Tonogenesis and tone renewal in Baltic and Slavic languages

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This article discusses the rise of new tones in Baltic and Slavic languages. It draws attention to the underlying mechanisms in the rise of these new tones and adduces typological parallels for some of the sound changes involved. It is argued that two processes played a crucial role in tonogenesis in Baltic and Slavic: stress retraction and reanalysis of an earlier phonation contrast as a tonal contrast. Tone renewal as a result of stress retractions in a number of South Slavic dialects is argued to have resulted from language contact.

Keywords: tonogenesis, tone renewal, Baltic, Slavic, stress retraction, laryngealization

1. Introduction

This article aims to contribute to the typological literature about the evolution of tone by describing some of the identifiable mechanisms of tonogenesis in the closely related Baltic and Slavic branches of the Indo-European language family.[1] It starts with a brief overview of attested tonal systems in Baltic and Slavic languages and a summary of previous research on tonogenesis in Baltic and Slavic. It then shifts its focus to two specific diachronic mechanisms that have produced new contrastive tones in Baltic and Slavic: the rise of tone from an earlier phonation contrast and the rise of tone as a result of stress retraction.[2] The former is well

1. Most specialists nowadays agree that Baltic and Slavic originally formed a single branch of the Indo-European language family and share a common Proto-Balto-Slavic ancestor that may have existed for over a thousand years after the disintegration of Proto-Indo-European, see, e.g., Pronk (2022) for an overview and discussion of the relevant data as well as references to the relevant literature.

2. These include cases in which new (phonetic) tones arose when language contact caused original word-final stress to be realized as a delimitative high tone on the initial syllable or mora of the prosodic word. This type of tonogenesis or tonomitosis has already been discussed elsewhere (Pronk 2018; Rinkevičius 2021) and will be ignored in the remainder of this paper.

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known from the typological literature; the latter is not. Typological parallels will be adduced for some of the sound changes involved.

The rise of new tonal contrasts in a language that already has phonemic tone has been referred to as "tonomitosis" or "tone change" to distinguish it from tonogenesis in systems that previously had no contrastive tones (Hyslop 2022: 276). In the case of Baltic and Slavic, however, the ultimate origin of phonemic tone is debated (see below) and it is therefore not always possible to tell whether the rise of a particular tone in the prehistory of these languages is a case of tonogenesis or of tonomitosis. Therefore, the term "tonogenesis" will be used in this paper to refer to all types of newly created tonal contrasts, regardless of whether or not the language already had phonemic tones at an earlier stage.

2. Tone in Baltic and Slavic

Many variants of Lithuanian, Slovene and the Bosnian/Croatian/Montenegrin/Serbian continuum combine contrastive lexical stress[3] with two or more contrastive tones. Latvian combines fixed, delimitative word-initial stress with two or three contrastive tones, depending on the dialect. Tonal contrasts in Baltic and Slavic languages are in most cases restricted to stressed syllables, but in Latvian and some dialects of Lithuanian, tones are also contrastive in unstressed syllables. In most varieties, only syllables containing a long vowel or a diphthong carry contrastive tones. In some South Slavic dialects, including the dialects underlying the Bosnian, Croatian, Montenegrin and Serbian standard languages, tones are also contrastive in syllables containing stressed short vowels, but this is known to be a recent phenomenon (Table 1).

The functional load of tone is relatively low in all Baltic and Slavic systems which have tone, which is reflected in the fact that there are few minimal pairs. It is generally accepted that those Slavic languages that have no distinctive tones lost them at some point during the second millennium CE.

3. In this paper, the term *stress* is used according to the following definition: The syllable that is marked phonetically as the most prominent in a prosodic word is *stressed*. In the languages discussed in this paper, stress is usually marked by increased loudness and higher pitch, and in some cases also by increased vowel length or differences in vowel quality. The words *pretonic* and *posttonic* refer to the position before or after the stressed syllable respectively and are unconnected to tone. The *prosodic word* is the orthotonic word plus any dependent clitics.

Table 1. Tone and stress in Baltic and Slavic tonal systems

	Contrastive stress	Number of contrastive tones	Contrastive tone on			
			Stressed heavy syllables	Stressed light syllables	Unstressed heavy syllables	Unstressed light syllables
Standard Lithuanian	+	2	+	–	–	–
Dialectal Lithuanian	+	2–4	+	–	+/–	–
Latvian	–	2–3	+	–	+	–
Standard Slovene	+	2	+	–	–	–
Dialectal Slovene	+	2	+/–	+/–	–	–
Standard B, C, M, S	+	2	+	+	–	–
Dialectal B, C, M, S	+	2–3	+/–	+/–	–	–

The basic regular correspondences between the tones of Baltic and Slavic systems that are discussed in this paper are illustrated in Table 2.

Table 2. Etymologically corresponding tones in Baltic and Slavic. Any correspondences that are the result of demonstrably recent innovations in well-defined environments have been omitted from this table. Some such innovations will be mentioned in the text below.*

	"acute"			"circumflex"
	Medial	Initial stressed	Initial stressed/ unstressed	
Aukštaitian Lithuanian	*-îː-*	*'sêːti*	*'gîːv-*	*'saũs-*
Žemaitian Lithuanian	*-i̯ː-*	*'si̯eːte*	*'gi̯ːv-*	*'sãus-*
Latvian	*-i̯ː-*	*sēːt*	*dzi̯ːv-*	*sâus-*
Common Slavic	*-ě-*	*'sě̀ti*	*'ʒ́îːw-*	*'sûːx-*
	verbal suffix	'to sow'	'alive'	'dry'

* Žemaitian Lithuanian dialects are spoken in the north-west of the Republic of Lithuania. The remaining dialects of Lithuanian form the Aukštaitian sub-group of Lithuanian dialects. Standard Lithuanian is based on western Aukštaitian dialects. Common Slavic forms are reconstructions based on those given by Derksen (2008).

There are three basic correspondences which are generally considered to reflect a single original tone. This tone is traditionally referred to as the "acute". It contrasts with the original tone reflected in the last column, which is referred to as "circumflex". There is a complementary distribution between the three sets of "acute" correspondences. There are different correspondence sets in medial syllables, in word-initial syllables that are always stressed, and in word-initial syllables that are sometimes stressed and sometimes unstressed within the same nominal or verbal paradigm.

3. The origins of tone in Baltic and Slavic

There are three hypotheses about the origins of the Baltic and Slavic tones:

(1) Tonal contrast was inherited from Proto-Indo-European
(Bezzenberger 1883: 66–68; Hirt 1892; Dybo et al. 1978)

Bezzenberger, Hirt and their contemporaries assumed that a tonal opposition existed in Proto-Indo-European final syllables containing a long vowel. This idea is no longer accepted by modern scholars of Indo-European (Petit 2010: 101–102; Jasanoff 2004: 254). Dybo, Nikolayev and Starostin proposed a different tonal reconstruction for Proto-Indo-European, in which each Proto-Indo-European morpheme had an inherent high or low tone. This idea is by no means widespread, but not all modern scholars have completely rejected the possibility of inherited tones in Balto-Slavic; see e.g. Kortlandt (1986), Pronk (2013: 151–152), and Kapović (2019: 119–126) for potential arguments in favour of such a view. Although it cannot be ruled out *a priori* that tone was inherited from Proto-Indo-European in view of the tonal phenomena in Vedic Sanskrit and Classical Greek, this hypothesis can only account for part of the actually attested tonal contrasts in Slavic and for none of the tones that are found in Baltic. The possibility that tone was inherited from Proto-Indo-European will therefore be ignored in the remainder of this paper.

(2) Tonal contrast is a shared innovation of the Baltic and Slavic languages
(Olander 2009; Jasanoff 2017; Villanueva Svensson 2023)

Proponents of this view reconstruct a Proto-Balto-Slavic system in which some morphemes were phonologically "unaccented". In prosodic words with only unaccented morphemes, the stress was automatically assigned to the initial syllable of the word, but its realization differed from other types of stress by having low or falling pitch. This analysis is rooted in synchronic and diachronic analyses of the

prosodic systems of Slavic languages by Trubetzkoy (1939: 190–191) and Jakobson (1963).

Jasanoff (2017: 122) reconstructs two Proto-Balto-Slavic stress retractions — one from word-internal syllables and one from word-final syllables with a nasal in the coda — that gave rise to this system, e.g., pre-Proto-Balto-Slavic *ne 'wedoʔ > *nè wedoʔ > Lithuanian '*nevedu* (*nèvedu*) 'I do not lead', and pre-Proto-Balto-Slavic *min'tin > *mĩntin > Lithuanian '*mĩnti:* (*miñtį*) 'thought (ACC.SG.)').[4]

Jasanoff's reconstructions have — to my mind rightly — been criticized by Olander (2018) for lacking both typological plausibility and support in the attested data. Olander himself also reconstructs a Proto-Balto-Slavic tonal contrast, which arose as a result of "a pre-Proto-Balto-Slavic change of high pitch to low pitch in word-final moras" (2018: 104, see also Olander 2009: 155–159), e.g., pre-Proto-Balto-Slavic *min'tin > *ˌmintin > Lithuanian '*mĩnti:* (*miñtį*) 'thought (ACC.SG.)'. Typological parallels for such a change have been adduced from various Baltic and Slavic languages (Olander 2009: 159–162; Rinkevičius 2021), but the validity of these parallels for Proto-Balto-Slavic has also been called into question (Kortlandt 2010a; Pronk 2018). Olander's law explains part of the attested data, but there is also a significant number of counterexamples (see his discussion of the relevant data in Olander 2009: 166–198).

The most recent theory advocating tonogenesis in Proto-Balto-Slavic is the one by Villanueva Svensson (2023: 290–294), who has combined various older ideas into a scenario in which Balto-Slavic tones evolved from an earlier phonation system. Villanueva Svensson reconstructs long vowels with tense/creaky voice and hyper-long vowels for Proto-Balto-Slavic. The hyper-long vowels were shortened and became long vowels with a falling tone, while the tense/creaky voice vowels developed a contrasting high or rising tone.

(3) Tonal contrast arose independently in Baltic and Slavic (Kortlandt 1975, 2009)

Kortlandt attributed tonogenesis in Baltic to a stress retraction from prevocalic *-i-*, leading to a rising tone in Lithuanian but a falling tone in Latvian if the syllable was originally laryngealized, and the opposite if the syllable was not originally laryngealized, e.g. Proto-East-Baltic *ąuk'ʃtias > Lithuanian '*aŭkʃtis* (*aũkštis*)

4. Forms are cited in IPA; the transliteration of the forms into IPA throughout the article is my own. The transcriptions have been simplified by leaving out phonetic nuances that are irrelevant for this paper. The notation of the tones in IPA is an approximation. In some cases, it may be other phonetic properties than pitch height or contour of the stressed syllable which carry the main distinctive load, e.g. duration (see, e.g., Rinkevičius 2021: 275–276; Villanueva Svensson 2023: 59 on Lithuanian, and Greenberg 2007: 77–79 on Slovene). For examples from the standard languages and Proto-Slavic, the traditional orthography is given in brackets after the form in IPA.

'height', Proto-East-Baltic *vil'kią̃ > Lithuanian *'vîlke:* (*vìlkė*) 'she-wolf'. Kortlandt explained tonogenesis in Slavic from a large-scale analogical replacement of a high tone by a low tone in the stressed initial syllable of words with paradigmatic mobile stress in analogy to forms from the same paradigm in which the stress was not on the initial syllable, e.g., pre-Proto-Slavic 1SG.PRES. *'néson → *'nèson (*nȅsǫ) 'carry' in analogy to the (subphonemic) low tone of the initial syllable of 3SG. *nè'sé (*nesè). Olander (2009: 49) has objected to this scenario on the grounds that analogical changes — in this case consistent levelling in favour of the tone of the unstressed allomorph — do not generally result in the same regular patterns as phonetic laws.

4. A Proto-Balto-Slavic phonation contrast

At present, there is thus no consensus on when and how phonemic tone arose in Baltic and Slavic and these questions will not receive a definite answer in this article. There is, however, one source of tones that most scholars of Balto-Slavic nowadays assume did play a role in the evolution of tone in Balto-Slavic: there is a growing consensus that some ancestor of the Baltic and/or Slavic languages had a phonation contrast between laryngealized[5] and modal vowels. This was first argued for by Vaillant (1936: 114–115) and others have since supported this reconstruction or at least considered it plausible for a pre-stage of Baltic and/or Slavic (Stang 1966: 137; Kortlandt 1975: 20–34; Young 1994; Matasović 2005: 152; Olander 2009: 145; Jasanoff 2017: 71). It remains a matter of debate for which stage(s) of the proto-language(s) the phonation contrast can or should be reconstructed. It is also not always clear whether the primary phonemic contrast in the reconstructions is supposed to be one of phonation with allophonic variation in pitch or of tone with allophonic variation in phonation (and whether this is relevant or reconstructible at all).

The main comparative argument for reconstructing a phonation contrast between laryngealized and modal vowels comes from languages in which actual laryngealization plays a role in the prosodic system: Latvian, the western, so-called Žemaitian dialects of Lithuanian, and perhaps also Slovene (Greenberg 2007, with experimental data on subphonemic laryngealization). In these languages, pitch clearly plays an important role, too, and laryngealization can be regarded as part of the realization of one of the contrastive tones.

5. In the literature on the subject, other terms than laryngealization are often used, most prominently glottalization and creaky or tense voice. As far as I can tell, these usually refer to the same or very similar phonetic phenomena.

The most detailed theory to operate with laryngealization as a source of the Baltic and Slavic tones is that of Kortlandt (starting with his 1975 monograph, with later updates in, e.g., 2008: 8–9 and 2010b: 64–65). Kortlandt reconstructs a Proto-Balto-Slavic glottal stop, which he argues eventually developed into laryngealization of a preceding vowel or diphthong in the same syllable in Baltic and Slavic. In Kortlandt's theory, the actual phonemicization of tone is due to different processes (see above), but the distinction between laryngealized and modal vowels is continued as a tonal contrast in the modern languages.

A somewhat different scenario is elaborated by Villanueva Svensson in his recent book on Balto-Slavic prosody (2023: 106–121). Villanueva Svensson argues against a Proto-Baltic contrast purely in terms of phonation in view of the typological rarity of systems involving a phonemic contrast between modal and non-modal vowels, rejecting the inner-Baltic and -Slavic comparative arguments for the reconstruction of a Proto-Balto-Slavic phonation contrast that have been adduced in the literature. Villanueva Svensson reconstructs a Proto-Balto-Slavic bitonal contrast "without excluding a phonetic component of phonation" (2023: 121), which did, however, evolve from an earlier phonation system (2023: 290–294). Villanueva Svensson's main argument for an *early* Proto-Balto-Slavic phonation contrast is the fact that syllables containing a diphthong and a Proto-Indo-European laryngeal are reflected with a different tone in Baltic and Slavic than syllables containing a diphthong but no laryngeal. In Villanueva Svensson's scenario, like in Kortlandt's scenario, the three Proto-Indo-European laryngeals merged into a glottal stop and caused laryngealization of a preceding vowel or diphthong in the same syllable. The actual phonemicization of tone in Proto-Balto-Slavic would be linked to the shortening of hyper-long vowels.

In this paper we will follow what now seems the consensus view that Proto-Balto-Slavic did indeed have a phonation contrast between laryngealized and modal vowels. The question at which exact point the phonation contrast was reinterpreted as a pitch contrast is, however, not easy to answer. There is no reason to reconstruct more than two types of syllables for early Proto-Balto-Slavic, one of which was realized with laryngealization. Whether the same type could also be realized allophonically without laryngealization, in which case it would be distinguished by pitch only, is unclear. In all attested Baltic and Slavic prosodic systems in which laryngealization plays a role, the systems are best described as being primarily characterized by pitch, with laryngealization being a subphonemic feature of one of the tones. This probably indicates that for the speakers of Proto-Balto-Slavic, it was at least ambiguous which feature carried the main functional load: phonation or pitch or both. This ambiguity paved the way for the rise of new tones: pitch became a distinctive feature when new contrastive tones in syllables containing modal vowels arose. We have seen in §3 that there is no

consensus about the question when exactly these new tones arose — during or after the Proto-Balto-Slavic period — or which processes led to the rise of these new tones. This is not the place to evaluate these proposals in detail, the important point is that the ambiguity of the phonation contrast provided the necessary conditions for pitch to be reanalysed as distinctive. The variation in pitch created by the phonation contrast opened the door to the reanalysis of other features and processes as being characterized primarily by pitch. In the following, it will become clear that this reconstruction leads to a natural explanation for the tonal phenomena in Baltic and Slavic.

5. Phonation to tone: Baltic

In order to understand the evolution of Baltic and Slavic tones, it is easiest to start with the Baltic data, because Baltic underwent fewer innovations than Slavic in this respect, which is in line with the general relative conservatism in phonology of the Baltic languages compared to the more innovative phonology of Slavic. The Proto-Baltic situation can be reconstructed by comparing the prosodic systems of Latvian, Žemaitian Lithuanian and Aukštaitian Lithuanian (see Table 3).[6] Latvian and Žemaitian have an opposition between acute and non-acute heavy syllables regardless of stress. In Latvian, the tonal difference in non-initial syllables that were unstressed in Proto-Baltic is in principle an opposition between presence versus absence of laryngealization (also referred to as "glottalization", "constriction" or "broken tone" in the literature) and the associated pitch difference. In Žemaitian Lithuanian and Latvian, laryngealization is also one of the realizations of the acute tone in stressed syllables. This laryngealization is typically realized in or just before the middle of the syllable and the pitch of such syllables is typically sharp rising in the part before the laryngealization and sharp falling after it (Ekblom 1933; Girdenis 1967).

In Aukštaitian Lithuanian, the opposition between acute and non-acute tones does not involve laryngealization and is restricted to stressed heavy syllables. Unstressed syllables are neutral with respect to tone. However, the workings of two well-established Lithuanian sound laws show us that in Aukštaitian Lithuan-

6. The Old Prussian data will be ignored here. The spelling of diphthongs in one Old Prussian text, the so-called *Enchiridion* or *Third Catechism*, seems to reflect contrastive tones, but the interpretation of the realization of these tones depends heavily on comparison with the modern East Baltic tones. See Rinkevičius (2020) and Villanueva Svensson (2023: 21–23, 67–68) for overviews and discussions of the relevant data.

ian, too, there used to be an opposition between acute and non-acute unstressed heavy syllables:

Saussure's law: an unstressed acute (laryngealized) syllable attracts the stress from a preceding non-acute (non-laryngealized) syllable: *'ranka̰ː > *ran'ka̰ː 'hand'.

Leskien's law: an acute (laryngealized) final syllable loses its acuteness (laryngealization) and becomes short, regardless of whether it is stressed or unstressed: *ran'ka̰ː > Lithuanian *ran'ka* (*rankà*) 'hand', *'lḭepa̰ː > *'lḭepa > Lithuanian *'lîepa* (*líepa*) 'linden'.

Unstressed acute derivational suffixes show a direct correspondence between laryngealized syllables in Žemaitian and Latvian, e.g., Žemaitian adjectival *-ṵok-*, *-ḭng-* and verbal *-ḭ·-* corresponding to Latvian *-a̰ːk-*, *-ḭːg-* and *-ḭː-*.[7] Examples include Žemaitian (Kretinga) *ma'ʒṵoks* 'quite small', *da'rḭ·te* 'to do', *'baimḭːngs* 'fearful' corresponding to Latvian *'mazа̰ːks* (*mazâks*) 'smaller', *'bailḭːgs* (*baîlîgs*) 'fearful', *'darḭːt* (*darît*) 'to do'. Lithuanian has a stressed medial syllable in *ma'ʒôːkas* (*mažókas*), *dar'îːti* (*darýti*), Žemaitian *ma'ʒṵoks*, *da'rḭ·te* < *'maʒа̰ːkas, *'darḭːti 'to do', because the stress was regularly shifted from the initial syllable onto the following laryngealized one (Saussure's law). These examples show that, at least in non-initial syllables that were unstressed in Proto-Baltic, the tonal opposition that can be reconstructed for Proto-Baltic is one between presence versus absence of laryngealization.

The same opposition is *a priori* likely to have existed in initial syllables, but there the situation is more complex; see the correspondences in Table 3.

Table 3. Corresponding Baltic tones in initial syllables of words with (original) fixed stress on the initial syllable or mobile stress. R = rising/level tone, F = falling tone, L = broken tone/laryngealization

	Latvian	**Aukštaitian Lithuanian**	**Žemaitian Lithuanian**	**Proto-Baltic**	
initial stress	R	F	L/F	*laryngealized	"acute"
mobile stress	L	F	L/F	*laryngealized	
initial/ mobile stress	F	R	R	*modal	"circumflex"

7. The prosodic properties of the first two suffixes have been discussed by Dybo on various occasions (e.g., 2009: 35, 58–59).

Žemaitian Lithuanian, where the primary reflex of the acute tone is laryngealization, reflects the most archaic system in this respect (Kortlandt 1975: 20–34). In Latvian, the laryngealization is only preserved in the form of the broken tone in words which used to have mobile stress, e.g. *'ga̰lva* 'head' (*gal̂va*), which corresponds to Aukštaitian Lithuanian NOM.SG. *gal'va* (*galvà*), ACC.SG. *'gâ:lva:* (*gálvą*) 'head' with mobile stress. Apart from those cases in which Latvian and Žemaitian Lithuanian preserve the original laryngealized realization of the "acute" tone, the East Baltic reflexes of the acute vary from being a falling tone in Aukštaitian Lithuanian to being a level or slightly rising tone in Žemaitian and Latvian. This variation is also best understood if it is assumed that the original contrast involved phonation type rather than (just) tone.

The Proto-Baltic reconstruction in Table 3 replaces the traditional model according to which Proto-Baltic had a rising tone instead of laryngealization and a contrasting falling tone in modal heavy syllables (Stang 1966: 125; Villanueva Svensson 2023: 96; cf. also Petit 2010: 101–103, who remains undecided which reconstruction is to be preferred).[8] One of the disadvantages of the traditional model is that it requires a seemingly unmotivated tone reversal to account for the opposing tones of Lithuanian and Latvian.

Villanueva Svensson (2023: 108) argued against viewing Žemaitian Lithuanian laryngealization as being inherited from Proto-Baltic, because there are cases where the laryngealization is a demonstrably recent innovation, e.g. *gę̰rs* 'good' < *'geras. This argument is invalid, because there are good reasons to assume that the specific laryngealization in *gę̰rs* and similar cases is of a more recent date than in other environments (see Pronk 2017: 665). The rise of laryngealization in this and similar words is connected to the compensatory lengthening of the initial syllable due to loss of the final syllable. The conditions for the loss of the final syllable are different in different dialects, which points to a relatively recent process. Similar examples of secondary laryngealization due to compensatory lengthening are also found in western Latvian. The rise of secondary laryngealization in such cases suggests that the vowel that had undergone compensatory lengthening had a sharply falling pitch, which was reinterpreted as being identical to that of pre-

8. The reconstruction of the Proto-Baltic prosodic system has not been straightforward due to the fact that all modern Baltic prosodic systems must have undergone significant changes compared to the original Proto-Baltic one, regardless of its exact reconstruction: stress shifts affected Latvian, Žemaitian Lithuanian and part of Aukštaitian Lithuanian, tones were lost in unstressed syllables in Aukštaitian Lithuanian, various types of metatony (phonetic change of one tone to another) in individual words affected all systems, etc. Apparently, the Proto-Baltic prosodic system was not particularly stable or, in other words, not easy to transmit faithfully across multiple generations. The same is true for the Proto-Slavic prosodic system and may well be a general characteristic of systems that combine tone and stress.

viously existing laryngealized syllables. This type of reinterpretation finds a neat parallel in western Latvian dialects in which the Proto-Latvian falling and laryngealized tones merged into a single laryngealized tone. Elsewhere (Pronk 2017), I have argued that Curonian, a now extinct Baltic language once spoken in the Baltic coast and forming a substrate to western Lithuanian and Latvian, may have played a role in this process.

The loss of Proto-Baltic laryngealization in Aukštaitian Lithuanian produced a falling tone, e.g. *'sḛːti > *'sêːti* 'to sow' (*séti*). This falling tone is easily understood in the light of the sudden fall of the pitch after the glottal constriction in laryngealized syllables. In Latvian and Žemaitian Lithuanian, laryngealization was only lost in some syllables, producing a new tone that contrasted with the tone of originally modal syllables as well as that of syllables that remained laryngealized. In Latvian this happened in stressed initial syllables. Here, the high pitch of the superimposed fixed initial stress of Latvian must have played a role in the loss of the laryngealization and the resulting level tone. In most of Žemaitian, laryngealization was lost if the laryngealized syllable was followed by another heavy syllable, e.g., *'kạ̰rvei > *'kărvę̰* 'cow (DAT.SG.)'. Apparently, the falling pitch of the second part of the laryngealized syllable was lost due to the pitch movement on the following heavy syllable, resulting in a slightly rising pitch and associated loss of laryngealization.

A typological parallel for the Aukštaitian Lithuanian reinterpretation of laryngealization as a falling tone is found in Mariteco Cora, Yucatec Maya and Ocotepec Mixe, where a laryngealized vowel is optionally realized with a falling pitch contour only (Kim & Valdovinos 2014; Avelino 2016: 172–173). The fact that, in Latvian, laryngealization is preserved in originally unstressed syllables but was lost phonetically in stressed syllables (cf. Endzelīns 1899) is perhaps linked to typological observations that laryngealization is in some languages more frequent in unstressed syllables than in stressed syllables. For this phenomenon see Aare et al. (2017) on laryngealization in Estonian, and Bird et al. (2008) on laryngealized resonants in St'át'imcets. As suggested above for Latvian, the correlation between laryngealization and lack of stress may be due to the clash between the falling pitch of laryngealized syllables and the high pitch of the delimitative stress on initial syllables.

6. Phonation to tone: Slavic and the shortening of laryngealized vowels

In Slavic, the original realization of the Proto-Slavic "acute" tone is less clear due to a number of innovations that obscure the picture. It has been argued, however, that at least some of the tonal features and differences in vowel length in Slavic

are best explained as a result of loss of laryngealization in the 9th century CE (Kortlandt 1975: 20–34; Greenberg 2007). In late Common-Slavic, stressed acute vowels had a rising tone and were short. The acute tone is only found in syllables containing etymologically long vowels and diphthongs that had been shortened in earlier Common-Slavic.

The short reflexes of the Slavic acute are reminiscent of Leskien's law in Lithuanian (on which see §5), although the exact conditions for the shortening were clearly different in Slavic. In both cases, the fact that originally heavy syllables with an acute tone — but not those with a circumflex tone — have become short in certain environments may be seen as a trace of earlier laryngealization. In this respect, it is interesting to note that Ekblom (1933) reported that Latvian diphthongs were shorter under laryngealization. His findings were, however, based on measurements with a single speaker, the linguist Jānis Endzelīns. A later experimental analysis by Kariņš (1996: 127–129) did not find a significant pattern across multiple speakers. In northern Žemaitian Lithuanian, stressed acute syllables are shorter than stressed non-acute ones, apparently regardless of whether or not laryngealization is part of the realization of acuteness (Murinienė 2007: 172).

There have also been reports that laryngealized vowels can be structurally shorter than modal ones in other language families, e.g. in Hmong (Andruski & Ratliff 2000: 49) and Coatzospan Mixtec (Gerfen & Baker 2005: 320–321). Stress has also been observed to play a role in this respect. In Upper Necaxa Totonac, stressed non-laryngealized vowels are significantly longer than corresponding stressed laryngealized vowels (García-Vega & Tucker 2021: 69). A potential historical parallel for Leskien's law in Lithuanian is found in Burmese, which has a creaky tone that derives from a lost final glottal stop. In traditional Burmese orthography, creaky vowels were written with the symbols that the Indian scripts use for short vowels or a dot derived from a final glottal stop. The use of the short vowel suggests a shorter duration of the creaky vowels than vowels with another tone (Bradley 1982: 121–122).

7. Possible origins of laryngealization in Baltic and Slavic

Thus far we have not addressed the question of the origin of Balto-Slavic laryngealization. This is a hotly debated topic in itself, which will not be settled here. It will suffice to briefly discuss two scenarios that have been proposed for registrogenesis[9] in Balto-Slavic.

9. Registrogenesis is "the process whereby phonation-type registers become distinctive" (Michaud & Sands 2020).

For Balto-Slavic, laryngealization can be reconstructed in two or three environments:

1. In syllables that ended in a Proto-Indo-European laryngeal;
2. In syllables that ended in or were followed directly by a Proto-Indo-European voiced stop. This process is referred to as "Winter's law". A Proto-Indo-European voiced aspirated stop did not have this effect;
3. Possibly in syllables that originally contained a Proto-Indo-European long vowel.

The last category is controversial (see Petit 2010: 104–139; Villanueva Svensson 2011, 2023: 144–187, and Pronk 2012 for discussions of the relevant data). Especially in word-final syllables, there is ample evidence that the reflexes of Proto-Indo-European long vowels are prosodically different from long vowels that developed from a Proto-Indo-European short vowel followed by a laryngeal consonant (Olander 2009: 114–115) There are two possible scenarios for registrogenesis in Balto-Slavic:[10]

Scenario 1. The three categories produced modal long vowels and diphthongs in Proto-Balto-Slavic, which spontaneously obtained laryngeal coarticulation. When new long vowels arose, e.g. due to vowel contraction, the laryngealization became distinctive (thus, e.g., Jasanoff 2004). In this scenario, Proto-Indo-European long vowels became laryngealized and an additional rule is required to explain the modal reflexes in word-final syllables. The failure of Proto-Indo-European voiced aspirated stops to lengthen preceding vowels would have to explained as well. One option is to assume that they were (partly) voiceless during the relevant period, as they are in, e.g., Greek, and became (fully) voiced at a later stage. Schematically, this scenario looks as follows: *VH* > *V:* > *V̲:* and *VD* > *V:D* > *V̲:*.

Scenario 2. This scenario requires two assumptions: the Proto-Indo-European laryngeals merged into a glottal stop in Balto-Slavic (as they appear to have done independently in the Indo-Iranian branch; Lubotsky 2018: 1881) and the voiced stops that cause laryngealization are reconstructed as glottalized stops. If this is accepted, it can be assumed that Balto-Slavic vowels and diphthongs became laryngealized before a glottal or glottalized stop (Kortlandt 1985). In this

10. An intermediate position between the two scenarios is advocated by Villanueva Svensson (2023: 218–223, 293), who argues that laryngealization originated in the sequence of a Proto-Indo-European vowel before a laryngeal, but not before a voiced stop: *VH* > *V?* > *V̲:* > *V̌:* and *VD* > *V:D* > *V̌:D*.

scenario, the Proto-Indo-European long vowels never became laryngealized. Schematically, this looks as follows: *VH* > *V*ʔ > *V̲ː* and *V̍D* > *V*ʔ*D* > *V̲ː*.

The second scenario is easier to understand from a phonetic and phonological point of view than the first one. Laryngealization of vowels before a glottal stop has also been documented in other languages, e.g., in Chamorro in the Mariana islands (Witucki 1974: 64). An interesting parallel is also found in Chalcatongo Mixtec, where there is synchronic variation in realization of sequences of a vowel and a glottal stop, with the glottal stop spreading to the vowel, e.g. [kóʔlo] next to [kóʔᵒlo] 'turkey' (Macaulay & Salmons 1995: 40). Loss of glottal stops is known to be a cause of tonogenesis, e.g. in Vietic languages (Ferlus 2004). The proposed rise of tonal contrasts as a result of loss of glottalization of a glottalic stop finds a neat parallel in Athabaskan languages like Chipewyan and Gwich'in (Kingston 2005: 137; Kortlandt 2010a).

The second scenario does, however, shift the question of tonogenesis or registrogenesis in Balto-Slavic to the question what the origin would be of the pre-Proto-Balto-Slavic glottalic stops that are required for the scenario to work. This question will be addressed in a forthcoming volume on the reconstruction of Proto-Indo-European stops (Kloekhorst & Pronk 2025) and will not be pursued here.

8. Stress retractions and tonogenesis in Slavic and Baltic

New tones in Baltic and Slavic languages arose as a result of stress retractions, typically resulting in a rising or level tone. This is a type of tonogenesis that has not been discussed in the typological literature about tonogenesis as far as I am aware (it is not mentioned in Ratliff 2015, Michaud and Sands 2020 or Hyslop 2022). The most famous example of this phenomenon is the stress retraction in Neoštokavian dialects in Serbia, Bosnia and Croatia:

*ruːˈka > *ˈrŭːka* (*rúka*) 'hand (NOM.SG.)'
*siroˈta > *siˈrŏta* (*siròta*) 'orphan (NOM.SG.)'
*poˈtoka > *ˈpŏtoka* (*pòtoka*) 'stream (GEN.SG.)'

Word-initial stressed syllables could not undergo stress retraction and obtained (or retained) a falling tone, contrasting with the new rising tone:

*ˈruːku > *ˈrûːku* (*rûku*) 'hand (ACC.SG.)'
*ˈsirotu > *ˈsîrotu* (*sȉrotu*) 'orphan (ACC.SG.)'

Strictly speaking, the tones became phonemic only after the analogical introduction of falling tones in non-initial syllables. Vermeer (1984–1985) has shown that most Neoštokavian dialects do indeed tolerate word-internal falling tones in loanwords or of analogical origin, e.g., in GEN.PL. forms of the type *Dalma'tîːnaːt͡ʃaː* (*Dalmatînācā*) 'Dalmatians (GEN.PL.)'. Judging by the neighbouring toneless Torlak dialects of southeastern Serbia that did not undergo the Neoštokavian stress retraction, at least part of the Neoštokavian dialects did not have phonemic tone prior to the stress retraction.

Tonogenesis due to stress retractions is surprisingly common in South Slavic and it is not only limited to systems that did not have phonemic tone before the stress retraction took place. It is also found in Croatian dialects that also preserve part of the Proto-Slavic tonal contrast. Stress retractions from final syllables are common in Croatian dialects and in most cases do not lead to the introduction of new tonal contrasts. In some dialects spoken in Slavonia, however, stress retractions did lead to the rise of new tones (Ivšić 1913; Klaić 2007: 19–20): (Strizivojna) *mliː'ko > '*mlȋːko* 'milk', (Bizovac) *mleː'ko > '*mlȅːko* 'milk (NOM.SG.)'. The new rising tones of the Slavonian dialects have in common that they contrast with the two previously existing falling and level/slightly rising tones. Elsewhere in Croatia, tonogenesis that is similar to but independent from the Neoštokavian tonogenesis has taken place as well, viz. in the dialects of southern Istria and around the town of Ozalj (Lukežić 1990: 55; Mandić 2009, 2012: 387): *mliː'ko > (southern Istria) '*mlíːko*, (Ozalj) '*mlȋːko* 'milk'. The new rising tone in Ozalj and the new high level tone in southern Istria create a new tonal contrast with other long stressed vowels, which have falling pitch.

In Lithuanian, stress retractions produced a new level tone in the northern dialect of Panevežys. In that dialect, a newly stressed heavy syllable has a level tone that contrasts with the older rising and falling tones: (Rozalimas) '*sūːnos* < *suː'naŭs 'son (GEN.SG.)', '*sûːnus*, '*sûːno* 'son (NOM.PL., GEN.PL.)', '*diẽnos* < *die'nŏːs, '*diẽnos* 'day (GEN.SG., NOM.PL.)' (Girdenis & Židonytė 1994).

Summarizing, there are at least four known independent cases of stress retractions leading to a new contrastive tone; three in South Slavic and one in Baltic. Many other Baltic and especially South Slavic dialects have stress retractions resulting in a rising or level tone that is identical to an already existing tone. In South Slavic systems with tone, there is a tendency to retract the stress from final syllables (Ivić 1958: 105–107; Kapović 2015: 671–733). A similar retraction is also believed to have taken place in Proto-Slavic, producing a rising tone that is commonly referred to as the "neoacute": *daː'mɪ > *'dăːmɪ (*dámь) 'I give', *noˈsîːʃɪ > *'nŏsiːʃɪ 'you carry' (*nòsišь) (Stang 1957: 168–169). When this rising tone arose, it contrasted with the two previously existing tones usually referred to as "acute"

and "circumflex", corresponding to the two original tones of Baltic (see §7 concerning the phonetics of the acute tone in Slavic).

9. Tone renewal

In the overview in the previous section, the South Slavic cases of renewed tonogenesis or tone renewal, i.e. pitch becoming phonemically distinct in systems that had lost phonemic tone at a slightly earlier stage, are particularly interesting. This phenomenon is found in the widespread Neoštokavian dialects, in the dialects of southern Istria and in those of the region around the Croatian town of Ozalj. In the following, I will argue that the fact that tonal contrast was first lost and subsequently became distinct again can be connected to the specific history of these dialects.

In the original prosodic system of Proto-Slavic, the functional load of tone was limited. The number of cases in which tone alone distinguished minimal pairs was extremely low. An example would have been Proto-Slavic ACC.SG. *'wɪlnɔ̃, which meant 'wool' or 'wave', depending on the tone of the first syllable (*vьl̏nǫ 'wool' versus *vьlnǫ̑ 'wave' in traditional notation), but the number of instances in which there would have been actual confusion if a word would have been pronounced with the wrong tone would have been vanishingly small. The role of tone as a marker of grammatical categories was also very limited and always supported by other phonological material. Moreover, tone interacted with both distinctive stress and distinctive vowel length. As a result, loss of any of these three features, whether due to internal pressure or due to language contact, did not massively impede communication. It is thus not surprising that languages that descend from Proto-Slavic include languages that have lost tone and vowel length and only retain distinctive stress, like East Slavic languages and Bulgarian, or that have lost contrastive tone and stress and only retain distinctive vowel length, like Czech and Slovak. Tone was particularly vulnerable, as is demonstrated by the fact that it was lost in all Slavic languages except the western part of South Slavic. Even in western South Slavic, tone loss is quite common. It affected, amongst others, the predecessors of at least part of the Neoštokavian dialects as well as the southern Istrian and the Ozalj dialects that later underwent tone renewal as a result of stress retraction. Tone loss in these dialects can be dated after the rise of the earliest prosodic isoglosses in western South Slavic, i.e. roughly after the 11th or 12th century CE (cf. Pronk 2021: 16–19).

Apparently, once lost, contrastive tone could relatively easily be reintroduced if the conditions were right. So what were those conditions? Two factors are likely to have played a role: the phonetics of the original sound system in which tone

had ceased to be contrastive and contact with related systems in which phonemic tone had been preserved. Right after the loss of contrastive tone, pitch probably continued to play a relatively important role as a cue for stress. In such a system, pitch peak could still easily be reinterpreted as a feature of the prosodic word that was independent of (other) cues for stress in the ears of speakers of a closely related language or dialect in which tone was phonemic. It is hardly a coincidence that all the areas in which we find tone renewal are known to have had a complicated linguistic history.

The Neoštokavian stress retraction, which is one of the causes of tone renewal mentioned above, started around the 15th century (Kapović 2015: 690–691) and spread with the large-scale migrations that took place during the 15th and 16th centuries that were caused by the Ottoman conquest of Bosnia and Herzegovina and that led to complex situations of contact between speakers of various dialects (Lisac 1996: 9–21). Although the exact circumstances leading to the stress retraction and associated tonogenesis in the first place can no longer be determined, the fact that it took place at a moment of great societal upheaval and that it managed to spread rapidly seems to suggest that language contact played an important role.

The dialects of southern Istria, which also show tone renewal, are not native to that area, but the result of migrations from southern Dalmatia during the 16th century, after which these dialects came under the influence of local tonal Istrian dialects (Lisac 2009: 61–63). The third dialect area where tone renewal is found, the Ozalj dialect, shares features with the so-called Čakavian dialects to its west and the so-called Kajkavian dialects to its north, and it has been argued that the Kajkavian influence is of a more recent date. The position of the dialect is discussed by Težak (1981: 421–427), who observed that the rise of the new distinctive rising tone is a relatively recent innovation that links the Ozalj dialect with tonal dialects to its north and sets it apart from the toneless dialects to its south and west. He also observed that distinctive tone is still spreading to toneless dialects under the influence of neighbouring dialects with tone (Težak 1981: 424).

It can be concluded that tone renewal in South Slavic seems to be a typical result of dialect mixture.

10. Conclusion

The reinterpretation of laryngealization as a tonal feature is well known from the typological literature. It played a pivotal role in the rise of tone as a distinctive feature in Baltic and Slavic and in the rise of additional tones in Proto-Slavic, Latvian and Žemaitian Lithuanian. Tone likely became phonemic in Baltic and Slavic when distinctive tones arose in non-laryngealized heavy syllables, possibly by one

of the processes that have been proposed in the literature and that were described in §3 of this article. One of the proposed triggers for tonogenesis discussed there are stress retractions. In §8, we saw that stress retractions often caused tonomitosis or tonogenesis at a later stage in individual Baltic and Slavic languages. A special case is found in South Slavic dialects, which underwent tone loss, only to restore phonemic tone at a later stage. It was argued in §9 that this type of tone renewal is typically the result of contact between closely related dialects.

In general, the Baltic and Slavic examples of tonogenesis lend support to the idea that the "tonogenetic potential" of certain features is "mediated by the state of the phonological system as a whole" (Michaud & Sands 2020). Michaud and Sands specifically refer to the tonogenetic potential of consonants. The different tones of the genetically related Baltic and Slavic tonal languages show that other features such as phonation and stress can also play an important role in the rise of tone, depending on the properties of the phonetic system of the language as a whole. The presence of both laryngealization and free stress in Proto-Balto-Slavic, both associated with their own patterns of rising and falling pitch in a word, formed an ideal environment for contrastive tone to develop. Speakers reanalysed one or more of these pitch movements as being phonemically relevant independent of laryngealization or stress. The rich diversity in prosodic systems that characterizes Baltic and western South Slavic languages today is the result of the relative instability of phonemic systems in which contrastive pitch is combined with free stress.

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Abbreviations

ACC accusative
DAT dative
GEN genitive
NOM nominative
PL plural
PRES present tense
SG singular

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