, p. 87; Shahin, 2002, 2011, p. 612; Watson, 2002, p. 271–272, 277–278; Moisik, 2013, p. 484; Sylak-Glassman, 2014, p. 72). For instance, "the tongue body is front with the Arabic pharyngeals, as we can see by the adjacent front allophone of the low vowel" (McCarthy, 1991, p. 78).[7]

Pharyngeal consonants are traditionally represented by the distinctive feature [low] in phonological theory (Chomsky and Halle, 1968, p. 305; Ladefoged, 1971, pp. 92–94; Lass and Anderson, 1975, p. 18; Prince, 1975, p. 12; Rood, 1975, p. 329–333; Halle, 1983; Halle and Clements, 1983; Cole, 1991, p. 25; Coleman, 1998, p. 69; Jensen, 2004, p. 97; Calabrese, 2005, p. 59–60; Hayes, 2009, p. 87–88; Miller, 2011, p. 434; Flynn, 2012, p. 142–144; Odden, 2013, p. 54, 60; among many others). The basic idea is that the canonical low vowel /a/ corresponds to the approximant /ʕ/ in consonant positions, as shown in Figure 2.[8] Crucially, the feature [low] is considered *least marked* in syllable-nucleus position and *most marked* in syllable margins (Prince and Smolensky, 2004, p. 157). Using [low] as in Figure 2 therefore nicely captures the typological fact that all

4 Czaykowska-Higgins (1990) follows an old tradition here in taking the tongue body to be the designated articulator of not only dorsal consonants, but also vowels (Sievers, 1881, p. 93ff; Chomsky and Halle, 1968, p. 302; Sagey, 1986).

5 See also Czaykowska-Higgins (1987), Gorecka (1989), Goad (1989), Bessell (1993), Davis (1993; 1995, p. 471–472), Halle (1995, p. 18), Mahadin and Bader (1995), Rose (1996), Shahin (1996, 1997, 2002, 2011), Zawaydeh (1998), Watson (1999), Al-Raba'a and Davis (2020, p. 22ff), Abo Mokh and Davis (2020, p. 40–41), among many others.

6 See also Czaykowska-Higgins (1987), Goad (1989, 1991), Bessell (1993), Davis (1993; 1995, p. 471–472), Al-Raba'a and Davis (2020, p. 22ff), Abo Mokh and Davis (2020, p. 40–41), among others.

7 The fronting effect of pharyngeals is apparently a consequence of their "double bunching" (Catford, 1983, p. 349). Roughly, the tongue is displaced forward by the lower pharyngeal constriction which accompanies the epilaryngeal constriction in pharyngeal consonants (for details, see Catford, 1983, p. 349; Moisik, 2013, p. 482–500; Sylak-Glassman, 2014, p. 70–73; Beguš, 2021, p. 715).

8 The nucleus is not recognized in standard moraic theory (Hayes, 1989) but this syllabic constituent is essential to a wide range of phonological phenomena (Shaw, 1993, 1994, 1996, 2002; Shaw et al., 1999; Bach et al., 2005; Davis, 2006). For instance, the nucleus is the unitary structure behind diphthongs. Standard moraic theory treats bimoraic diphthongs (e.g., /ɑɪ/ in "buy", /ɔɪ/ in "boy") the same as bimoraic vowel-consonant sequences (e.g., /ɑm/ in "bomb", /ɔɹ/ in "bore"), but this uniform treatment is belied by phonological and psycholinguistic facts. To give just one example, fluent backward talkers (Cowan et al., 1985) reverse the order of bimoraic vowel-consonant sequences (e.g., /mɑb/ for "bomb", /ɹɔb/ for "bore") but they leave the components of bimoraic diphthongs in order—the nucleus is preserved as a unitary structure (e.g., /ɑɪb/ for "buy", /ɔɪb/ for "boy").

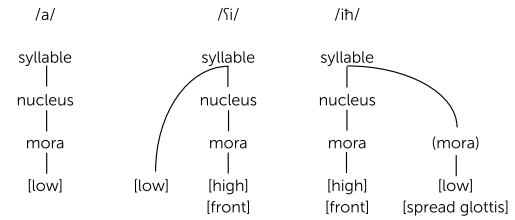

FIGURE 2
Unmarked [low] in syllable nucleus vs. marked [low] in non-nuclear positions.

spoken languages have a low vowel whereas only a small number of languages have pharyngeals.

The understanding of true pharyngeals as [low] rather than [RTR] helps to explain why adjacent non-low vowels become lower, but not necessarily more retracted, and why adjacent low vowels may even be slightly fronted, as in Nxaʔamxcín (Kinkade, 1967, p. 232; Czaykowska-Higgins, 1990, p. 2, fn. 4). However, it should be noted that the latter effects are not observed elsewhere in Interior Salish (Bessell, 1993, p. 98). The so-called pharyngeals in other Interior Salish languages turn out to be uvular approximants /ʁ̞ ʁ̞ʷ ʔʁ̞ ʔʁ̞ʷ/ (Namdaran, 2006, p. 145, and citations therein). That these uvulars have become true pharyngeals in Nxaʔamxcín is not surprising—"there is a common sound change of uvulars to pharyngeals" (Blevins, 2004, p. 198), as seen, for instance, "in every branch of Semitic" (Namdaran, 2006), in Wakashan (Jacobsen, 1969) and in Haida (Eastman and Aoki, 1978). As Weiss (2015) remarks, "the typological surveys of Simpson (2003) and Kümmel (2007) show that uvulars frequently become pharyngeals but pharyngeals don't often become uvulars" (p. 135). "All evidence points to pharyngeals as an innovation in Southern Interior Salish due to a regular uvular to pharyngeal sound change" (Blevins, 2004, p. 198).

This brings us to the origin of retracted coronal consonants and vowels in Interior Salish. Speakers of Proto Interior Salish innovated these sounds by spreading the retracted articulation of their uvular obstruents /q qʷ q' qʷ' χ χʷ/ and uvular approximants /ʁ̞ ʁ̞ʷ ʔʁ̞ ʔʁ̞ʷ/ inside words (Kuipers, 1981; Cook, 1985, 1987; Van Eijk and Nater, 2020). More specifically, the emphatic series /tˤ sˤ .../ developed by assimilating the phonological feature [RTR] from a uvular in the same word. [RTR] assimilation arguably remains an active phonological process in certain Interior Salish languages (e.g., Cole, 1987; Czaykowska-Higgins, 1990; Ananian and Nevins, 2001; Shahin, 2002; cf. Davis, 2020, p. 458). The diachronic and synchronic spread of emphasis in Interior Salish words is a handy analogy for the fact that phonological emphasis has spread to unrelated languages to the north of Interior Salish.

2.2 Emphatics via dentals: Tsilhqot'in

The Athabaskan language Tsilhqot'in has a series of retracted coronals which patterns with uvular consonants, just like its Interior Salish neighbors to the south (Krauss, 1975; Cook, 1978, 1983, 1984, 1993a,b; Latimer, 1978, p. 237–238, 2013, p. 20; Goad, 1989; Ananian and Nevins, 2001; Hansson, 2010, p. 79–81; Bird and Onosson, 2022). Hansson (2010) gives a pointed description:

> [A]lveolar sibilants in Tsilhqot'in contrast in pharyngealization, with "sharp" ([−RTR]) /s, z, ts, tsʾ, dz/ vs. "flat" ([+RTR]) /sˤ, zˤ, tsˤ, tsˤʾ, dzˤ/. Consonant harmony operates over precisely this distinction, making it a rare instance of secondary-articulation harmony… In Tsilhqot'in, all alveolar sibilants in a word agree in [±RTR], with the rightmost one determining their surface [RTR] value. … Tsilhqot'in also has a velar vs. uvular contrast (/k/ vs. /q/, etc.), which also appears to involve [±RTR] (Cook, 1993a), given that uvulars and "flat" sibilants have the exact same lowering and / or retraction effect on neighboring vowels (/æ/→ [ɑ], /u/ → [o], and so forth). (p. 164)

As this quote illustrates, the feature [RTR] is generally assumed for both coronal emphatics and uvulars in Tsilhqot'in (Latimer, 1978; Cook, 1984, 1993a, 2013, p. 35–37; Goad, 1989, Ananian and Nevins, 2001; Hansson, 2010).[9] Flynn and Fulop (2014, p. 215) "suggest that uvulars acted as an origin of the pharyngealization in the emphatic coronals," such that even today, "uvulars pattern with emphatic coronals in triggering flattening consonant harmony in Tsilhqot'in, e.g., **tsʾiqi, *t̪sʾiqi* [t̪sˤʾəiqəi] "woman" (cf. **tsiṣaj, *t̪siṣaj* [t̪sˤəiṣaj] "sand"; Cook, 1983, 1993a)."

It is now possible to be more concrete: the phonological feature [RTR] was redeployed as phonological emphasis from the uvulars, which date back to Proto-Athabaskan (Leer, 1979; Cook, 1981). More specifically, Tsilhqot'in speakers repurposed the [RTR] feature of their large uvular series /q qʷ qʰ qʷʰ qʾ qʷʾ χ χʷ ʁ ʁʷ/, turning an earlier series of dental obstruents into emphatic sibilants, under the influence of emphatic coronals (including sibilants) in neighboring Interior Salish languages. Emphatic coronals are rare sounds so it is unlikely that they developed in Tsilhqot'in independently of their use in neighboring Interior Salish languages. The examples in (1) illustrate that dental consonants, which remain intact in Dëne Sułiné (among other northern Athabaskan languages), have evolved into emphatics (written <ŝ ẑ tŝ dẑ tŝʾ>) in Tsilhqot'in (Cook, 2004; Flynn and Fulop, 2014).

(1)	*Dëne Sułiné*	*Tsilhqot'in*		*Dëne Sułiné*	*Tsilhqot'in*	
	t̪θʰɛ̃ɬ	t̪sˤʰɬ́	"axe"	θɛ-	sˤɛ-	perf. conj.
	-t̪θʰí	-t̪sˤʰí	"head"	jaθ	jəsˤ	"snow"
	-t̪θʰə́n	-t̪sˤʰə́	"meat"	-ðe	-sˤi	"belt, hide"
	-t̪θʾi	-t̪sˤʾi	"stay (pl)"	-ðá	-zˤí	"mouth"
	t̪θʰaj	sˤaj	"sand"	-néð	-nezˤ	"long"

Flynn and Fulop (2012, 2014) explain that dental obstruents like [θ] are somewhat grave, auditorily, in the precise sense

9 Latimer (1978) first characterized the "flat" consonants in Tsilhqot'in with "the feature [RTR]" which, he tentatively suggests, "corresponds to a contraction of the styloglossus" (p. 54).

(2) *F-mutation in Witsuwit'en* (Wright et al., 2002, p. 46).

/ə/	/-t'ətsˀ/	[t'ʌtsˀ]	"incisor"	/t^həz/	[t^hʌz]	"cane"	*cf.*	/təz/	[təz]	"driftwood"
/o/	/-t'otsˀ/	[t'ɔtsˀ]	"peel, bark"	/t^ho/	[t^hɔ]	"water"		/toso/	[tosɔ]	"gunny sack"
/a/	/t'atsˀ/	[t'ɑtsˀ]	"backward"	/t^haj/	[t^hɑj]	"paternal uncle"		/taji/	[tæji]	"appointed chief"

that the high-frequency noise above 2.5 kHz is not predominant, meaning that the amplitude of noise below 2.5 kHz is at least as great. They use this acoustic property to explain the varied shifts of dentals in other northern Athabaskan languages—to laterals, which are also somewhat grave; to velars, which are also grave; and to labials and labiovelars, which are not only grave but also flat, because they involve a "downward shift of a set of formants" (Jakobson et al., 1952, p. 31; see also Trubetzkoy, 1939, p. 127ff). Crucially, tongue-root retraction is also somewhat flat (e.g., it lowers F2) and as such, it lowers the noise spectrum of otherwise acute sibilants. Flynn and Fulop (2014, p. 216) suggest that Tsilhqot'in speakers traded in their grave dentals for the flat sibilants of their Interior Salish neighbors on the basis of this lowered spectrum. See Flynn and Fulop (2014) for a broader discussion of "grave" and "flat" in sound change.

Note that an emphatic-dental connection is recognized elsewhere. The emphatic approximants <z̲ z̲'> are interdental in the Mount Currie dialect of the Interior Salish language St'at'imcets, which adjoins Tsilhqot'in (Van Eijk, 1997, p. 4; Shahin, 2002, p. 177–178). Notably, too, emphatic *ḍ* and *ẓ* are [ðˤ] in many dialects of Arabic (Bellem, 2014).[10]

2.3 Phonological emphasis via fortis: Nedut'en-Witsuwit'en

Tsilhqot'in borders another Athabaskan language to the north, Nedut'en-Witsuwit'en, in which fortis consonants cause any following vowel to be lowered and retracted, an effect called F(ortis)-mutation (Cook, 1984, 1987, 1989, 1990; Story, 1984; Vaux, 1996, p. 176–177; Wright et al., 2002, p. 46–48; Hargus, 2007). The fortis set in question consists of the voiceless fricatives /ɬ s ɕ χ^w χ h/ as well as stops and affricates which are either [constricted glottis] ([CG]) /t' tɬ' ts' (tʃ') c' q^w' q' ʔ/ or [spread glottis] ([SG]) /t^h $t\text{ɬ}^h$ ts^h c^h ($t\text{ʃ}^h$) q^{wh} q^h/.[11] The examples in (2) illustrate that /ə o a/ change to [ʌ ɔ ɑ] after ejective /t'/ and aspirated /t^h/, but not after plain /t/, which is approximately lenis [d̥]. F-mutation affects the other vowels similarly, but more complexly: /i/ changes to [e] in closed syllables (except in loans) and to [əj] in open or laryngeal-closed syllables; /e/ changes to [ɛ]; /u/ remains unchanged or else changes to [o̥] (Hargus, 2007, p. 186).

Cook (1984, 1987, 1989, 1990) suggests that fortis consonants in Nedut'en-Witsuwit'en have a secondary articulation of pharyngealization, which affects adjacent vowels like the emphatics do in Tsilhqot'in and Interior Salish.

> I have no doubt in my mind from my experience with "flattened" vowels in Chilcotin (see Cook, 1983) and "retracted vowels" in Interior Salish (see Cook, 1985), that the phonetic basis for the vowel quality in the fortis syllable is the retracted tongue root—narrowed pharyngeal cavity. (Cook, 1989, p. 139)

More specifically, Cook treats "F-mutation as a process of pharyngealization" (Cook, 1990, p. 124) which is triggered by the feature [RTR] (Cook, 1989, p. 139) or [radical] (Cook, 1990, p. 303). This implies that Nedut'en-Witsuwit'en speakers phonologized tongue-root retraction in fortis consonants. Such retraction in voiceless obstruents is well-understood as aerodynamically motivated: the pharyngeal cavity is constricted by retracting the tongue root, which increases the supraglottal pressure, which in turn serves to inhibit passive voicing in fortis consonants (Trigo, 1991; Vaux, 1992, 1996).

Interestingly, a strong prediction follows from Cook's (1989) [RTR]-analysis of F-mutation in Nedut'en-Witsuwit'en: if this analysis is correct, then the same effect on vowels is expected from non-fortis uvulars, on the assumption that all uvulars are [RTR] (see Section 2.1). As it happens, this is precisely what Cook (1990) found—"F-mutation is triggered not only by a fortis consonant, but also by any consonant of the Q-series [i.e., uvulars]" (p. 132), including lenis /q/ ([ɢ̥]) and /ʁ/ (transcribed by Cook as /G/ and /ɣ/, respectively), e.g., /qis/ [ɢ̥eis] "spring salmon" (p. 129), /peʁu/ [b̥eʁo] "his / her tooth" (p. 132), /q^hequni/ [q^hɛɢ̥oni] "leather shoe" (Cook, 1990).[12]

10 Tellingly, emphatic d̤ [ð̤] has become labiodental [f] in a subvariety of Faifi Arabic (Davis and Alfaifi, 2019). This substitution is expected on Flynn and Fulop's (2012, 2014) claim that a pharyngealized dental like [ð̤] and a labiodental like [f] are both grave and flat, auditorily. Interestingly, Shockley (2024) reports an intermediate sound in Musandam Arabic: "pharyngealized linguolabial fricative [ð̤ˤ]" (p. 16), e.g., *waḏ̤ˤaʕ* "situation."

11 The labio-dorsals are uncertain. They are rounded uvulars in Nedut'en-Witsuwit'en according to Story (1984, p. 25) and Cook (1989, p. 139), among others. Thus /ə/ becomes retracted and rounded as [ɔ] before the labio-dorsals (Story, 1984). Hargus (2007) notes that labio-dorsals in Nedut'en-Witsuwit'en originate from labialized uvulars in Proto-Athabaskan (p. 29, fn. 14) and that they pattern with non-labialized uvulars in a recent merger of laryngeal contrasts in Witsuwit'en (cf. p. 221–223): *q, *q^h > q^h; *q^w, *q^{wh} > q^{wh}. "The mergers," Hargus (2007, p. 222, fn. 58) remarks, "are also in accord with a phonetic universal proposed by Maddieson (1997) that VOT duration correlates with degree of backness: the backer the sound the longer its VOT." However, Story (1984) reports that Proto-Athabaskan high vowels became mid before non-labialized uvulars, whereas these vowels remain high before labio-dorsals, so Hargus (2007, p. 34) argues that the latter are actually labialized velars. At any rate, "labio-velars are relatively rare, particularly when adjacent to vowels other than /ə/" (Hargus, 2007, p. 157).

12 Cook transcribes the first vowel as [e], but it is expected to be [ɛ] after the fortis uvular /q^h/. This word is usually recorded with ɛ in the first syllable (e.g., Hargus, 2007, p. 243).

According to Hargus (2007, p. 215–218), the phonetic gesture that was phonologized in Nedut'en-Witsuwit'en fortis consonants was not tongue-root retraction, but rather larynx raising. Specifically, she identifies "synchronic F-mutation" (Story, 1984, p. 30) with [–lowered larynx], a phonological feature proposed by Trigo (1988, 1991). Larynx raising has long been associated with pharyngeal constriction, e.g., "the smaller pharynx is produced by retracting the root and raising the larynx. The vertical position of the larynx is reasonably well-correlated with the position of the tongue root" (Lindau, 1975, p. S12; see also Trigo, 1988, 1991; Moisik, 2013). So it is reasonable for Hargus (2007) to ascribe "synchronic pharyngealization" (Cook, 1989, p. 141) to [–lowered larynx].

However, there are several reasons for doubt. First, if F-mutation is caused by [–lowered larynx], why would the [+lowered larynx] "lenis consonants of the Q-series trigger F-mutation" (Cook, 1990, p. 133), as noted above? Second, the majority of fortis consonants in Nedut'en-Witsuwit'en are [spread glottis] according to Hargus (2007): "Voiceless fricatives are [+spread glottis]" (p. 217), just like "the [+spread glottis] voiceless aspirated stops / affricates" (Hargus, 2007).[13] The problem here is that [spread glottis] is normally associated with larynx lowering, not raising, according to Trigo herself (see also Esling et al., 2019, p. 18). To give just one example: "In the case of Madurese, as discussed by Trigo, it seems quite plausible that the *aspirated stops* and the voiced stops are indeed both [+LL]" (Cohn, 1993, p. 119, italics added). Third, there is no precedent or independent motivation for the phonological feature [LL] in Nedut'en-Witsuwit'en, unlike [RTR], which has long been assumed for uvulars and other sounds in Athabaskan (Latimer, 1978; Cook, 1985, 1989; Czaykowska-Higgins, 1987; Goad, 1989; see Section 2.1). Finally, it must be said that Trigo's (1988, 1991) proposed feature is considered "somewhat controversial" (Cohn, 1993, p. 118) and "tentative" (Moisik, 2013, p. 405).

The pharyngealization of fortis consonants in Nedut'en-Witsuwit'en likely occurred under the influence of secondary pharyngealization in Tsilhqot'in to the south—pharyngealized sounds are rare, so it is unlikely that they developed independently in these neighboring, closely-related languages.[14] In this contact situation, the only possibility for redeployment was the [RTR] feature of uvulars in Nedut'en-Witsuwit'en. By contrast, [–lowered larynx] had no precedent in Nedut'en-Witsuwit'en, as mentioned. As explained above, tongue-root retraction is an enhancement gesture for fortis consonants (cf. Stevens and Keyser, 1989, 2010; Keyser and Stevens, 2001, 2006), which was phonologized by repurposing the [RTR] feature of uvulars to voiceless fricatives and to stops and affricates which are either [CG] or [SG].[15] Thus all fortis consonants, along with the lenis uvulars /q ʁ/, cause lowering and retraction in following vowels, due to their [RTR] specification, like the emphatic sibilants and uvulars in neighboring Tsilhqot'in.

2.4 Phonological emphasis via fortis, again: X̄a'islaḵala-X̄enaksialaḵala (Haisla)

In Nedut'en-Witsuwit'en, the uvular series /q q^h q' χ ʁ/ does not contrast with a velar series /k k^h k' x ɣ/, but rather with a palatal one /c c^h c' ç j/ (Wright et al., 2002; Hargus, 2007). This is the outcome of a phonetic-distancing effect called "polarization" (Keating, 1984; Ladefoged and Maddieson, 1996, p. 46). The use of palatalization to distance velars from uvulars is attested elsewhere in Athabaskan (Leer, 2011; Flynn and Fulop, 2014, p. 210), including eastern Ahtna (Kari, 1977, p. 284–285) and Hupa (Woodward, 1964, p. 200; Gordon, 1996). It is also an areal feature shared by languages to the west of Nedut'en-Witsuwit'en, including the Wakashan language X̄a'islaḵala-X̄enaksialaḵala (Lincoln and Rath, 1986) and the Tsimshianic languages Gitxsan (Brown et al., 2016, p. 368–369) and Sm'algyax (Dunn, 1995).

Ironically, the Nedut'en-Witsuwit'en strategy to palatalize the velar stops (in order to create distance from the uvular stops /q q^h q'/) resulted in palatal stops /c c^h c'/ which are more similar to the alveolar stops /t t^h t'/. This may be a contributing factor to the shift of palatal stops to more distinct [strident] affricates in syllable onset position in the Nedut'en /U'in Wit'en dialects of Fort Babine (Wit'at) and Takla Lake (Hargus, 2007, p. 6), e.g., /cəs/ > /tʃəs/ "hook" (cf. /təz/ "driftwood"), /c^həs/ > /t$ʃ^h$əs/ "down feathers" (cf. /t^həz/ "cane"), /tinc'əj/ > /tintʃ'əj/ "four" (cf. /-t'əts/ "incisor").[16]

This dilemma is also evident in the neighboring Wakashan language X̄a'islaḵala-X̄enaksialaḵala, also known as Haisla (Lincoln and Rath, 1980, 1986; Bach, 1991, 1997). Apparently in order to create phonetic distance from the uvular stops /q, ɢ, q'/, the velar stops are strongly palatalized /k^j ~ c, g^j ~ ɟ, $k^{j\prime}$ ~ c'/, so much so that they risk confusion with the alveolar stops /t, d, t'/. With this in mind, the following fact is striking:

> It is a peculiarity of Haisla that /t/ and /t'/... cause a following vocalic plain resonant to sound like after a plain uvular. (Lincoln and Rath, 1980, p. 25)
>
> In Kitimaat, with the phonemes /t/ and /t'/... a following vocalic resonant is pronounced as after an unrounded uvular... cf. /tɬq^w/ [t^hʌlχ^w] "soft", /'tiɬa/ ['t^hɛrɬa] "to fish with a line and baited hook", /'t'ɱsdu/ ['t'ɑmsʈu] "stye", /'t'ux^{w}a/ ['t'oʊx^{w}a] "big wave, ocean swell", /t'ɬ:s/ [t'ʌl:s] "cranberry." (Lincoln and Rath, 1986, p. 45)

13 See also Vaux (1998), Vaux and Miller (2011), and Esling et al. (2019, p. 42–43).

14 Babine-Witsuwit'en and Tsilhqot'in share certain grammatical innovations, too (e.g., Hargus, 2007, p. 371; Cook, 2013, p. 521–522).

15 This shift may also have occurred on the basis of acoustic similarities between the stiff vocal folds of voiceless consonants in Babine-Witsuwit'en and the retracted tongue root of emphatic consonants in neighboring Tsilhqot'in. Stiff vocal folds increase the relative intensity of higher frequencies. Similarly, tongue root retraction or pharyngeal contraction increases damping of F1, which causes the spectrum to sound brighter in the high frequencies (Fulop et al., 1998; Guion et al., 2004). Thanks to Sean Fulop for helpful discussion.

16 In practice, the new U'in Wit'en affricates /tʃ t$ʃ^h$ t$ʃ$'/ are more similar to the preexisting affricates /ts ts^h ts'/ than the palatal stops /c c^h c'/ were. This similarity between sibilant series is precisely what drove /ts ts^h ts'/ to become dental /t̪θ t̪$θ^h$ t̪θ'/ in the immediate precursor of Tsilhqot'in, as discussed in Section 2.2 (cf. Leer, 2011; Flynn and Fulop, 2014).

The fact that /t t'/ have the same lowering and retracting effect as /q ɢ q' χ/ suggests that the [RTR] feature was redeployed from the latter to the former in X̄a'islaḵala-X̄enaksialaḵala, under the influence of neighboring Nedut'en-Witsuwit'en, in which /t^{h} t'/ have precisely the same lowering and retracting effect; see (2) above. The secondary articulation of pharyngealization renders /t/ and /t'/ auditorily flat in Haisla, which presumably helps to distinguish them from the auditorily sharp /k^{j} ~ c/ and /k^{j}' ~ c'/, respectively.

Note, finally, that /d/ causes no lowering or retraction in adjacent sounds in X̄a'islaḵala-X̄enaksialaḵala. A secondary articulation of pharyngealization would render /d/ auditorily flat, which would presumably help to distinguish it from the auditorily sharp /g^{j} ~ ɟ/. However, /d/ is evidently not [RTR] in X̄a'islaḵala-X̄enaksialaḵala, presumably for the same aerodynamic reason that lenis non-uvular consonants are not [RTR] in Nedut'en-Witsuwit'en (Section 2.3). As Vaux (1996, p. 178) puts it: "Phoneticians have long known that advancement of the tongue root is necessary to produce voicing in stop consonants (for a review of the literature, see Vaux, 1992)." Such tongue-root advancement is obviously antagonistic to [RTR], which helps to explain why voiced /d/ is not [RTR], unlike voiceless /t/ and ejective /t'/.[17]

2.5 Interim conclusion

The retracted consonants known as emphatics were innovated in Interior Salish and then spread to neighboring (unrelated) languages. Such cases demonstrate that listeners can re-weight and re-map phonetic cues onto novel phonological structures. On Archibald's conception of redeployment, cues can indeed be re-weighted, but phonological structures which underlie a new contrast are not expected to be fully novel; rather, they must be assembled from preexisting phonological structures: "We need to look at what cues are detected in the input, which subset of the input becomes intake, and how this intake is parsed onto phonological structures" (Archibald, 2023, p. 288). As diagrammed in Figure 3, the feature [RTR] was redeployed from uvulars to other consonants on the basis of partial acoustic/auditory similarities with emphatic sounds in a neighboring language in Tsilhqot'in, Nedut'en-Witsuwit'en, and X̄a'islaḵala-X̄enaksialaḵala (Haisla).

On this understanding, languages without uvulars (and without any other [RTR] consonant) are not expected to participate in the areal spread of phonological emphasis. A case in point is the Northern Athabaskan language Dakelh (a.k.a. Carrier) spoken in the Central Interior of British Columbia, Canada (Morice, 1932; Walker, 1979; Story, 1984; Bird, 2003; Gessner, 2003). Dakelh has been in direct contact for centuries with the Athabaskan languages Nedut'en-Witsuwit'en and Tsilhqot'in (Chilcotin), with the Wakashan language X̄a'islaḵala-X̄enaksialaḵala, and with the Interior Salish languages Secwepemctsín (Shuswap) and St'át'imcets (Lillooet). Phonological emphasis has spread as an areal feature across all these other languages, but Dakelh remains unaffected. For context, Dakelh is closely related to Nedut'en-Witsuwit'en, within a larger "Central British Columbia" group which also includes Tsilhqot'in and the extinct language Nicola. Proto-Athabaskan uvulars are preserved in Nedut'en-Witsuwit'en and Tsilhqot'in, as we have seen. Uvulars were also preserved in Nicola according to Boas (1924, p. 36–37). However, the historical uvulars have shifted to velars in Dakelh (Leer, 1996, p. 197; Hargus, 2007, p. 11; Flynn and Fulop, 2014, p. 202). Thus, Dakelh does not have any uvulars, nor any other type of consonant with a phonological feature to redeploy as phonological emphasis.

17 North Wakashan languages like X̌a'islaḵala-X̌enaksialaḵala have three series of stops and affricates: plain voiceless, [voice], and [constricted glottis] (Howe [Flynn], 1999c, 2000).

3 The dissemination of phonological emphasis from Arabic

This second major section explains how pharyngealization originated in Arabic and then spread via redeployment to other languages. Of particular interest are cases in which the borrowed sounds have a different phonological structure than the original ones in Arabic.

3.1 Emphasis genesis: Arabic

The term emphasis has long been used in Afroasiatic studies not only for a secondary pharyngeal constriction in consonants (e.g., Wallin, 1855), but also for ejection—i.e., [constricted glottis] ([CG])—in cognate consonants (Gasparini, 2021). In point of fact, ejective emphatics are reconstructed for Proto-Afroasiatic (Diakonoff, 1984; Ehret, 1995; Orel and Stolbova, 1995; Bomhard, 2008) as well as for Proto-Semitic (Martinet, 1953; Ullendorff, 1955, p. 155; Cantineau, 1960; Knudsen, 1969; Dolgopolsky, 1977; Roman, 1981; Zemánek, 1996; Fallon, 2002, p. 102; Bellem, 2007; Watson and Bellem, 2011, p. 239; Kogan, 2012, p. 61; Bellem and Watson, 2014; Huehnergard, 2019, p. 49–50, 2023, p. 141–142; Pat-El, 2019, p. 81). By contrast, Arabic-style emphatics are new-fashioned, relatively speaking (Zemánek, 1996; Kogan, 2012; Huehnergard, 2017, p. 18): "In Arabic, … an important phonological development is the change of the "emphatic" consonants from glottalic to pharyngealized or uvularized, as in [s'] > [s^{ʕ}]" (Huehnergard and Pat-El, 2019, p. 11).

The terminological and historical coupling of ejection with pharyngealization and uvularization makes sense, phonetically: "The ejective is produced with a closed glottis, air being expelled through the constriction by raising the glottis and *narrowing the pharynx*, thereby creating an increased pressure in the mouth" (Halle and Stevens, 1971, p. 208; italics added). Indeed, Kingston (1985) measured intraoral pressure (Po) during the production of ejectives in the Ethiopian Semitic language Tigrinya and determined that larynx raising is insufficient to create the extreme intraoral pressure involved in the production of ejective stops in particular. He concluded:

> Other maneuvers which would contract the cavity, such as *retracting the tongue root*, together with an increase in the stiffness of the walls of the vocal tract to reduce passive

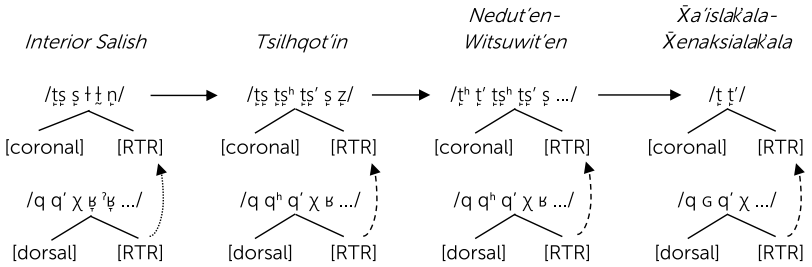

FIGURE 3
Emphatic consonants originated by assimilating [RTR] from uvulars in Interior Salish words (dotted curved-lined arrow) and spread to neighboring languages (solid straight-lined arrows) by redeploying [RTR] from uvulars in these languages (dashed curved-lined arrows).

> expansion in response to increasing Po, must also be employed if Po is to be elevated as high as it typically is in the articulation of an ejective. (p. 385; italics added)

The same point is made in Demolin's (2002) study of ejectives in another Ethiopian Semitic language: "The Amharic data suggest that additional maneuvers must be employed, such as *retracting the tongue root* or extending the magnitude of the contact in the oral cavity" (p. 470; italics added).

In other words, pharyngeal constriction and tongue root retraction are enhancement gestures for ejectives (cf. Stevens and Keyser, 1989, 2010; Keyser and Stevens, 2001, 2006; Stevens, 2002, 2005). Though enhancement properly belongs to the phonetic component of grammar, it is recognized that "enhancement gestures can become phonologized" (Keyser and Stevens, 2006, p. 61).[18] In fact, most phonologizations derive from enhancement gestures (Hyman, 2008). In the case at hand, the tongue-root retraction that accompanied ejectives in proto-Central Semitic became a proxy for the feature-defining gesture of [CG] in Proto-Arabic (for details on how phonetic proxies work, see Keyser and Stevens, 2006; Flynn, 2011; Flynn and Fulop, 2014). This proxy relation was phonologized early on, such that [RTR] replaced [CG] in nearly all forms of Arabic.[19] Specifically, [CG] */t' (t)θ' (t)s' (t)ɬ' k'/ became [RTR] /ṭ ḏ ṣ ḍ q/ (cf. Kogan, 2012).

The phonologization of tongue root retraction in Arabic emphatics may have been a true innovation if the feature [RTR] did not previously exist, that is, if Proto-Central Semitic had no uvulars or uvularization, nor even retracted vowels which might be considered [RTR] (cf. Zemánek, 1996; Kogan, 2012; Huehnergard, 2017, p. 18). This may be the case—unlike contact phenomena, ordinary internal sound shift is not constrained by phonological redeployment (see, e.g., Blevins, 2004). In practice, however, it is difficult to prove the prior absence of uvulars—Proto-Afroasiatic had uvular stops and fricatives according to Orel and Stolbova (1995), and Proto-Semitic had "velar / uvular" stops and fricatives (Huehnergard, 2019, p. 50). In particular, the reflexes of Proto-Semitic dorsal fricatives are uvular in most languages (Huehnergard, 2019, p. 51) and pharyngeal in others (Huehnergard, 2019), which suggests that these sounds may have been uvular from the beginning. As mentioned in Section 2.1, "the typological surveys of Simpson (2003) and Kümmel (2007) show that uvulars frequently become pharyngeals but pharyngeals don't often become uvulars" (Weiss, 2015, p. 135). "As documented by Simpson (2003), uvular to pharyngeal shifts are well documented in every branch of Semitic" (Blevins, 2004, p. 198).

Proto-Central Semitic also had /ʕ ħ/, so it is tempting to think that emphatics were created instead by combining coronal consonants with pharyngeals in Arabic. However, this would imply a secondary constriction in the lower pharynx and epilarynx, whereas Arabic emphatics are well-documented with a constriction in the upper pharynx at or just below the uvula (Ali and Daniloff, 1972; Dolgopolsky, 1977; Ghazeli, 1977; Czaykowska-Higgins, 1987, p. 2; Shahin, 1997, 2002, 2011; Zawaydeh, 1998, 2003; Al-Tamimi et al., 2009, p. 612–613; Jongman et al., 2011; Zawaydeh and de Jong, 2011; Israel et al., 2012; Al-Tairi et al., 2016, 2017; Al-Solami, 2017; Al-Tairi, 2018; Freeman, 2019; Alfaifi et al., 2020; Moisik et al., 2021, p. 26; Al-Ansari and Kulikov, 2023; Kulikov et al., 2023, p. 466). Because "the 'emphatics' are pronounced as uvularized consonants," Dolgopolsky (1977, p. 1) argued that they ought to be transcribed as /tᵡ dᵡ sᵡ/ instead of /tˤ dˤ sˤ .../.[20] McCarthy (1994), the most widely cited publication on the topic, is bullish on this point:

> Despite differences in details, the overall picture is consistent: the emphatics and *q* have a constriction in the upper pharynx similar to that of the uvular gutturals *χ* and *ʁ*. Although there are suggestions (Keating, 1988) that Arabic dialects differ in the location of the secondary constriction of emphatics (with some showing a low, *ʕ*-like constriction), this does not seem to be true; all studies, now encompassing several different dialect

18 Examples from English include [round] in /u/ (Keyser and Stevens, 2006, p. 38–40) and [strident] in /tʃ, dʒ/ (Clements, 2009, p. 50).

19 Exceptions that prove the rule include the Zabid dialect of Yemeni Arabic, where *q* can still be heard as [k'] (Naïm, 2008). Interestingly, Nakao (2022) suggests that [CG] may persist alongside [RTR] in Arabic dialects, pointing to reports of preglottalization and/or implosion in emphatics in isolated varieties of Arabic spoken in Algeria, Morocco, Palestine, and Egypt. Nakao argues that the glottalization effects which accompany emphatics in these cases are not the result of language contact.

20 Unfortunately for Dolgopolsky (1977), "[t]he symbol [ᵡ] ... to mark uvularization ... has not been made part of the IPA alphabet" (Anonby, 2020, p. 297, fn. 7).

> areas, find that the emphatics have a constriction in the upper pharynx. The so-called pharyngealized consonants of Arabic should really be called uvularized. (p. 218–219)

That "Arabic emphatics are uvularized" (Al-Tairi et al., 2016, p. 1) does not exclude the possibility that these consonants may additionally involve the same epiglotto-pharyngeal constriction as pharyngeals in certain varieties (Wallin, 1855, p. 612; Laufer and Baer, 1988; Al-Tamimi and Heselwood, 2011; Hassan and Esling, 2011; Al-Tamimi, 2017). However, recall from Section 2.1 that "the tongue body is not back but front with the Arabic pharyngeals, as we can see by the adjacent front allophone of the low vowel: compare pharyngeal [ħæːl] 'condition' with uvular [χɑːl] 'maternal uncle'" (McCarthy, 1994, p. 197). Crucially, Arabic emphatics pattern with uvulars rather than with pharyngeals in this regard (Herzallah, 1990, p. 29, 59; McCarthy, 1994, p. 220; Rose, 1996, p. 87; Shahin, 2002, 2011, p. 612, 615–616; Watson, 2002, p. 272; Moisik, 2013, p. 484). This suggests that Arabic emphatics (and uvulars) are not simply specified with the same phonological feature as pharyngeals, say [low] (see Section 2.1; cf. Lass, 1984, p. 87–88; Odden, 2013, p. 54, 60).[21]

The simplest solution is to assume that uvularized emphatics and uvulars uniquely share a different phonological feature, viz. [RTR] (Czaykowska-Higgins, 1987; Goad, 1991; Davis, 1993, 1995, p. 471–472; Mahadin and Bader, 1995; Zawaydeh, 1998; Watson, 1999; Halle et al., 2000, p. 425–426, 408, fn. 429; Ananian and Nevins, 2001; Hansson, 2010, p. 141–142, 161, 198; Slimani, 2018; Al-Bataineh, 2019; Al-Raba'a and Davis, 2020, p. 22ff; Alwabari, 2020; Jaradat, 2020; Al-Taisan, 2022; Habib, 2022, p. 16; Gebski, 2023). As the preceding citations illustrate, "the feature [RTR]... is the most agreed upon feature for emphatics in the literature" (Alwabari, 2020, p. 75). Likewise: "[+RTR] is the widely used feature specification for pharyngealization at least in Arabic that reflects the activity of the retraction of the root of the tongue" (Al-Tamimi, 2017, p. 29). Note that [RTR] is a phonological feature, so it disappears in the gesture-calculations component of the phonetics, where the feature-defining tongue-retraction gesture is accompanied by robust enhancement gestures, including pharynx constriction (cf. Stevens and Keyser, 1989, 2010; Keyser and Stevens, 1994, 2001, 2006; Stevens, 2002; Flynn, 2011, and references therein). Thus, Davis (1995, p. 471) describes "the feature [RTR] … as entailing a constriction in the upper pharynx," after Czaykowska-Higgins (1987) and Goad (1991).[22]

Finally, Rose (1996) and Shahin (2002) claim that Arabic pharyngeals are [RTR], too. This claim obscures the fact that pharyngeals cause low vowels to be slightly fronted, and non-low vowels to be lowered, but not necessarily retracted (see Section 2.1). It also obscures the fact that pharyngeals show [RTR] allophones in words with emphatics or uvulars (Card, 1983, p. 16; Anonby, 2020, p. 281). Moreover, "that emphatics, uvulars and pharyngeals share the feature [RTR] … is phonologically problematic because it does not account for the free occurrences of emphatics and pharyngeals in Arabic" (Al-Tairi, 2018, p. 65; cf. p. 33–39 on co-occurrence restrictions affecting gutturals in roots). Davis (1995) shows that Palestinian Arabic has a long-distance regressive dissimilation rule of "depharyngealization" whereby "the first of the two consonants containing [RTR] loses that feature" (p. 481). He illustrates the application of this rule to underlying emphatics and uvulars, e.g., /ṣadaqa/ "charity" (p. 482), /χabaṣ/ "mixed randomly" (p. 483), /ṣabaʁ/ "he dyed" (p. 480). Crucially, pharyngeals do not participate in this process:

> The phenomenon of depharyngealization … strongly supports the view that uvulars and emphatics are characterized by a common underlying [RTR] feature. This view has been argued for previously by Czaykowska-Higgins (1987) and Goad (1991). Moreover, it is revealing that the depharyngealization phenomenon is not triggered by the occurrence of a primary pharyngeal [ħ] or [ʕ] in the root, but only by a uvular. This supports Goad's (1991) specific proposal that primary pharyngeals do not have the feature [RTR] underlyingly. (Davis, 1995, p. 483)

Ironically, the next sections present language-contact cases in which Arabic sounds are borrowed by redeploying the "wrong" features—[low] for emphatics (Sections 3.2, 3.5), and [RTR] for pharyngeals (Section 3.3).

3.2 Phonological emphasis via ejectives: consonantal [low] in Semitic and beyond

As explained above, pharynx constriction works with larynx raising to pressurize the trapped air in ejectives. Arabic phonologized the upper pharyngeal constriction of ejectives as [RTR], creating retracted coronals /ṭ ṣ .../ and uvular /q/ from earlier ejectives */t' ts' ... k'/. This secondary pharyngeal constriction then spread as an areal feature across Northwest Semitic languages (Hebrew, Aramaic, and Phoenician) via their glottalized consonants (Huehnergard and Rubin, 2012, p. 269). It also spread—again,

21 Hoberman (1988), Halle (1989, p. 18), and Kenstowicz and Louriz (2009) assume [constricted pharynx] for both emphatics and pharyngeals. Prince (1975, p. 12) takes "[+low] (perhaps better is [+C.P.]) as the feature shared by /ṭ ṣ q/" in Tiberian Hebrew. The feature [constricted pharynx] is discussed further below.

22 Likewise, Napiorkowska (2021) treats emphatics as [RTR], defined as "constriction of the upper pharynx" (p. 326, fn. 8). As such, [RTR] is roughly equivalent to other features proposed for Arabic emphatics, such as [rhizo-lingual] (Brame, 1970, p. 15–17), [upper pharynx] (Czaykowska-Higgins, 1987, p. 13; Hess, 1998, p. 268–271), [constricted tongue root] (Stevens, 1998, p. 251–254), [retracted tongue back] (Zawaydeh, 1999), [retracted] (Sylak-Glassman, 2014, p. 137), and [–ATR] (Gasparini, 2021, p. 17–18; Archangeli and Pulleyblank, 1994, p. 20–21). Goad (1989) and Elorrieta Puente (1991) argue that emphatics and uvulars are [RTR], but warn that uvulars may not be [RTR] in all languages (see also Trigo, 1991, p. 122). Vaux (1994, p. 251–256) and Bin-Muqbil (2006) claim that emphatics are [+RTR], whereas uvulars are [–ATR, –RTR]. Purnell and Raimy (2015, p. 526) treat pharyngealization as [RTR], but uvulars as [back].

via ejectives—to more distantly related languages within Semitic and Afroasiatic more generally. For example, "the pharyngealized articulation of Berber emphatics is ascribed to the influence of Arabic" (Zemánek, 1996, p. 18).

Remarkably, the influence of Arabic on ejectives in neighboring languages can be observed even in our present time. The North Ethiopic language Tigre (Palmer, 1956) and the Modern South Arabian language Ḥarsusi (Al Bulushi, 2019) are apparently partway through the shift from ejection to secondary pharyngeal constriction under the influence of Arabic. More specifically, Rose (1996, p. 92–97) and Bulakh and Kogan (2011, p. 7–8) claim that [CG] ejectives in Tigre and Ḥarsusi have become [RTR] under the influence of Arabic emphatics:[23]

> To the best of my knowledge, Tigre and Harsusi, a Modern South Arabian language (Johnstone, 1977), are the only two languages in which ejectives lower vowels. My solution to the lowering facts requires positing an [RTR] feature on ejectives, yet [RTR] normally defines emphatics and not ejectives. … Interestingly, the two languages which do show retraction next to ejectives have considerable contact with Arabic and could plausibly be influenced by the behavior of emphatics in Arabic. This is supported by Fre Woldu's (1986) study, in which he shows that perceptually, Tigrinya ejectives are judged by Sudanese Arabic speakers to be almost indistinguishable from emphatics. (Rose, 1996, p. 94)

Of special interest is that Tigre previously had pharyngeal /ʕ ħ/, but no uvulars. On Rose's (1996) assumption that pharyngeals are [RTR] (Section 3.1), she could claim that [RTR] was redeployed from pharyngeals to [CG] ejectives, making them pharyngealized. However, if pharyngeals are not [RTR] (see Sections 2.1 and 3.1 and references therein), then Tigre could not have redeployed [RTR] in this way, because there is no precedent for [RTR] in the language—Tigre had no [RTR] uvulars, as just mentioned, nor is there clear evidence of [RTR] contrasts in Tigre vowels. There is, therefore, only one possibility for redeployment: the [RTR] secondary articulation of Arabic must have been borrowed as a [low] secondary articulation in Tigre, by redeploying the marked consonantal use of [low] in Tigre pharyngeals (Section 2.1). That is, the pharyngeal constriction which enhances the feature-defining gesture of [CG] in ejectives (Halle and Stevens, 1971, p. 208) was phonologized in Tigre ejectives as [low].

Keyser and Stevens (1994) define [low] as lowering the tongue body (p. 231), but they remark that constricting the lower pharynx serves to enhance the acoustic manifestation of [low] (p. 226), and further, that an enhancement gesture like pharyngeal constriction is more reliable than a feature-defining gesture like tongue-body lowering—"unlike feature-defining gestures, enhancement gestures are never subject to overlap severe enough to mask their acoustic consequences" (Keyser and Stevens, 2006, p. 57–58). Chomsky and Halle (1968) first suggested that [low] could be used for consonants with secondary pharyngealization because "the superimposed articulation... in pharyngealization is [a]-like" (p. 305).

As it happens, there is compelling evidence for the redeployment of [low] from pharyngeals to ejectives in Tigre. As Rose (1996) concedes, "Lowenstamm and Prunet argue that the feature [+low] … is prosodically spread, from syllable to syllable" (p. 93)—"c'est le noeud [low] qui se propage" (Lowenstamm and Prunet, 1988, p. 23). Faust (2017, p. 3) has described "Tigre Lowness Harmony" more recently as follows:

> Tigre displays... five phonetically-stable vowels [i, u, e, o, a], and one phonetically-unstable one, of generally low quality, realized as [ə, ɛ, ʌ, a] depending on the context.... [A]s noted by Palmer (1956), the quality of that vowel is [a], rather than one of the higher qualities, if one of three conditions holds:
>
> i. A stable vowel [aː] follows anywhere in the word, and no other stable vowel interferes.
> ii. The onset of its syllable is an ejective [t', k', ʦ', ʧ'] or a pharyngeal [ħ, ʕ] consonant.
> iii. One of these consonants follows anywhere in the word.

That ejectives are specified [low] is supported by the fact that they pattern with phonetically-stable [a] and with the pharyngeals [ħ ʕ] in triggering an [a]-allophone of the phonetically-unstable vowel. The latter vowel is analyzed by Palmer (1956, p. 565) as "a short half open central vowel" /ɐ/ underlyingly. Crucially, Palmer is explicit that the [low] allophone of /ɐ/ is "a short open *front* vowel" [a] (Palmer, 1956; italics added). He indicates that a "retracted" vowel allophone is triggered by /u, w/, and /k, g/ (p. 567–568), but the pharyngeals and ejectives cause no special retraction on /ɐ/; they only cause it to be more open and more front. This indicates that pharyngeals and ejectives are specified [low] in Tigre, as suggested by Lowenstamm and Prunet (1988, p. 23–25), and not [RTR], contra Rose (1996, p. 92–97), and Bulakh and Kogan (2011, p. 7–8).

Tellingly, non-ejective /ʔ/ is also variably pharyngealized in Tigre. As Moisik et al. (2012) describe,

> Tigre (Semitic) has an optional process that neutralizes the contrast between /ʔ/ and /ʕ/ in the presence of pharyngeals and ejectives anywhere else in the word. For example, /ʔaddaħa/ "noon" is variably realized as [ʕaddaħa] or [ʔaddaħa] (Raz, 1983, p. 5; see also McCarthy, 1994). Critically, /h/ and /ħ/ do not show neutralization under the same conditions. (p. 11)

That is, [CG] /ʔ/ becomes [ʕ] by assimilating the marked consonantal use of [low] from a pharyngeal or an ejective in the same word. This is a variable phonological process, but it is similar to the redeployment strategy in Tigre diachrony: the [CG] ejectives "assimilated" the marked consonantal use of [low] in pharyngeals. The fact that /ʔ/ synchronically (if variably) assimilates [low] from a pharyngeal or ejective, but not from /a/, finds a parallel in redeployment, too: [low] emphatic consonants were created by redeploying the [low] feature of pharyngeal consonants, not by redeploying the [low] feature of the vowel /a/. As discussed by Martinez et al. (2023, p. 390), "redeployment within systems" (e.g., [low] within the consonant system) is privileged over "redeployment

23 I will argue shortly that Tigre ejectives are not [RTR], but [low].

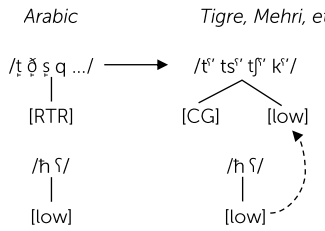

FIGURE 4
Emphatic consonants are [RTR] in Arabic, unlike its pharyngeals, which are [low], but emphatic sounds have been borrowed as [low] in Tigre and Mehri, among others (solid straight-lined arrows) by redeploying [low] from pharyngeals in these languages (dashed curved-lined arrow).

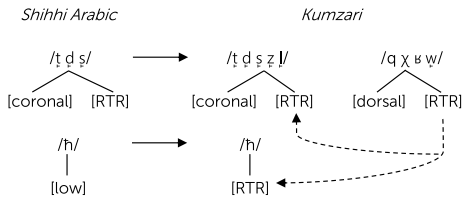

FIGURE 5
/ħ/ is [low] in Shihhi Arabic, unlike the coronal emphatics, which are [RTR]. Kumzari has acquired both /ħ/ and coronal emphatics as [RTR] (solid straight-lined arrows), by redeploying [RTR] from its uvulars (dashed curved-lined arrows).

across systems" (e.g., [low] from the vowel system to the consonant system).[24]

To broaden the discussion, Tigre is just one of many Afroasiatic languages that have changed their [CG] ejectives to emphatics under the areal influence of Arabic (Hebrew, Aramaic, Phoenician, Berber, etc.). As already mentioned, this change can be observed in progress in other present-day languages, such as Modern South Arabian languages Mehri (Watson and Bellem, 2011; Naïm and Watson, 2013; Watson and Heselwood, 2016; Ridouane and Gendrot, 2017), Ḥarsusi (Johnstone, 1977; Al Bulushi, 2019), and Soqotri (Kogan and Bulakh, 2019, p. 283). As mentioned above, Proto-Afroasiatic (Diakonoff, 1984; Bomhard, 2008) and Proto-Semitic (Kogan, 2012; Huehnergard and Pat-El, 2019) are reconstructed with [low] pharyngeals, but not necessarily with [RTR] uvulars (cf. Huehnergard, 2019, p. 50), so it is likely that some of the languages mentioned above adopted phonological emphasis like Tigre, by redeploying the marked consonantal use of [low] in preexisting pharyngeals, as diagrammed in Figure 4. To give just one potential example, Ridouane and Gendrot (2017) report the following for Mehri as spoken in Salalah, Oman:[25]

> Ejectives were shown to pattern together with uvulars and pharyngeals as a natural class defined by the feature [+low]. One very important characteristic of this class of segments is that it systematically triggers the diphthongization of following long high vowels /iː/ and /uː/ to [aj] and [aw], respectively, and the lowering of long /eː/ into /aː/. (p. 142)

3.3 Pharyngeals via uvulars: [RTR] in Kumzari

In "Emphatic consonants beyond Arabic," Anonby (2020) reports on Kumzari, an endangered Indo-European language spoken mainly in Oman. Kumzari has uvular obstruents, viz. /q χ ʁ/, which is not uncommon in (Southwestern) Iranian languages, but it also has a new series of alveolar emphatics /ṭ ḍ ṣ ẓ ɬ/ and a new pharyngeal fricative /ħ/, due to the influence of Arabic. On the redeployment view, Kumzari speakers must have created the emphatics and pharyngeal by redeploying the [RTR] feature of their historical uvulars, as diagrammed in Figure 5.[26]

This predicts that the emphatics are uvularized as [RTR] (see Sections 2 and 3.1), rather than pharyngealized as [low] (see Section 3.2). More daringly, it also predicts that the pharyngeal is [RTR], like the emphatics. Both of these predictions appear to be confirmed by Anonby (2020):

> Uvularization is the main articulatory basis for emphasis in Kumzari. The alveolar emphatics ṭ ḍ ṣ ẓ ɬ exhibit strong, simultaneous posterior secondary articulation, with uvularization dominating but bounded by a unified stricture all the way from the pharynx up to the velum. … The remaining member of the Kumzari emphatic series, however, is a pharyngeal consonant *ḥ* [ħ]. Although *ḥ* is not uvularized, its behavior suggests that it should be classed as an emphatic. (p. 297)
>
> The uvularized alveolar emphatics, uvular consonants *x q ġ*, the pharyngeal *ḥ*, and the uvularized allophone of *r* all cause preceding as well following non-back vowels to be retracted (*ā* [aː] → [ɑː], *a* [ɐ] → [ʌ]). In the case of non-low vowels, they cause lowering in the transition between the

24 See Nelson (2023) for a possible case of redeployment across systems in adult language acquisition.

25 The reverse influence is rare, but al-Kathīrī (2019) reports on a variety of Oman Arabic that has changed its [RTR] /ṭ/ and /q/ to [CG] /tʃʷʼ/ and /kʼ/, respectively, under the influence of neighboring Modern South Arabian languages with ejectives. Crucially, Arabic has long lost its historical emphatics, but it has preserved /ʔ/. Evidently, the feature [CG] was redeployed from /ʔ/ to /ṭ q/ in this variety of Oman Arabic, creating the new ejectives /tʃʷʼ kʼ/ under the influence of surrounding Modern South Arabian languages.

26 As Kahn (1976) says of closely-related Persian: "whereas Persian does not have any pharyngealized or pharyngeal consonants, it does have a post-velar stop/approximant /q/" (p. 27). Proto-Iranian is not reconstructed with a phonemic distinction between velars and uvulars (Skjærvø, 2009, p. 51), but its lone dorsal fricative was probably uvular *χ (Cantera, 2017, p. 482), such that most branches have uvular fricatives and many eventually developed uvular stops (see Bashir, 2009; Edelman and Dodykhudoeva, 2009; Windfuhr and Perry, 2009, etc.).

> vowel and consonant (*i* [iː] → [iə] before a consonant, [əi] after a consonant; *ē* [eː] → [eə] before a consonant, [əe] after a consonant). (p. 298)

The uvularized nature of Kumzari emphatics is not surprising, given that Arabic has uvularized emphatics, too (Anonby, 2020, p. 282; see Section 3.1 above). The fact that Kumzari /ħ/ retracts vowels the same as emphatics and uvulars is more significant. Recall that "the tongue body is not back but front with the Arabic pharyngeals, as we can see by the adjacent front allophone of the low vowel: compare pharyngeal [ħæːl] 'condition' with uvular [χɑːl] 'maternal uncle'" (McCarthy, 1994, p. 197). This fronting effect is not as pronounced in the Shihhi Arabic that surrounds Kumzari (cf. Anonby, 2020, p. 301–302), but according to Bernabela (2011) it remains the case that /ħ/ (the only pharyngeal in Shihhi Arabic) does not cause retraction in low vowels, e.g., *yiftaħ* [ˈjɪftaħ] "he opens" (p. 29), *ħasan* [ˈħasæn] "Hasan (proper name)" (p. 30); *maħħ* [maħ] "with her" (p. 93, fn. 164), *ħafiz* [ˈħaːfiz] "(shop)keeper" (p. 94, fn. 166). By contrast, emphatics and uvulars cause low-vowel retraction in Shihhi Arabic:

> In the vicinity of one of the velarised consonants *ṣ, ṭ* or *ḍ, a* is usually backed [ɑ] and velarised: *qōṣar* [ˈqɔːsɑɻ] "need"; *manṭaqih* [ˈmɐnʈɑqiʰ] "area"; *manḍarih* [ˈmɐnɖɑɽiʰ] "mirror". The uvulars *q* and *x* have the same backing effect: *qarnēn* [qɑɻˈneːn] "two horns"; *xallnu* [ˈxɑlnʊ] "let us." (Bernabela, 2011, p. 30)

Anonby (2020, p. 309) explains that Kumzari speakers created many emphatics by "diffusing" phonological emphasis from uvular obstruents (Ar. *qyās* > K. *qyāṣ* "measurement;" Middle Persian (MP) *suxr* > *ṣirx* "red;" etc.) and from /w/, which he therefore analyzes as labio-uvular (Ar. *walā* > *waḷa* "or;" Middle Persian (MP) *sabz* > *sawẓ* > *ṣawẓ* "green;" etc.). Crucially, /ħ/ was created in the same way (e.g., Ar. *qahwa(t)* > K. *qaḥwē* "coffee") and, in turn, the new /ħ/ also "diffused" phonological emphasis (e.g., Ar. *sāḥir* "magician" > K. *ṣāḥar* "sorcerer"). This strongly suggests that in Kumzari the pharyngeal fricative shares the same phonological property as emphatics and uvulars, viz. [RTR].

Anonby agrees that Kumzari's historical uvulars played a key role in its adoption of Arabic emphatics:

> In Kumzari, an Indo-European language in close contact with Arabic,... a core set of alveolar emphatics is also found, but is characterized by uvularization as a dominant secondary articulation. In keeping with a uvular place of articulation, the consonants *x* ["voiceless uvular fricative" (p. 296)] and *q*, as well as uvular *w*, have a clear role in the historical diffusion of emphasis; and evidence for a historical spread of emphasis from pharyngeal *ḥ* is also found. (p. 322–312)

However, he hesitates to implicate [RTR] in Kumzari's adoption of pharyngeal /ħ/ and its involvement in the diffusion of phonological emphasis, because this phonological feature "is typically limited to emphatics with secondary articulations in synchronic accounts of emphasis" (p. 309). On the other hand, he concedes that pharyngeals may present [RTR] allophones in words with emphatics and uvulars in Arabic (p. 280), and he suggests that "in Cairo Arabic and Palestinian Arabic, there is even a contrast available between plain and emphatic pharyngeals" (p. 280–281), so in principle, nothing prevents Anonby from treating Kumzari /ħ/ as [RTR], like uvulars and alveolar emphatics.[27]

3.4 Phonological emphasis without redeployment in Northern Songhay?

The preceding section argued that Kumzari speakers acquired the [RTR] emphatics of their Arabic neighbors by redeploying the [RTR] feature of preexisting uvulars. By contrast, Section 3.2 argued that speakers of Tigre, which previously lacked uvulars, acquired the [RTR] emphatics of their Arabic neighbors as [low] instead, by redeploying the marked consonantal use of [low] in preexisting pharyngeals. Beyond cases like these, I have made a sincere effort to look for falsifying evidence—languages which have acquired emphatic consonants in language contact, with no previous uvulars or pharyngeals or any other type of consonant with a phonological feature that might be redeployed as phonological emphasis.

Coming closest are Northern Songhay languages spoken in Saharan oases across Algeria, Niger, and Mali: Korandje, Tasawaq, Tagdal, and Tadaksahak. These languages have each adopted a series of pharyngealized coronals under the areal influence of Berber and Arabic, in spite of Proto-Songhay having no uvulars or pharyngeals (Nicolaï, 1981; Souag, 2020, p. 646). However, Souag (2010) remarks that "Proto-Northern Songhay had probably already developed a phoneme q, judging by the pan-Northern sound change k > q /_o (Nicolaï, 1981)." As Nicolaï (1981) explains, the development of /q/ in Proto-Northern Songhay probably occurred under the areal influence of Tamasheq, a variety of Tuareg Berber, but this development was nonetheless an internal sound change, rooted in the difficulty of maintaining the Songhay phonemic contrast between /k/ and /kʷ/ before /o/, so "it remains possible that the shift in question occurred independently of language contact" (Nicolaï, 1981, p. 359). Souag (2012) describes the internal sound shift *k > q /_o as "a genuine shared innovation" (p. 184) in Northern Songhay and perhaps the strongest phonological evidence for this subgrouping within the larger family of languages. In short, it seems that Proto-Northern Songhay had /q/ before various descendants borrowed coronal emphatics from Berber and Arabic, so we can assume that the feature [RTR] was redeployed from their /q/ to facilitate this borrowing, as diagrammed in Figure 6.

3.5 Phonological emphasis via alveolopalatals: consonantal [low] in Northwest Caucasian

Section 3.2 described how a language like Tigre, which had [low] pharyngeals but no [RTR] uvulars, apparently borrowed the [RTR] emphatics of its Arabic neighbor as [low] instead. Section 3.3 described how a language like Kumzari, which had an [RTR] uvular but no [low] pharyngeal, apparently borrowed the [low]

27 Even laryngeals are [RTR] in certain languages, such as Nedut'en-Witsuwit'en (Section 2.3). Howe [Flynn] (1999a,b, 2000) argues that uvulars and laryngeals are both [RTR] in the Wakashan language Oowekyala.

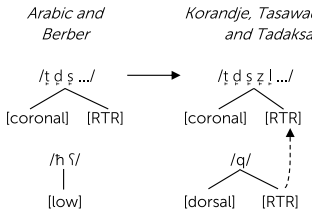

FIGURE 6
Northern Songhay languages have acquired the [RTR] emphatics of their Arabic and Berber neighbors (solid straight-lined arrow), by redeploying [RTR] from a preexisting uvular (dashed curved-lined arrows).

pharyngeal of its Arabic neighbor as [RTR] instead. Kumzari also borrowed Arabic emphatics as [RTR], by redeploying this feature from preexisting uvulars. Section 3.4 suggested that emphatics were similarly borrowed into several Northern Songhay languages. The present section describes a more equivocal case: the borrowing of Arabic emphatics into a Northwest Caucasian language which had a [low] pharyngeal as well as [RTR] uvulars.

For historical context, many Circassians were exiled from the Caucasus to the Ottoman Empire after the Russo-Circassian war (Natho, 2009). Notably, the Israeli village "Kfar Kama was established in 1878 by 1150 Circassian immigrants of the Shapsugh tribe and is located in the eastern Lower Galilee" (Reichel, 2010, p. 255). Natho (2009) remarks:

> About 3,000 Shapsughs now live prosperously in Kfar-Kama... The children are taught Arabic, Circassian, Hebrew, and English languages in their school. … Remarkable is the fact that the inhabitants of this village are purely Circassian, and that all of them old and young speak Circassian fluently. (Natho, 2009, p. 517–518)

The Shapsugh dialect of Adyghe spoken in Kfar Kama, Israel, has the following inventory of sounds:

(3) *Phoneme inventory in Israeli Shapsugh Adyghe* (adapted from Colarusso, 1988, p. 424).

p		t	ts		**ts^{ʕw} (~ tɕ^{ʕw})**	tʃ		c ~ k^{j}	q	q^{w}				
b		d	dz		**dz^{ʕw} (~ dʑ^{ʕw})**	dʒ		ɟ ~ g^{j}						
p’		t’	ts’		**ts^{ʕw}’ (~ tɕ^{ʕw}’)**	tʃ’	tɬ’	c’ ~ k^{j}’					ʔ	ʔ^{w}
f	f^{w}		s	**s^{ʕ} (~ ɕ^{ʕ})**	**s^{ʕw} (~ ɕ^{ʕw})**		ɬ	ç ~ x^{j}	χ	χ^{w}	ħ	(h)		
			z	**z^{ʕ} (~ ʑ^{ʕ})**	**z^{ʕw} (~ ʑ^{ʕw})**		ɮ	ʝ ~ ɣ^{j}	ʁ	ʁ^{w}				
			s’	**s^{ʕ}’ (~ ɕ^{ʕ}’)**	**s^{ʕw}’ (~ ɕ^{ʕw}’)**									
m		n									ã	ə		
	w	r						j			a	ə		

Of special interest are the emphatic sibilants shown in boldface font. These were documented in 1973 by Catford after spending 5 weeks working with Shapsugh speakers in Kfar Kama at the invitation of the Israeli Ministry of Education (Catford, 1984, p. 27). Catford's report is confirmed by Colarusso (1988, p. 22–23):

> Professor Catford has informed me that the younger members of the village of Kafr Kama in Israel, who speak a form of Shapsugh, have substituted pharyngealized alveolar spirants for the alveo-palatal series. Tapes kindly provided to me by Miss Wendy Orent of Boston University and Mr. Alexander Borg of Hebrew University confirm Catford's observation. This substitution may have been aided by the presence of pharyngealized coronals in the neighboring Arabic dialects. For Israeli Shapsegh the contrast between alveolars, pharyngealized alveolar, and rounded pharyngealized alveolars, as in /sa/ "knife," /s^{ʕ}a/ "100," and /s^{ʕw}a/ "skin, hide," present data which show that rounding and pharyngealization are not mutually exclusive.

As mentioned in this quote, the pharyngealized sibilants correspond to alveolopalatals in other Shapsugh dialects (Colarusso, 1988, p. 421–436). Perhaps for this reason, Catford transcribed the emphatic sibilants as pharyngealized alveolopalatals (p.c., Colarusso, 1988, p. 75, n. 7). "Some speakers may in fact have this articulation," Colarusso (1988) wrote, but he added: "The specimens which I have heard of Israeli Shapsugh... appear to have a lamino-alveolar articulation [+anterior, –high], with pharyngealization" (p. 75, n. 7). Wallis (1987), who conducted fieldwork in Kfar Kama in the 1970's, also recorded emphatic sibilants as alveolar, e.g., *s^{ʕ}ə* "to make," *ps^{ʕ}as^{ʕ}a* "girl" (p. 85).[28]

Colarusso (1988, p. 23) claimed that the pharyngealized sibilants in Israeli Shapsugh are specified [constricted pharynx], defined as "a narrowing of the *lower* pharynx" (Perkell, 1971, p. 124; italics added). Perkell (1971) argued for a total abandonment of [low] in favor of this new feature. Keating (1988) dismissed the proposed replacement as "a short-lived move" (p. 15), but it should be noted that Stuart Davis favors [constricted pharynx] over [low] to characterize pharyngeals in Arabic (Davis, 1993, 1995, p. 471; Abo Mokh and Davis, 2020, p. 40–41). Like other Circassian languages, Israeli Shapsugh has /ħ/, so it is possible that the relevant phonological structure was redeployed from this pharyngeal fricative to the alveolopalatal sibilants under the influence of pharyngealized coronals in Arabic. The structure in question could be the feature [constricted pharynx], as Colarusso suggests, or else the marked consonantal use of [low] in syllable margins.

There is too little information on Israeli Shapsugh to be confident that its pharyngealized sibilants /s^{ʕ} z^{ʕ} z^{ʕ}’ s^{ʕw} z^{ʕw} s^{ʕw}’ ts^{ʕw} dz^{ʕw} ts^{ʕw}’/ are phonologically [low], but it is significant that these sounds developed from earlier alveolopalatals /ɕ ʑ ɕ’ ɕ^{w} ʑ^{w} ɕ^{w}’ tɕ^{w} dʑ^{w} tɕ^{w}’/ and that some alveolopalatalization may persist (Colarusso, 1988, p. 75, n. 7). As mentioned earlier,

28 Wallis recorded the rounded emphatic in s^{ʕw}əz "woman" as an "alveopalatal retroflexed sibilant" (p. 85), but evidently not all her consultants were from Kfar Kama: "Field work as the basis for this paper was done in the village of Kafr Kama, Israel, 1971–1979. More recent work has been done with speakers now living in the Circassian community in the Paterson, N.J. area of the U.S." (Wallis, 1987, p. 89, n. 1).

[low] pharyngeals cause non-low vowels to become lower, but not necessarily more retracted, and adjacent low vowels may even be slightly fronted, as in the Interior Salish language Nxaʔamxcín (Section 2.1) and in Arabic (Section 3.1). A fronting effect is also reported for pharyngeals in Northwest Causasian languages such as Abkhaz, Kabardian, and Tsakhur (Trubetzkoy, 1931; Catford, 1983; Colarusso, 1985, 1988, 1992, p. 31, 2013, p. 98–99; Sylak-Glassman, 2014, p. 72–73; Beguš, 2021, p. 716). For instance, Andersson et al. (2023) report that Cwyzhy Abkhaz has "slightly palatal" (p. 271) [round] sibilants which they transcribe as alveolopalatal [ɕᶣ ʑᶣ tɕʰᶣ dʑᶣ tɕᶣ'] (p. 269–270). Crucially, they find the same "front rounded secondary articulation" (p. 6) in [low, round] /ħʷ/, i.e., [ħᶣ]. This Abkhaz dialect lacks [low, round] /ʕʷ/, but Chirikba (2014) reports that in certain varieties, *ʕʷ has changed into /jʷ/, phonetically [ɥ] (see fn. 7 for an articulatory explanation).

More pointedly, certain Northwest Caucasian languages have consonants with secondary pharyngealization. Notably, "in Ubykh there is a series of pharyngealized labials, /pˤ/, /bˤ/, /pˤ'/, /mˤ/, /vˤ/, and /wˤ/, in addition to the two pharyngealized uvular series, plain /qˤ, qˤ', χˤ, ʁˤ/ and rounded /qˤʷ, qˤʷ', χˤʷ, ʁˤʷ/" (Colarusso, 1988, p. 48; see also Beguš, 2021, p. 700–701). Similar to pharyngeals, Caucasian emphatics are known to cause "slight front coloring" (Colarusso, 2013, p. 98) in adjacent vowels, an effect called "emphatic softening" (Trubetzkoy, 1931) or "emphatic palatalization" (Trubetzkoy, 1969, p. 131–132; Catford, 1983, 1992; Colarusso, 1985, p. 366, 1988, p. 26, 2013; Rose, 1996, p. 98; Comrie, 2005; Bellem, 2009, p. 98–99; Moisik, 2013; Sylak-Glassman, 2014, p. 71–72; Beguš, 2021, p. 715–716). As mentioned, such effects are less perplexing if the emphatic feature is [low], rather than [RTR]. Again, see fn. 7 for an articulatory explanation.

Moreover, Ubykh already has [RTR] /q qʼ χ ʁ/ and [round, RTR] /qʷ qʷʼ χʷ ʁʷ/, so the pharyngealized counterparts must involve an additional feature, say [low, RTR] /qˤ, qˤ', χˤ, ʁˤ/ and [low, round, RTR] /qˤʷ, qˤʷ', χˤʷ, ʁˤʷ/. Pace Halle et al. (2000, p. 408–410) and Purnell and Raimy (2015, p. 526), among others, the velar-uvular contrast cannot be understood as [front]-[back] instead, freeing up [RTR] to characterize secondary pharyngealization in Ubykh uvulars. This is because the [front]-[back] dimension is contrastive not only among velars (/k g kʼ/ vs. /kʲ gʲ kʲʼ/), but also among uvulars (/q qʼ χ ʁ/ vs. /qʲ qʲʼ χʲ ʁʲ/; Colarusso, 1988, p. 438; Beguš, 2021, p. 700–701).

Tellingly, "there are no palatalized, pharyngealized uvulars" (Colarusso, 1988, p. 274). Thus, in Ubykh, the [front] (palatalized) uvulars do not contrast for [low] (pharyngealization), unlike the [round] (labialized) uvulars. Similarly, in Cwyzhy Abkhaz (Andersson et al., 2023), [front] and [round] are both contrastive across coronals (e.g., /ʃ ʃʲ ʃʷ/), velars (e.g., /k kʲ kʷ/), and uvulars (e.g., /χ χʲ χʷ/), but [front] is not contrastive in the [low] pharyngealized uvulars and pharyngeals; only [round] is: /χˤ χˤʷ ħ ħʷ/ (Colarusso, 1988, p. 268; Chirikba, 2014, p. 298). The lack of a [front] contrast among [low] consonants in Ubykh and Abkhaz is surely related to "emphatic palatalization," mentioned above. Under such palatalized-pharyngealized phonetic conditions, it is difficult to establish or maintain a [front] contrast among pharyngeals and pharyngealized consonants. It is challenge enough to distinguish plain /χ/, say, from [front] /χʲ/, [low] /χˤ/, [round] /χʷ/, and [low, round] /χˤʷ/ in Ubykh (Beguš, 2021, p. 700–701) and Abkhaz (Andersson et al., 2023, p. 268).

As mentioned, Colarusso (1988, 2013) entertains [low] for certain "adytal pharyngeals" /ħ ʕ/ in Caucasian languages, but he rejects the use of this feature for pharyngealized uvulars in Ubykh, because the tongue body is not always low in these sounds, so he adopts Perkell's (1971) [constricted pharynx] instead to represent pharyngealization. On the other hand, he suggests [advanced tongue root] instead of [front] for palatalized uvulars and velars (e.g., Colarusso, 1988, p. 438, 2013, p. 98). As discussed in Sections 2 and 3.1, the vast majority of theorists treat uvulars as [retracted tongue root] (Latimer, 1978; Czaykowska-Higgins, 1987; Cook, 1989, p. 139; Goad, 1989; Davis, 1993, 1995; Mahadin and Bader, 1995; Rose, 1996; Shahin, 1996, 1997, 2002, 2011; Zawaydeh, 1998; Watson, 1999; Halle et al., 2000, p. 425–426, 408, fn. 8; Rose and Walker, 2004, p. 484–485; Hansson, 2010, p. 141–142, 161, 198; Slimani, 2018; Al-Bataineh, 2019; Al-Raba'a and Davis, 2020, p. 22ff; Alwabari, 2020; Jaradat, 2020; Al-Taisan, 2022; Habib, 2022, p. 16; Alqahtani and Almoaily, 2023; Gebski, 2023; etc.). For instance, Halle et al. (2000) explicitly describe Arabic *q* as an emphatic with "consonantal [RTR]" and even suggest "a prohibition *[+RTR, +ATR]" (p. 408, fn. 9). The point is: it is somewhat inconsistent to avoid using [low] for pharyngealized uvulars in Ubykh while also using [ATR] for palatalized uvulars in the same language.[29]

In sum, using [low] rather than [RTR] helps to explain "the seemingly anomalous palatal or fronting bias of pharyngeals and pharyngealization, most famously embodied by the "emphatic palatalization" of Caucasian languages" (Moisik, 2013, p. 558). Critically, alveolopalatals are usually palatalized or [front] (see Section 1), so their pharyngealization in Israeli Shapsugh makes more sense in terms of [low] than [RTR], too. If so, speakers of Israeli Shapsugh may have borrowed Arabic emphatics like speakers of Tigre (Section 3.2), by redeploying the consonantal use of [low] in preexisting pharyngeals, as diagrammed in Figure 7.

4 Conclusion

> [S]econd-language acquisition and bilingualism provide us with methodological utilities to inspect sound patterns because patterns that emerge when sound systems meet are not only familiar to us from the native language of the speaker or listener, but are also reflective of the universal laws of

29 Likewise, Sylak-Glassman (2014) argues against the use of [low] for pharyngealized uvulars in Ubykh, because the tongue body is not necessarily low in these sounds. He suggests using a new feature [constricted epilarynx] instead. Critically, he does not blink at palatalized uvulars in the same language (p. 22, 26, 112–3). He suggests that these palatalized sounds are specified [+front, +retracted, +raised, +open] (p. 128, 137–8, 141, 145). His features [+raised] and [+open] are somewhat at cross purposes, but not nearly so much as the other features. The "forward movement of the tongue body" (p. 137) of [+front] in /qʲ qʲʼ χʲ ʁʲ/ is directly opposed to the "retraction of the tongue body" (Sylak-Glassman, 2014) of [+retracted] and to the "backward" (Sylak-Glassman, 2014) tongue movement of [+raised]. The point here is not to criticize Sylak-Glassman's proposed features—contrastive palatalization in uvulars is bound to involve partly antagonistic gestures in any feature system. The point is: using [front] for palatalized uvulars in Ubykh is comparable to using [low] for pharyngealized uvulars in the same language.

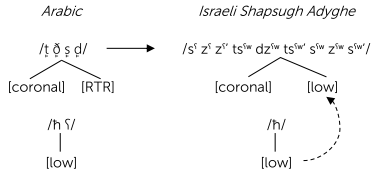

FIGURE 7
Emphatic consonants are [RTR] in Arabic, unlike its pharyngeals, which are [low], but emphatic sounds have been borrowed as [low] in Israeli Shapsugh (solid straight-lined arrow) by redeploying [low] from its pharyngeal (dashed curved-lined arrow).

> phonetics and human cognition. At the crossroads of unity and variation across the languages of the world, studying second-language sound patterns therefore gives us a unique window of opportunity to understand the nature of linguistic processes and representations as well as the extent of human grammars. All of these shape "patterns" that linguists are fond of because, after all, patterns are manifestations of how we get to know what we know. For one thing, second-language acquisition is expected to mimic linguistic change through language contact, albeit—and perhaps luckily—observable within an individual's life span. (Kabak, 2019, p. 250)

Spurred by reflections like Kabak's, I have applied the notion of redeployment in second language acquisition to contact-induced diachronic changes. Of particular interest are cases where a marked phonological contrast has spread across neighboring languages. Such cases suggest that listeners can re-weight and re-map phonetic cues onto novel phonological structures. On the redeployment view, cues can indeed be re-weighted, but phonological structures which underlie a new contrast are not expected to be fully novel; rather, they must be assembled from preexisting phonological structures (Archibald, 2003, 2005, 2009, 2018, 2021, 2022, 2023; Archibald et al., 2022).

Emphatics prove to be an instructive case. These typologically marked consonants were innovated in Interior Salish (Section 2.1) and Arabic (Section 3.1), and were then borrowed into neighboring (unrelated) languages. Most phonologists consider the original emphatics to be [RTR], like uvulars, "entailing a constriction in the upper pharynx" (Davis, 1995, p. 471), and the emphatics were evidently borrowed as such in many languages. In Tsilhqot'in (Section 2.2), Nedut'en-Witsuwit'en (Section 2.3), X̄a'islak̓ala-X̄enaksialak̓ala (Section 2.4), Kumzari (Section 3.3), and Northern Songhay languages (Section 3.4) among others, the feature [RTR] was redeployed from preexisting uvulars to other consonants on the basis of partial acoustic /auditory similarities with emphatic sounds in neighboring languages. Importantly, languages without uvulars (and without any other [RTR] consonant) did not and arguably could not participate in the areal spread of phonological emphasis. For example, Dakelh (Section 2.5) did not have uvulars, nor any other type of consonant with a phonological feature to redeploy as emphasis, so it has not adopted emphatic consonants in spite of prolonged contact with five languages with these sounds (Sections 2.1–2.4).

On the other hand, it was found that languages with pharyngeals may borrow emphatics differently (Sections 3.2, 3.5). Pharyngeal consonants entail a constriction in the epilarynx and lower pharynx, traditionally represented by the phonological feature [low]. This feature can apparently be used for secondary pharyngealization, too. For example, Tigre had no uvulars so the [RTR] emphatic consonants of Arabic were arguably borrowed as [low] instead, by redeploying [low] from preexisting pharyngeal consonants to [CG] ejectives (and to [CG] /ʔ/ in words with [low] consonants). To clarify: Tigre redeployed the phonological use of [low] in a consonant, not simply the feature [low], which presumably occurs in most spoken languages, notably in low vowels. Similarly, recall from Section 1 that some native speakers of Korean appear to learn English [posterior] /ʃ/ as [front] /ɕ/. What gets redeployed in that case is the phonological use of [front] in a sibilant, not simply the feature [front], which occurs in most languages, notably in front vowels.

A background assumption here is that redeploying a feature within the consonant system is easier than redeploying a feature from the vowel system to the consonant system. Take Soqotri (Kogan and Bulakh, 2019), one of several Modern South Arabian languages which have acquired emphatics under the influence of Arabic, as discussed in Section 3.2. Soqotri phonology has long distinguished laryngeals /h, ʔ/ from [low] pharyngeals /ħ, ʕ/, but it does not distinguish velars from [RTR] uvulars (Kogan and Bulakh, 2019, p. 283).[30] However, Soqotri phonology does distinguish /e, o/ from [RTR] /ɛ, ɔ/ (Kogan and Bulakh, 2019, p. 285–286).[31] Interestingly, Soqotri speakers apparently acquired the [RTR] emphatics of Arabic as [low] instead, by redeploying their use of [low] in pharyngeal consonants, rather than by redeploying their use of [RTR] in mid vowels. So for instance, /ɛ/ has two allophones according to Kogan and Naumkin (2014, p. 58): "open mid-front [ɛ]" and "open front [a] ('average European *a*');" "the first is the basic allophone appearing in neutral environments, the second is conditioned by the proximity of emphatics and pharyngeals" (Kogan and Naumkin, 2014). The fact that Soqotri emphatics cause vowel lowering to front [a], not back [ɑ], suggests that they are—like pharyngeals—[low] rather than [RTR].

Conversely, recall from Section 3.3 that /ħ/ is arguably [low] in Shihhi Arabic, but Kumzari speakers did not redeploy the feature [low] from their vowel system to acquire /ħ/ from Shihhi Arabic. Rather, Kumzari speakers redeployed the feature [RTR] from their preexisting uvulars to acquire /ħ/ as [RTR] instead. As Anonby (2020, p. 297) writes: "Although *ḥ* is not uvularized, its behavior suggests that it should be classed as an emphatic" (p. 297). So for instance: "The uvularized alveolar emphatics, uvular consonants *x q g*, the pharyngeal *ḥ*, and the uvularized allophone of *r* all cause preceding as well following non-back vowels to be retracted (ā [aː] → [ɑː], a [ɐ] → [ʌ])" (p. 298). By contrast, in Shihhi Arabic [low] /ħ/ does not have the same retraction effect on vowels as [RTR] emphatic consonants do (Bernabela, 2011, p. 30).

Critically, most languages distinguish several height levels in vowels, such as /a/ vs. /e, o/ vs. /i, u/, and many languages further distinguish /ɛ, ɔ/, so the phonological features [low] and [RTR] are frequently active in vowel systems. By contrast, these

30 Soqotri <q> is /kˤ/, i.e., [stop, dorsal, low, constricted glottis].

31 The /o–ɔ/ contrast has a low functional load; e.g., "*hɔ* as form of address vs. *ho* 'I'" (Kogan and Bulakh, 2019, p. 283).

phonological features are relatively rare in consonant systems. The overall impression is that in contact situations, a language may newly adopt emphatics or pharyngeals as [RTR] or [low] only if the relevant feature is already in use in its consonant system. This supports the redeployment construct in second language acquisition theory (Archibald, 2003 *et seq.*). It also dovetails with the discussion in Martinez et al. (2023, p. 390): "redeployment within systems" (e.g., [RTR] or [low] within the consonant system) is privileged over "redeployment across systems" (e.g., [RTR] or [low] from the vowel system to the consonant system).

5 Envoi on consonantal [low]

Finally, it must be acknowledged that using [low] to represent epiglotto-pharyngeal constriction in consonants is disputable, albeit traditional (Chomsky and Halle, 1968, p. 305; Ladefoged, 1971, p. 92–94; Lass and Anderson, 1975, p. 18; Prince, 1975, p. 12; Rood, 1975, p. 329–333; Halle, 1983; Halle and Clements, 1983; Cole, 1991, p. 25; Coleman, 1998, p. 69; Jensen, 2004, p. 97; Calabrese, 2005, p. 59–60; Hayes, 2009, p. 87–88; Miller, 2011, p. 434; Flynn, 2012, p. 142–144; Odden, 2013, p. 54, 60; among many others). This distinctive feature was originally intended to be relatively abstract and implementable in both vowels and consonants with various articulators in the phonetics (hyoglossus muscles, jaw lowering, larynx raising, etc.). In practice, however, [low] is often narrowly defined as "a lowered tongue body" (Sagey, 1986, p. 278).

In Feature Geometry, too, various possibilities were originally contemplated for [low] in the tree—it might be located directly under the Place node (Clements, 1985), or under a Height node (Hyman, 1988, p. 269; Odden, 1991, p. 265; Lahiri, 2018, p. 234), or a Vowel place node (Goad, 1991), or a Pharyngeal node (McCarthy, 1988, p. 105). However, most assume that [low] is located under a Dorsal node or under a [dorsal] feature (Sagey, 1986, p. 61; Steriade, 1987, p. 597; Keyser and Stevens, 1994, p. 231; Halle, 1995; Avery and Idsardi, 2001, p. 68; Hall, 2007, p. 313), or else under a Tongue Body node alongside [dorsal] (Halle et al., 2000). This narrow conception of [low] is ill-suited to represent pharyngeals and pharyngealization according to some theorists (McCarthy, 1991, p. 43; see also Lee, 1995, p. 343).

As mentioned in Section 3.5, Perkell (1971) proposed to replace [low] with [constricted pharynx], defined as "a narrowing of the lower pharynx" (p. 124). Alternative replacements include [lower pharynx] (Czaykowska-Higgins, 1987, p. 13), [laryngopharynx] (Hess, 1998, p. 268–271), [constricted epilaryngeal tube] (Moisik and Esling, 2011; Moisik et al., 2012; Al-Tamimi, 2017; Al-Tairi, 2018; Esling et al., 2019), and [constricted epilarynx] (Sylak-Glassman, 2014). These various features were introduced to model the phonetic realities of pharyngealization more accurately than [low]. But phonological features were never intended to be used directly in the phonetics:

> [W]hile the input to the gesture-calculations component is a phonological representation, the output is not. Rather, the output is a series of instructions to the musculature. This entails that the phonological representation disappears at this point, being replaced by motor instructions. Hence, if the birthplace of lexical representation is in the lexicon, its demise is in the gesture-calculations component. (Keyser and Stevens, 2006, p. 36)

Moreover, even theorists who reduce distinctive features to particular defining gestures still place greater importance on other accompanying gestures in the phonetics. As already mentioned, Keyser and Stevens (1994) define [low] as a tongue-body feature and locate it as such in their feature tree (p. 231), but they remark that constricting the lower pharynx serves to enhance the acoustic manifestation of [low] (p. 226). Crucially, enhancement gestures like pharyngeal constriction are introduced in the phonetics, not in the phonology, and as such, these gestures prove to be more reliable phonetic cues than feature-defining gestures like tongue-body lowering:

> [W]hile feature-defining gestures are, in certain contexts, subject to severe weakening up to and including obliteration, enhancement gestures are far more robust and are apparently never obliterated… We hypothesize that overlap is responsible for the deviations in careful speech. We also suppose that, unlike feature-defining gestures, enhancement gestures are never subject to overlap severe enough to mask their acoustic consequences. (Keyser and Stevens, 2006, p. 57–58)

It turns out to be relatively common for an enhancement gesture to serve as a proxy for a phonological feature whose defining gesture is obliterated in the phonetics (e.g., Stevens and Keyser, 1989, 2010; Keyser and Stevens, 2001, 2006; Stevens, 2002; Flynn, 2011, and references therein). So it remains defensible to use the traditional feature [low] to represent pharyngeals and certain emphatics (Cole, 1991, p. 25; Coleman, 1998, p. 69; Jensen, 2004, p. 97; Calabrese, 2005, p. 59–60; Hayes, 2009, p. 87–88; Odden, 2013, p. 54, 60; etc.), on the understanding that this feature is implemented with additional gestures in the phonetics, such as jaw lowering (Nolan, 1995) and larynx raising (Esling, 1999), and that an enhancement gesture like pharyngeal constriction acts as a proxy for [low] in certain phonetic contexts (Keyser and Stevens, 1994, p. 231). This may be the case in Tigre ejectives (Section 3.2) and perhaps in Northwest Caucasian emphatics (Section 3.5), where the tongue body is indeed not always low.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

DF: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Validation, Writing – original draft, Writing – review & editing.

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