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RHINOGLOTTOPHILIA: THE MYSTERIOUS CONNECTION BETWEEN NASALITY AND GLOTTALITY

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1.0. Introduction

Rhinoglottophilia--an affinity between the feature of nasality and the articulatory involvement of the glottis--is more prevalent than is generally realized. Although it sounds like a disease, or even a perversion, rhinoglottophilia is actually quite a benign and natural condition. It is of interest chiefly because it is not obvious why there should be any such affinity at all. At first glance there does not seem to be any particular relationship between the lowering of the velum and the articulation of such laryngeal sounds as [h] or [ʔ]. Yet we can document this connection with evidence from a variety of genetically unrelated languages, both synchronically and diachronically.

After rapidly surveying some synchronic data from TAI, TIBETO-BURMAN, INDO-EUROPEAN, SEMITIC, and NIGER-CONGO [section 2], we take a look at some articulatory explanations that have been offered, both impressionistically (Matisoff) and scientifically (Ohala) [section 3]. We then go on to focus on the nasal/glottal interrelationship as it has been manifested in the history of TIBETO-BURMAN, especially with regard to the phonetic interpretation of the controversial prefix "h-" of Written TIBETAN [section 4].

In section 5, we consider an apparent paradox: if nasality and glottality are so closely related syntagmatically (co-occurring on the same or neighboring segments), how has it happened that the two features have come to be opposed paradigmatically to each other at various stages in the history of TIBETO-BURMAN?

2.0. Nasalization of vowels in the environment of "laryngeals"

Nobody is surprised to find that a vowel has become nasalized before or after a nasal consonant [mṼ-, nṼ-, ŋṼ-; -Ṽm, -Ṽn, -Ṽŋ]. This is a classically simple sort of intersegmental assimilation, whereby the lowered velum perseverates into the articulation of the following vowel, or is lowered during the articulation of the vowel in anticipation of the following consonant. A matter of the timing of the velar gesture. No such explanation can account for vowel nasalization in the environment of [h] or [ʔ], since no laryngeal segment has an "intrinsic" nasal component to be "assimilated to". Yet many languages display this phenomenon.

2.1. THAI and LAO. In standard Bangkok THAI, as described e.g. in Noss 1964 (p. 15), all three low vowels are allophonically nasalized after syllable-initial nasal consonants, but also after syllable-initial /h/ and [ʔ]. The three low vowels of THAI[1] are usually transliterated as / ɛ a ɔ /, though the front one is not like the e in ENGLISH bed, but like the a in ENGLISH hat: [æ a ɒ]. Analysts differ as to the phonemic status of syllable-initial pre-vocalic glottal stop in THAI. Haas (1945, 1964) regards [ʔ] as phonemic in this position, partly because this yields a simpler syllable-canon (since there are then no syllables that begin with a vowel), and partly because she considers glottal stop to be phonemic in syllable-final position as well (once a phoneme always a phoneme).[2] Noss (p. 9) denies phonemic status to [ʔ], whether initial or final. Be that as it may, the phonetic facts are clear, and we encounter forms like the following:

/maa/	[mãã]	'come'
/hɛ̀ɛ	[hɛ̃ɛ̃]	'parade'
/ʔɔ̀ɔk/ or /ɔ̀ɔk/	[ʔɔ̃ɔ̃k]	'leave, depart'

The nasalization is strongest if the vowel is /a/. As far as the Bangkok dialect goes, it is my impression that the nasalizing effect of /m- n- ŋ -/ is more general than that of the laryngeals, such that any of the nine vowels is nasalized to some degree after a syllable-initial nasal consonant, while only the three low vowels (especially /a/) show any noticeable nasalization after the laryngeals /h/ and [ʔ]:

$$V \rightarrow [+nas] \;/\; \begin{matrix} C \\ [+nas] \end{matrix} \_\_\_\_$$

$$\begin{matrix} V \\ [+low] \\ [esp.\ +\ central] \end{matrix} \rightarrow [+nas] \;/\; \left\{ \begin{matrix} h \\ ʔ \end{matrix} \right\} \_\_\_\_ .$$

Thus, words like /hãa/ 'five', /hăa/ 'visit', /ʔaw/ 'take' have extra-strong nasalization, even more than words like /hɛ̀ɛ / 'parade' or /hɔ̀ɔ / 'package'.

Professor Haas points out that in Northeastern THAI the nasalizing effect of /h/ is general for all vowels.[3] Are we to imagine that the Northeast is reflecting the original SIAMESE state of affairs, so that Bangkok speakers innovated by "stopping nasalizing" non-low vowels--or are we to suppose that rhinoglottophilia first gained a foothold with the low vowels, and later generalized in certain dialects, to non-low vowels as well? We return to this question in Section 3.

A similar nasalizing effect on vowels by syllable-initial laryngeals has been noted for LAO, the national language of Laos, which is mutually comprehensible with some dialects of Northern THAI.[4]

Not to be confused with the nasalizing effect of initial laryngeals on the following vowel is the fact that some TAI dialects show an interchange between nasal and laryngeal consonants in syllable-initial position. Thus, in many Southern THAI dialects (Songkhla, Nakhon Si Thammarat, etc.), Common TAI syllable-initial *ŋ- has regularly developed into h-.[5] Thus, 'snake' is ŋuu in Bangkok, but huu in Southern Thailand. Although it would be interesting to investigate whether the denasalization of the initial consonant in these dialects is being "compensated for" by the nasalization of the following vowel [hũũ], perhaps we should look at this the other way around: once the original nasal consonant had caused the following vowel to nasalize, maybe the nasality of the consonantal segment came to be felt as redundant, so that it could be dispensed with in favor of the "minimal consonant" h-:

*ŋuu > ŋũũ > hũũ (perhaps > huu)

At any rate, it would surely be misguided to invoke "underlying" nasal consonants as a general explanation for the nasalizing power of laryngeals in the various TAI dialects.[6]

2.2. LAHU and LISU. In LAHU, an important language of the LOLOISH branch of the LOLO-BURMESE subgroup of TIBETO-BURMAN,[7] nasal consonants do not have any noticeable nasalizing effect on the following vowel. On the other hand, many speakers have strong nasalization in syllables beginning with a vowel (i.e. zero consonantal onset) or with h-. This effect is especially strong when the vowel is / ɔ / or /a/.[8] Thus:

'four'	/ɔ́/	[ɔ́]	~ [ɔ̰́]
'underpart'	/ɔ̀-hɔ́/	[ɔ̀-hɔ́]	~ [ɔ̀-hɔ̰́]
'elephant'	/hɔ/	[hɔ]	~ [hɔ̰]
'to bend'	/ɔ́/	[ɔ́]	~ [ɔ̰́]
'water buffalo'	/ɔ́-qā/	[ɔ́-qā]	~ [ɔ̰́-qā]
'likeness, image, spirit'	/ɔ̀-ha/	[ɔ̀-ha]	~ [ɔ̀-ha̰]
'grandchild'	/ɔ̀-hwɛ̄/ < /ɔ̀-hɔ̄-ɛ̄/	[ɔ̀-hɔ̄-ɛ̄]	~ [ɔ̀-hɔ̰̄-ɛ̄]

Unlike THAI, LAHU has no trace of a phonetic glottal stop in syllables that do not otherwise begin with a consonant. This indicates that we should group [h], [ʔ], and [zero consonant] together into some natural class of rhinophiliacs.

In LISU, a LOLOISH language closely related to LAHU, the relationship between h-, vocalic onset, and nasalization was noted long ago by the

missionary Fraser 1922 (pp. 3, 4). Of the nine simple vowels he distinguishes, seven are always nasalized if there is no syllable-initial consonant: /i/, /ü/ (front rounded), /u/, /ï/ (superhigh central),[9] /ə/ ("as in get, but with the lips puckered"), /á/ ("as in cat", i.e. [æ]), and /aw/ ("as in law", i.e. [ɔ] or [ɒ]). The other two vowels, /a/ and "rgh", may occur either nasalized or non-nasalized in syllables with no initial consonant. (Fraser describes "rgh" as "a plain guttural vowel sound, difficult to describe--approximated in involuntary retching" (p. 3). It is clear he means barred-i, /ɨ/.) This nasal/oral distinction between /a/ and /ã/, /ɨ/ and /ɨ̃/ is certainly a recent secondary development in LISU, since all etymological syllable-final nasals have long since disappeared without leaving any segmental trace beyond an "oral" alteration of the vowel quality (e.g. 'you' *na ŋ > LISU nu; 'iron' *syam > LISU haw, etc.).

Fraser is worth quoting in extenso in connection with /h-/ and vowel nasalization:

> "The consonant h has three values, plain, guttural and nasal, represented by h, hh, and h' respectively. Nasal words with h might equally well be represented by a plain h and a nasal vowel; e.g. h'a 'soul' could be equally well written ha'; h'i 'house' written hi', etc. In other words it makes no difference whether the nasal inflection is referred to the consonant or to the vowel..." (p. 4)

By "hh" Fraser clearly means the velar spirant /x/. But there is no doubt that Fraser is being insightful and correct when he points out the nasal/oral contrast after initial h-. (This is the only initial consonant after which the contrast exists.) We may find minimal pairs like haw (Tone 5) 'to pour' vs. h'aw (also Tone 5) 'penis'. This contrast seems certainly to have arisen via the transfer of the feature of nasalization from syllable-initial (more precisely prefixial) position onto the vowel. Thus 'penis' is reconstructible as *n?yi at the PROTO-LOLO-BURMESE level (Burling 1967), and ultimately as PROTO-TIBETO-BURMAN *m-li ~ *m-ley (Benedict 1972, set No. 262). Glottalized semivowels, liquids and nasals typically reduce to h in LOLOISH (Matisoff 1969b)--and h is a consonant which offers no resistance to the intersegmental transfer of the feature of nasality.[10]

2.3. SEMITIC. Hetzron 1969 reports that in EAST GURAGE, a SEMITIC language of Ethiopia, vowel nasalization occurs in the environment of glottal and pharyngeal consonants. (See also Leslau 1972.)

Closer to home, there are several cases of secondary nasalization in borrowings from HEBREW (SEMITIC) into YIDDISH (GERMANIC), in

environments where the HEBREW original has a glottal stop from PROTO-SEMITIC ayin (the voiced pharyngeal constrictive that survives as ARABIC 'ain, [ʕ]). The name 'Jacob', HEBREW ya?akov, gets pronounced /yankev/ in YIDDISH, more frequently encountered in its diminutive form /yankl/ 'Jake, Jim, Jimmy'. Similarly, the HEBREW word ma?ase 'deed, happening, story' has been borrowed into several YIDDISH dialects as [mããse] or [mãyse]. (Note that in these examples it is again the low vowel /a/ which is involved.)

2.4. ENGLISH. As I observed in Matisoff 1970,[11] there are certain upper-class dialects of British ENGLISH where vowel nasalization is rampant, especially in words with syllable-initial vowel or h- and the low central vowel /ɑ/:

'half'	[hɑ̃ɑ̃f]
'hour'	[ɑ̃ɑ̃ə]
'heart'	[hɑ̃ɑ̃t]
'half an hour'	[hɑ̃ɑ̃fənɑ̃ɑ̃ə]
'art'	[ɑ̃ɑ̃t]

It is intriguing to recall the fact that the phones [h] and [ŋ] are in complementary distribution in ENGLISH, with [h] occurring only syllable-initial and [ŋ] occurring only syllable-final. If we wanted to be cute we could analyze them as belonging to the same phoneme, writing 'hat' and 'sing' as /hat/ and /sih/--or perhaps as /ngat/ and /sing/.[12] By the time you finish reading this paper, that might even begin to seem reasonable to you.[13]

3.0. Articulatory explanations

"Far from being mutually exclusive, the features of nasality and glottality are interrelated in such a variety of ways that it is imperative to search for an explanation in terms of universal articulatory fact" (Matisoff 1970: 42). Not being an instrumental phonetician, I could only come up with imprecise and impressionistic articulatory "explanations" for rhinoglottophilia, like my concept of velic lassitude (Matisoff 1969a). When you arrive home exhausted with two armfuls of groceries, and finally sink into a chair, you might well utter the syllable [hə̃ə̃ə̃ə̃ə̃ə̃] as you sigh with relief. For such a syllable the vocal tract is in its most relaxed, least constricted modality, with the glottis open for the h- and the velopharyngeal port open for the nasalization, with the tongue in a neutral, central position for the shwa. Raising the velum requires a certain amount of muscular effort, and human beings are notorious for operating according to the "principle of least effort".

Further impressionistic evidence for the coexistence of laryngeals

and nasalization in "low-tension states" of the vocal apparatus is to be found with other kinds of paralinguistic grunts and noises--utterances that are below the level of "articulate" speech. When we are thinking something over, we often make a sound that is conventionally transcribed "hmmmmm" --here we are simply leaving our articulatory motor running, idling the engine until we really have something to say. When we do not catch what somebody has just said, the most natural and informal way to ask for a repetition is to utter the sound [hm̀m̀] or [h̀ə̀ə̀] (often conventionally transcribed "huh? "), with a rising intonation and a laryngealized onset preceding a syllabic nasal or nasalized low or low-central vowel. When we are singing softly to ourselves without opening our lips much, we are conscious of both a nasal and a glottal component to our activity--which is why we call it HuMMing. When we clear our throats, we make a noise conventionally transcribed "ahem". When we are inarticulately groping for words, we hem and haw...

This is all very well to point out--but it is still not much of an explanation. Stimulated partly by rhinoglottophiliac conversations we have had, my colleague John Ohala has gone on to devise ingenious experiments that bear on the two principal questions at issue: (a) why does vowel nasalization so frequently occur in the environment of glottal consonants? and (b) why is it mainly low vowels that are affected (see 2.1.-2.4 above).

Ohala has reported on his findings and interpreted them on at least five occasions (Ohala 1971, 1972, 1974a, b, c), and he is worth quoting in detail.

3.1. Why [h] and [ʔ]? To see if the soft palate behaved in some special way during glottal consonants, Ohala used a new device called a "nasograph", a flexible plastic tube containing a light and light sensor, which he would stuff up the subject's nose and into his pharynx, such that the light was in the pharynx and the sensor in the nasal cavity.

> "Greater or lesser velar elevation allows less or more light to impinge on the light sensor and thus develop relatively a greater or lesser voltage which can be recorded and related to other speech events". (Ohala 1972, p. 1167)

It was found that glottal consonants like [ʔ] and [h] seem to require neither a raised nor a lowered velum, "but instead allow the velar elevation to be determined by neighboring consonants and vowels" (Ohala 1972, p. 1168). This is in sharp contrast both to **obstruents** (which require a totally raised velum) and to nasal consonants (which forbid a totally raised velum). Ohala goes on to speculate,

> "One may guess that the reason that glottal consonants have no requirement for velar elevation is that it is possible to produce acoustically acceptable versions of these consonants regardless of the state of the soft palate, as long as, perhaps, there is some minimal opening between the pharyngeal and oral cavities". (p. 1168; underlining mine)

So far this explanation is basically a negative one--since it does not rock the perceptual boat of the hearer to lower the velum during glottal consonants, and since other things being equal, human beings will prefer to perform as few articulatory gestures as they can get away with, why not keep the velum down when you can? In this sense, "the lack of a constraint can be a cause".[14]

In Ohala 1974b, a further argument is adduced, based on the work of Schourup 1973--we might call this the "aerodynamic argument":

> "Unlike the oral obstruents, glottal (and probably pharyngeal) consonants do not require soft palate elevation since they involve air pressure build-up further back in the vocal tract than the point where the nasal and oral cavities join". (p. 364)

However, Ohala feels this consideration is not as strong as the "lack of acoustical distortion" argument, since other sounds--notably high vowels and the liquid l--also have an air-pressure build-up at the glottis, yet with these sounds the velum must generally be raised in order to avoid distorting their distinctive acoustic character (Ohala 1974b, p. 364).

In Ohala 1974c, the aerodynamic argument is repeated, though phrased in a more cautious, negative way:

> "An open velopharyngeal port would not prevent the build-up of air pressure behind the glottal or pharyngeal constriction since it is in front of these constrictions..." (p. 5)

Ohala then offers a more detailed explanation for the lack of acoustic/perceptual effect that vowel nasalization has on laryngeals:

> "The noise produced by voiceless glottal and pharyngeal obstruents (i.e., h, ʔ, and H) is so diffuse and so low in intensity with higher frequencies dominating in the spectrum that any oral-nasal coupling would have little acoustic and thus little perceptual effect on it". (p. 5)

Later in the same paper (p. 6), Ohala adds a third, "positive" line of argument to the effect that [h], by virtue of the open position of the glottis during its articulation, may actually produce acoustic effects on the adjacent vowel that are similar to an open velopharyngeal port. These include (a) a down-shifting of formants (especially F_1):[15] (b) increased

bandwidth of formants; (c) the presence of anti-resonances in the spectrum; and (d) an over-all lowering of the amplitude of the vowel.

We may sum all this up as follows:

Vowel nasalization frequently occurs in the environment of laryngeals because (1) a nasal-oral coupling has negligible acoustic/perceptual effect on laryngeals; (2) there is no aerodynamic requirement for velar closure in the articulation of laryngeals; and (3) in the case of [h], the open glottis exerts a positive acoustic effect on the vowel similar to that exerted by a lowered velum.

3.2. Why low vowels? Ohala's work with the nasograph has confirmed an oft-made observation that, in the absence of any neighboring nasal consonant, velar height for vowels varies directly with the "height" of the vowel (Ohala 1972: 1167; 1974b: 367), though the exact reason why this should be so remains somewhat obscure.[16] The physiological fact that low vowels are more likely to be articulated with a somewhat lowered velum than high vowels is responsible for the diachronic dynamics of what we might call the processes of nasovocogenesis and nasovocoexodus.[17] If vowel nasalization invades a language, it is the low vowels that are affected first; conversely, even if distinctive nasalization is losing its contrastive oomph in a language, it will be the low vowels on which it survives the longest.[18]

But how can a language "get away with" an open velum during the articulation of a low vowel? The answer[19] seems to be that a somewhat lowered velum can be tolerated during a low vowel because nasal coupling has less of an effect on its acoustic quality (Ohala 1974b, p. 368). This is because the main effect of nasalization on sonorants is a downward shift in the region of the first formant. Thus the lower the first formant of a vowel is to begin with, the less willing it will be to suffer the further degradation of a downward shift. Since low vowels have higher F_1's than high vowels, they are less uptight about being nasalized (Ohala 1974c, p. 5).

In fact, not only is a lowered velum "tolerated" most easily on low vowels, but there is electromyographic and nasographic evidence that for many American ENGLISH speakers the velum is actively and consistently pulled down during low "oral" vowels even in non-nasal environments, in words like bad, bod, bawd (Ohala 1974c, p. 6).

By analyzing these intricate combinations of "positive" and "negative" interrelationships on the articulatory, aerodynamic, acoustic, and perceptual planes, therefore, we can understand why it is that such an extremely favorable environment for nasalization is provided by the combination of a glottal consonant and a low vowel.

4.0. Rhinoglottal coexistence: the case of the mysterious letter "ḥ-" in Written TIBETAN

There is an important orthographic symbol in Written TIBETAN (WT), ཧ, whose precise phonetic value has always been something of a puzzle. The name of the letter is "a-chung" (i.e. "little a"), which implies that it represented some sort of attenuated vowel sound. It has been transcribed in various ways by Tibetanists--we shall use the symbol now most widely accepted, "ḥ".

"ḥ" occurs in two structural positions in WT syllables: (a) initially before vowels (ḥug-pa 'owl', ḥo-ma 'milk'); and (b) prefixially, before voiceless aspirated and voiced root-initial obstruents (ḥk', ḥg, ḥc', ḥj, ḥt', ḥd, ḥp', ḥb): ḥju-ba 'seize, grasp', ḥp'ye-ba 'creep, crawl', ḥgul 'neck', etc.

The reflex of WT ḥ- in pre-vocalic position is zero in some modern TIBETAN dialects (including that of Lhasa), which led the great lexicographer Jäschke (1881) to interpret its original phonetic value as zero also. For Jäschke it was a mere indication that the vocalic onset was smooth:

> "We meet here with the idea of the vowel absolute, the pure vocalic note, freed altogether from any presence of a consonant". (p. xiv)

For Jäschke, who was after all a German used to a good sharp glottal stop in pre-vocalic syllable-initial position, this smooth vocalic onset was a very difficult and exotic sound (p. 498-9)! Yet many modern TIBETAN dialects have a non-zero reflex of a-chung, either a voiced velar spirant [ɣ] or a glottal stop [ʔ]. Jäschke regards these as secondary, and in fact rather reprehensible:

> "Improper are the expedients of some of the dialects, the sound [of a-chung] being hardened to ɣ in Khams [Eastern Tibet] and ཨ [i.e. glottal stop] in Western Tibet". (p. xiv)

Jäschke does not feel the need to offer any explanation for these improper ex nihilo developments, though he is careful to give examples from the offending dialects (p. xvi):

Written TIBETAN		Modern Western Dialects (e.g. Ladakhi, Lahoul)	Modern Eastern Dialect (Khams)
'owl'	ḥug-pa	ʔug-pa	ɣug-pa
'milk'	ḥo-ma	ʔa-ma, ʔo-ma	ɣo-ma

So far, this evidence from the modern dialects leads us to suspect strongly that a-chung represented something other than pure zero--but what?

The picture is made more complicated when we consider ḥ- in its preconsonantal position, before voiceless aspirated and voiced obstruents. Here the reflexes of a-chung in the various dialects seem to point convincingly to some sort of nasal component in the proto-articulation of ḥ-. In the Khams dialect of Eastern Tibet, orthographic prefixial a-chung is regularly pronounced as a nasal homorganic to the following root-initial obstruent:

	Written TIBETAN	Khams	
'to agree'	ḥč'am-pa	ñč'am-pa	
'to grind'	ḥt'ag-pa	nt'ag-pa	
'to fly'	ḥp'ur-ba	mp'ur-wa	
'to move, shake'	ḥgul-ba	ŋgul-wa	(Jäschke, p.xx)

Again Jäschke offers no real explanation, beyond ascribing what he regards as a nasalistic innovation to human laziness:

> "It is not difficult to understand, how, if one is careless about closing the nasal passage, a nasal articulation of this prefix can easily grow common". (p. xv)

Furthermore, in most modern TIBETAN dialects (not just Khams) there is a strong tendency to give a nasal articulation to orthographic prefixial ḥ- where it occurs in the second syllable of dissyllabic compounds. Thus the WT word dge-ḥdun 'priesthood, whole body of the clergy' is pronounced gen-dun in Ladakhi and Lahoul (West Tibet), ge-dun or gen-dun in Spiti and Lhasa (Central Tibet), and ɣ gen-dun in Khams (East Tibet).[20] As our syllabification shows, the nasal reflex of prefixial a-chung now behaves phonetically like the final consonant of the previous syllable.

A search through Bell's dictionary of colloquial Lhasa TIBETAN (1920) confirms Jäschke's implication that in Central TIBETAN dialects the nasal reflex of prefixial a-chung in compounds is only sporadic. When the first syllable in the compound ended with a consonant in WT, the prefixial ḥ- in the second syllable usually drops without trace:

	Written TIBETAN		Lhasa	
'agony'	t'ugs-ḥk'ral	>	thu-thre	(Bell, p. 12)
'prostrate oneself'	p'yag-ḥts'al-ba	>	chha-tshe-wa	(Bell, p. 381)

But there are counter-examples where the a-chung of the second syllable seems to have caused the final stop of the first syllable to assimilate to its homorganic nasal:

	Written TIBETAN		Lhasa	
'be satisfied (honorific)'	t'ugs-ḥdod gaŋ -ba	>	thung-dö khang-wa	(Bell, p. 426)

When the first syllable of the compound ends in a vowel, the nasalization seems more likely to be present:

	Written TIBETAN		Lhasa	
'written prayer'	k'a-ḥdon	>	khan-dön	(Bell, p. 372)
'to shudder'	sku-ḥdar skyon-pa	>	kün-dar kyom-pa	(p. 387)
'to query (hon.)'	bkaḥ-ḥdri gnaŋ -ba	>	kan-dri nang-wa	(p. 387)
'to settle a lawsuit out of court (hon.)'	bkaḥ-ḥdum bnaŋ -ba	>	kan-dum nang-wa	(p. 437)[21]

Yet here too there are abundant counter-examples, where the a-chung in the second WT syllable simply drops in Lhasa with no nasalizing effect on the preceding syllable:

	Written TIBETAN		Lhasa	
'proximity'	ñe-ḥk'or	>	nye-khor	(p. 382)
'puddle'	č'u-ḥk'yil	>	chhu-khyil	(p. 382)

Though it may turn out to be as difficult to write a "rule" for the appearance of nasalization in this environment in Lhasa as it is to define precisely the conditions under which voicing occurs in the second syllable of BURMESE compounds,[22] there is still no denying that modern dialectal evidence strongly suggests some kind of nasalistic interpretation of a-chung.[23]

Yet surely there is no question of a-chung's having been an ordinary nasal consonant. Written TIBETAN does in fact have a real nasal consonantal prefix, m-, which interestingly enough has exactly the same distribution as ḥ-, occurring only before voiceless aspirated and voiced root-initial obstruents (mk', mg, mč', mǰ, mt', md, mp', mb). There is in fact much evidence that the prefixes m- and ḥ- stood in paradigmatic opposition to each other in TIBETAN (and other TIBETO-BURMAN languages') verb morphology (section 5.2. below).

A-chung undoubtedly did have (or develop) a nasal coarticulation, but my own work in comparative TIBETO-BURMAN (especially the LOLO-BURMESE family) has convinced me that this nasality is diachronically secondary, and that the real distinctive feature of the proto-prefix was glottality (Matisoff 1970, 1972).

The evidence for this is chiefly tonal. I have shown in detail how a particular tone of Lahu, the high-rising tone, /ˊ/, developed by a process

of "glottal dissimilation" in certain syllables which had earlier had a glottal incident in two places--both syllable-initial and syllable-final. Thus a PROTO-LOLO-BURMESE syllable of the form *ʔbak developed into pre-Lahu syllables like *ʔba ʔ (all final stops reduced to glottal stop in pre-Lahu)--this double burden of glottality was too much for the syllable to bear, and there was a dissimilatory upheaval which led to the birth of syllables like modern Lahu pá, under the high-rising tone. Now there are many cases where Lahu morphemes under /´/ correspond to WT cognates with h-, both in pre-vocalic and pre-consonantal position. It would take a lot of space to demonstrate this in detail,[24] but here are a few examples:

(a) Pre-consonantal (prefixial) position.
'suckle, milk, breast' WT hjibs 'suck', hjo-ba 'milk', Maru cʔap 'suck', Atsi suʔ-cʔup 'id.', Lahu chɔ̀ʔ 'suck', cú 'milk'. (PTB *ʔjip ~ *ʔjup; Matisoff 1972, set 73)

'bug, insect' WT hbu 'bug', Lahu pû 'id.', pú-gɔ̂ʔ 'ant' (WT grog-ma 'ant' < *k-rwak). The Lahu form for 'ant' arose by metanalysis from *ʔbu-krwak > *ʔbuk-rwak > *ʔbuʔ-gɔ̂ʔ > pú-gɔ̂ʔ (Matisoff 1970, set 97)

(b) Pre-vocalic position.
'below, underpart' WT hog, Written BURMESE ʔok (> Modern BURMESE ʔauʔ), Lahu hɔ́[25] (PTB *ʔok; Matisoff 1972, set 173)

'noise, chitchat' WT hur 'noise, din, babble, chitchat', Lahu nàʔ-ú te ve 'converse, chat' (PTB *ʔur; Matisoff 1970, set 69)[26]

A further buttress for the glottalistic interpretation of a-chung is, of course, the "guttural" reflexes of h- in prevocalic position in Modern TIBETAN dialects (Ladakhi, Lahoul ʔ-; Khams ɣ --see above).

All these facts and considerations can now be brought together under a single rhinoglottophiliac explanation, whereby we hug the phonetic ground so closely that our very noses are pressed into it.

There is in fact no contradiction at all between the "nasalistic" and "glottalistic" interpretations of the WT grapheme "h-". We assume that WT "h-" is the regular reflex of PROTO-TB *ʔ-. The TIBETO-BURMAN proto-phoneme *ʔ- must have had two positional variants or "proto-allophones". The variant that occurred in pre-vocalic position was simple glottal stop [ʔ], which, through the operation of the articulatory, aerodynamic, acoustic, and perceptual factors we have discussed (section 3), must have led to the subphonemic nasalization of the following vowel

already in the proto-language. The other variant of proto-*ʔ occurred prefixially, in pre-consonantal position. Here, like the other (buccally) obstruental prefixes (b- d- g-, etc.), it must have been pronounced with a following atonic shwa vowel intervening 'epenthetically" before the root-initial, [ʔə̆-].[27] Once this atonic vowel had developed (and it must in fact have been present from the beginning), it was highly vulnerable to nasalization in its post-glottal environment. Thus, although there is no reason not to set up the proto-prefix phonemically simply as */ʔ-/, phonetically we may assume that an unstressed nasalized shwa followed, thus *[ʔə̆̃-].[28] These redundant phonetic features of the proto-prefix still survive strongly in Khams TIBETAN, where the nasalization has been phonologized even in monosyllables; and in the other TIBETAN dialects it is preserved in dissyllabic compounds, where it is metanalyzed and reinterpreted as the final consonant of the first syllable (above).

Striking confirmation of the phonetic plausibility of our rhinoglottal reconstruction is provided by some modern LOLO-BURMESE languages. In Lahu, the most common noun-prefix is atonic [ə̆-], written conventionally with the low-falling tone /ɔ̀-/. The Lahu vowel /ɔ/ frequently is the reflex of the proto-sequence *aŋ.[29] Sure enough, in the recently discovered LOLOISH language, BISU,[30] the directly cognate prefix occurs, pronounced /ʔaŋ-/: ʔaŋ-hmāw 'lung', etc. And in PHUNOI,[31] a close relative of BISU, the prefix appears in a phonetically intermediate form that looks very much like our PTB reconstruction: ʔã-. Thus, PHUNOI ʔã-hlá 'tongue', ʔã-gàʔ 'branch', ʔã-shí 'grease, fat'.

The semantic contribution of the PTB prefix *ʔ- to the words in which it occurred is highly abstract, and has been discussed in Wolfenden 1929 (p. 177 ff.) and Benedict 1972 (pp. 121-3). Benedict sets the prefix up with a full vowel, *a-, and without the initial glottal stop. I would claim, however, that the very name of this sound in TIBETAN, "a-chung" or LITTLE a, implies that it was phonetically a short or reduced "ə̆", that is, shwa.

Finally, I would like to draw a parallel with Indo-European here. Indo-Europeanists set up two syllabic nasals, PIE *n̥- and *m̥-, which have, wholly or partially, vocalic reflexes in the various daughter languages. In GREEK and SANSKRIT, the syllabic nasals develop into short a, while in LATIN and GERMANIC the reflex is a short vowel plus nasal consonant. Thus, the prefixial negative morpheme set up as PIE *n̥- 'not' becomes the GREEK and SANSKRIT prefixes a-: PIE *n̥-gnōto 'ignorance' ("not + know") > GREEK agnōtos (whence our word agnostic) and SANSKRIT ajñāta-. Similarly, PIE *dekm̥ 'ten' > GREEK deka,

SANSKRIT dasa. The Germanic reflex of the syllabic nasals is the sequence un. Thus our Germanic negative prefix is un-, and the GOTHIC word for 'ten' is taihun. In LATIN the negative prefix is in- (< *n̥-) and the word for 'ten' has the sequence -em (decem) (< *-m̥).

Maybe for Indo-European as well, the highly abstract proto-syllabic nasals had a concrete phonetic realization not too different from the rhinoglottal entity we posit for TIBETO-BURMAN.

5.0. Paradigmatic nasal/glottal oppositions: philos/aphilos

So far we have been discussing cases of coexistence or co-occurrence of nasal and glottal features on the same or neighboring segments. Yet compatible as the two kinds of features seem to be, the accidents of linguistic change can sometimes bring them into paradigmatic opposition to each other.[32] In every such case known to me from TIBETO-BURMAN, however, this opposition can be shown to be secondary, and I would like to claim that a nasal/glottal opposition is inherently unstable and unlikely to be preserved for too long--the features are "too close for comfort."

5.1. In syllable-final position. SINO-TIBETAN syllables could have three nasals and three stops in final position, viz. /-m -n -ŋ; -p, -t, -k/. In many modern ST languages these final consonants have suffered "decay" or feature-loss, with all conceivable stages of the process being represented in one or another language.[33] A relatively minor stage of nasal decay is represented by modern MANDARIN, where the reflexes of PROTO-CHINESE *-m and *-n have merged to -n, so that the language now has only two syllable-final nasals, -n and -ŋ. A very advanced stage of decay is represented by LAHU, where the feature of nasality has been totally lost in syllable which once had final nasal consonants,[34] so that, e.g., PTB *-am > LAHU -o, PTB *-an > LAHU e, and PTB *-aŋ > LAHU ɔ . MODERN BURMESE is an intermediate case. Here the final nasals have lost their point of buccal articulation, but survive as nasalization on the vowel: PTB *-am > MODERN BURMESE -ã, PTB *-an > MODERN BURMESE ã, PTB *-aŋ > MODERN BURMESE -ĩ.

Similarly with final stops. Here both LAHU and MODERN BURMESE have lost the three-way contrast in point of articulation, and have merged all original final stops to glottal stop,[35] which is now best analyzed as a tonal feature belonging to the syllable as a whole:[36]

PTB *-ap > Lahu o?, MODERN BURMESE -a?
PTB *-at > Lahu e?, MODERN BURMESE -a?
PTB *-ak > Lahu a?, MODERN BURMESE -e?.

We see then that a secondary contrast has now developed in BURMESE between vowel nasalization and vowel glottal-offset. This contrast is not

likely to endure indefinitely in the language, however. Mergers have already occurred (both *-am and *-an > MODERN BURMESE ã;[37] both *-ap and *-at > MODERN BURMESE a?). All that is saving the situation from further decay is the fact that all BURMESE checked syllables are pronounced with a distinctive high-tone, which can never occur on syllables with open or nasalized vowels.

5.2. In syllable-initial position. There is ironclad evidence for an alternation between a nasal prefix *m- and a sibilant prefix *s- in PTB verb morphology, with the nasal prefix signifying an "inner-directedness" that is partially captured by such labels as "stative", "middle voice", "durative", "intransitive", or "reflexive".[38] The *s- prefix, on the other hand, signalled an "outer-directed" action, and has functioned variously as a directionalizer, transitivizer, or causativizer in the history of TB. Thus many daughter languages have verb-pairs like WT mnam-pa 'to smell, stink (v.i.)'/snam-pa 'to smell something (v.t.)'.

I have demonstrated in detail[39] how the causative *s- prefix had developed into a secondary glottal prefix by PROTO-LOLO-BURMESE times, so that the terms of the simplex/causative or transitive/intransitive opposition was then *N- versus *?: the features of nasality and glottality in paradigmatic opposition. Yet again, this proved to be an unstable state of affairs, and both prefixes disappeared in most LOLOISH languages, after leaving distinctive traces on the voicing and tones of the syllables in which they had occurred. Thus in LAHU, the old nasal prefix left its mark in the voiced series of obstruents /b d j g/, which derive exclusively from proto-prenasalized syllables. The LAHU reflex of the glottal causativizing prefix is a voiceless unaspirated initial accompanied by a distinctive tone (either mid / /, very-low /- /, or high-rising /ˊ/. Thus we have LAHU verb-pairs like the following:

d ɛ̀ 'come to rest (v.i.)'/ tɛ 'set something down (v.t.)'
dɔ̀ 'drink' (simplex transitive)/ tɔ 'give to drink, cause to drink (causative)'
dû 'dig (generalized action)'/ tū 'bury, as a corpse' (directionalized action)
và? 'hide oneself ("middle")'/ fá 'hide something (transitive)'.

6.0. Conclusion: the rhinoglottal quadrille

Nasalization and glottalization are constantly popping up "spontaneously" in languages. They are perhaps the two best ways of making a vivid perceptual change in a vowel's quality. Even a language like LAHU, which has a strict canonic constraint barring syllable-final "full" consonants, makes use of both a nasal and a glottal "prosody" in its paralinguistic expressive system. Thus a syllable-final glottal stop can be added "in-

tonationally" to a Lahu verb to make it brusquely imperative: qai-? 'Go!', ni-? 'look!'[40] Similarly, a vowel may be nasalized in certain onomatopoetic adverbs to convey a vivid quality to the action: ŋ á (V) 'be wide open', ŋ án kà? (Adv) 'wide open'; thê (V) 'be straight', thên kà? (Adv) 'straight as hell'.[41]

Yet as they say, easy come, easy go. Glottal and nasal coarticulations are unstable and evanescent in language history, especially when a language tries to exploit a paradigmatic opposition between them. Perhaps it is for that reason that the features join forces with each other so often. In rhinoglottal unity there is a strength and durability which neither feature seems to possess alone.

FOOTNOTES

[1] In keeping with standard usage, we use the term Tai to refer to the whole language family to which Siamese, Lao, Shan, etc. belong, and the form with the -h-, Thai, to refer to the principal language spoken in Thailand (Siam). Thus, "Thai" and "Siamese" are synonyms. Thai/Siamese is a language belonging to the Tai family.

[2] The best argument for the phonemic status of syllable-final -? in Thai is that the tonal behavior of syllables with phonetic short vowel plus glottal stop is identical to that of syllables with short vowels plus final buccal stop, /-p -t -k/. However, final buccal stops may occur after long or short vowels, while final -? is present only if the vowel is short.

[3] Personal communication, 1974.

[4] Personal communication, Professor Gordon Downer (now of the University of Leeds), 1967.

[5] M. R. Haas, personal communication, 1974.

[6] In at least one case, a Bangkok word with modern h- may be demonstrated to derive from a prototype with a nasal component. The word for 'five' /hâa/ is a very early loan from pre-Archaic Chinese *hŋ a (ultimately < Proto-Sino-Tibetan *bŋ a) (Benedict 1972, 162). Yet this ancient history is irrelevant to the synchronically observable rhinoglottophilia in the modern Tai languages.

[7] See Matisoff 1973. Lahu is spoken in SE China, North Burma, North Thailand, and Northwest Laos. Tibeto-Burman and Chinese are part of a larger linguistic stock called Sino-Tibetan (ST). The Tai languages, though coterritorial with Sino-Tibetan, and in intimate contact with ST for millennia, have now been persuasively demonstrated to be genetically related to Austronesian, and not to Sino-Tibetan (Benedict, forthcoming).

[8] There is even more of this allophonic nasalization in the dialect of Lahu described by Telford 1938 (Kengtung region of Shan State, Burma) than in the dialect studied by Matisoff in Northern Thailand (1965-present). See Matisoff 1973a, 20-21.

[9] "The plain colourless vowel sound used when pronouncing the consonants ch, ts, etc." Cf. the similar vowel of Mandarin occurring after sibilants and affricates (Wade-Giles "ŭ", IPA [ɿ]). Matthew Chen 1973 reports nasalization in the environment of laryngeals in the Amoy dialect of Chinese.

[10] This is similar to the "long stretches of perseveratory nasalization" in such languages as Tereño (Arawakan) and Sundanese (Austronesian), that can pass through glottal consonants. See Bendor-Samuel 1966 and Robins 1957, cited in Ohala 1974b, p. 362.

[11] Pg. 42. Quoted in Ohala 1972, p. 1167, and Ohala 1974, p. 362.

[12] Or maybe with some compromise symbol, like "ɦ̃": / ɦ̃at/, /siɦ̃ /.

[13] A rather interesting parallel situation is reported by Hyman (1972, 1975) and Williamson (1973). In certain dialects of Igbo (Kwa), what was historically a consonant followed by a homorganic nasal is realized as aspiration if the prenasal consonant was a noncontinuant, but as nasalization if the prenasal consonant was a continuant. A case can therefore be made for recognizing phonemic /pNa/ and /fNa/, which are realized, respectively, as [pʰa] and [fã], since aspiration of noncontinuants is in complementary distribution with nasalization of vowels. Thus, in Africa also, there would appear to be a connection between nasality and glottality.

[14] Ohala, personally communicated epigram, 1975.

[15] See Ohala 1974a.

[16] Apparently something other than a passive pull of the tongue on the soft palate is involved. See below.

[17] These ugly terms have been coined on the analogy of "tonogenesis" (Matisoff 1973) and "tonoexodus" (Lea 1973).

[18] See Chen and Wang 1973.

[19] Suggested already in Lubker 1968.

[20] There is a typo in the WT column in Jäschke, p. xx, where the form is erroneously given as "ɣ ge-ɦdun"--the voiced velar prefix never occurs before a velar root-initial in WT. However, the modern Khams reflex of WT prefixial d- is ɣ- so the Khams form ɣ gen-dun is correct.

[21] The final -ɦ in the WT morpheme bkaɦ 'word, speech (hon.)' is of no etymological significance, but is merely an orthographic device to indicate that the b- is prefixial, and not the root-initial. (Without the a-chung the syllable would be read "bak", with the "inherent vowel" -a getting inserted after the first consonant.)

[22] See Cornyn and Roop 1968, Okell 1969. Roughly stated, a voiceless obstruent in initial position in the second syllable of a Burmese compound is voiced if the first syllable is under one of the three non-checked tones. But for the rule to operate, the two syllables have to be in "close juncture"--and this is only definable grammatically (in fact lexically), not phonologically.

[23] This is the view of Shafer 1938. See Benedict 1972, p. 120, note 330.

[24] The interested reader is referred to Matisoff 1970 and 1972.

[25] Subphonemically nasalized [hɦ̃]. See above 2.2.

[26] There is evidence that a final liquid could constitute a "glottal incident" as well as a final stop. Besides this set, see 'spittle' (no. 32) and 'hang up' (no. 18) in Matisoff 1970.

[27] The most common noun-prefix in modern Burmese, အ, occurring before hundreds of roots, is pronounced exactly this way, [ə̃-]. In fact, all modern TB languages which preserve the old prefixes more-or-less intact pronounce them with an atonic shwa (e.g. Jinghpaw [Hanson 1906, revised by Maran 1975]); or with some other atonic vowel (e.g. Angami Naga, where atonic shwa varies with an unstressed vowel rather like the [ɛ] in English bed, e.g. 'dove' mə̆ khrŭ ~ mɛ̆ khrŭ < PTB *m-kruw.

[28] I first suggested this in Matisoff 1972, p. 16, note 28. The alternative rhinoglottal interpretation offered there, a preglottalized syllabic nasal *[ˀn̥-], now seems to me less likely. The modern Jinghpaw syllabic-nasal prefix has been shown to derive from the PTB prefix *r- (Benedict 1972, p. 109).

[29] E.g. 'you', PTB *naŋ > Lahu nɔ̀. See Matisoff 1969 for many examples.

[30] Nishida 1966a, b; 1967. Also Matisoff 1970, set 71.

[31] The most reliable data we have on Phunoi is based on recent field work by David Bradley in Laos. See Bradley 1973.

[32] Perhaps the Greeks had a word for this apparent paradox. Their word philos-aphilos 'love-hate' expresses the truth that the two emotions are organically intertwined. The opposite of "love" is not hate, but indifference.

[33] For a discussion of this "continuum of final consonant decay" in TB see Matisoff 1973:80; for Chinese dialects see Chen 1973.

[34]Nasalization is now purely allophonic rhinoglottophilia in Lahu, and has no etymological connection with original final nasals at all, as explained above, 2.2. For the "prosodic" use of nasalization in Lahu vivid adverbs, see 6.0. below.

[35]Except for those cases where the syllable also began with a glottal incident, where Lahu has developed high-rising tone and lost the final glottal stop by dissimilation. Above 4.2.

[36]See Matisoff 1973a, 1.62 (pp. 25-27).

[37]This, and the Mandarin case mentioned above, support Ohala's observation that nasals as a class are highly distinct from other consonants, but easily confusable among themselves (1974c, p. 3).

[38]See Wolfenden 1929; Benedict 1972, p. 117.

[39]Matisoff 1969b, 1970, 1972. It would lead us too far afield to explore this other fascinating phonetic affinity for which the history of TB provides evidence: "spirantoglottophilia" or the connection between voiceless spirantization and laryngeal involvement. See Burling 1967, where it is demonstrated that the Lahu tonal reflexes of PLB tones *1 and *2 are the same for syllables with sibilant and glottalized initials. Both prefixial *s- and original prefixial *ʔ- had largely merged by PLB times (Matisoff 1972, pp. 16-20). See the following table:

PTB	Written Tibetan	PLB
*N-	m-	N-
*s-	s-	ʔ-
*ʔ- [ʔə̆-]	h-	ʔ- [ʔə̆-, ʔɑ̃-, ʔɑŋ-, etc.]

[40]Matisoff 1973a, p. 353.

[41]Op. cit., pp. 302-3.

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