

Tom Schwartz
12/13/19
LIN 522
Andrija Petrovic

Georgian phonology

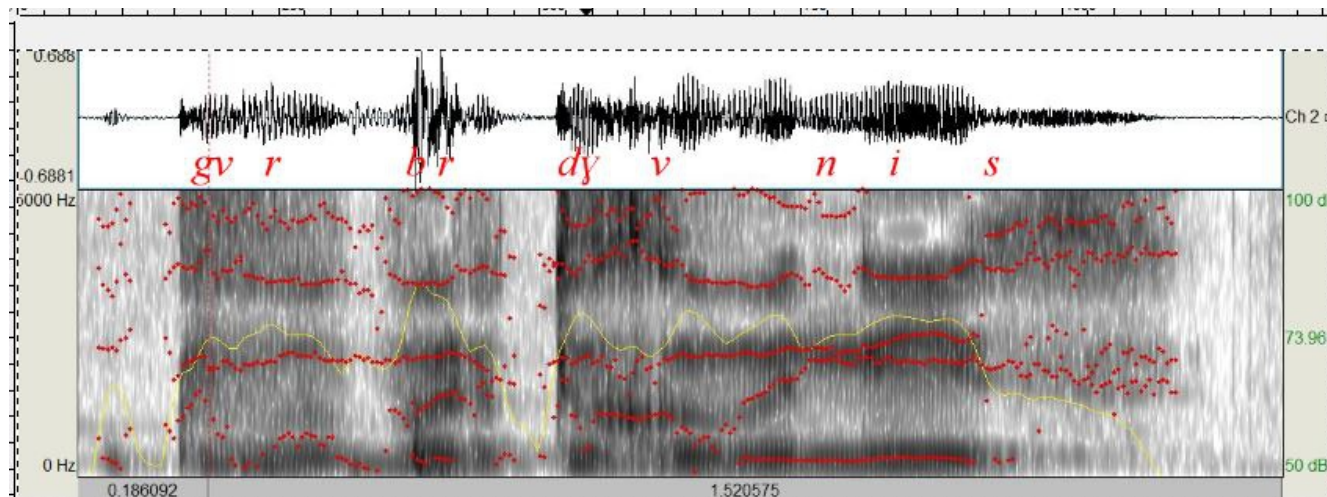
1. Introduction

Georgian is a Kartvelian language along with Svan and Mingrelian. This family of languages makes up the South Caucasian group, also named Iberian after the fifth century Kingdom of Iberia, not to be found on the Iberian peninsula. There is little evidence that Georgian is related to Basque or any other pre-Romance language in Iberia or outside of Transcaucasia. Georgian is an ancient and literary language that historically has used several scripts. Modern Georgian is written with the Mkhedruli alphabet. Georgian scripts all have one letter for each phoneme. We use Latinized writing for place names, Mkhedruli letters for lexical morphemes and all IPA transcriptions for figures 1 through 6 are direct transcriptions of Shoaat's voice by us, royally.

Georgian has long been a linguistic curiosity and most of the leading scholars are Georgians. Existing intertwined with its orthography has influenced it deeply since the 4th century at the latest. "Literary Georgian does not allow assimilation processes, due to the strong influence of the orthographic normativity," (Akhvlediani 1949) was referenced by Marika Butskhrikidze in 2002 when she wrote that, "In Literary Georgian there are no assimilation processes between vowels and vowel-consonant combinations." Modern Literary Georgian, is what we are analyzing but we'll briefly mention the Imreni dialect too.

There are 3.7 million native Georgian speakers in Georgia with 99.4% literacy (World Atlas 2018). Another million speakers live in neighboring countries and in diaspora. It is the most widely spoken Kartvelian language and its sister languages are also spoken in Georgia. Although Georgian shares neither branch nor root with other Caucasian languages like Daghestani, Circasian or Armenian, they share many phonological features like ejectives, consonant clusters and three-series of oral stops. Georgians often remark that they indeed say each and every written consonant in clusters as thick as CCCCCCCCCVC /gvrbrdyvnis/ 'He was snapped out of'.

Figure 1 - /gvrbrdyvnis/ sound clip 1.7 SECONDS



In *The Consonant Phonotactics of Georgian* Marika Butskhrikidze asserts that the sonorants /l r n m v/ are syllabic. Her view forms an important distinction for this paper's treatment of vocalic phones. An alternate theory is briefly discussed in section 5. Georgian stress is usually carried by raised tone and not duration or loudness (Borise 2018). In section 4 we'll try see if any consonant cluster is capable of receiving stress and in sections 3 & 2 we will explore how vowels are are similar to vocalic consonants.

The phonotactics are complex and favor adjacency of consonants with differing manner of articulation like /gvrbɾɣvnɪs/ canalized here.

A stop before a labiodental /gv/ is one of many environments that can bilabialize /v/. The resulting articulation has a coordinated release, like an affricate but with two points of articulation interacting instead of one point's set and stops, which release as an affricate. We have a (near) simultaneous release of a voiced velar stop and bilabialized fricative [gv]. In anticipation of the coarticulation of those first two phones in figure 1, the back of the tongue raises to the velum. As the lower lip starts to move, the voiced velar stop bilabializes the /v/ by bunching them [v⁰] before the alveo-palatal trill. These phones are simultaneous or in quick sequence and there is a wide distribution of possible allophones, a pursed bilabialized labio-dental fricative [v^w] or a bunched bilabial fricative [β]. The only other Georgian phoneme with so many allophones is the uvular ejective.

Next the alveo-dental place of articulation is trilled on for 0.35 second in the first [r]. The second one taps off after 0.1 second. The context for a syllabic consonant is “when it is surrounded by less sonorant consonants” (Akhvlediani 1949, Butskhrikidze 2002). There also appears to be a hierarchy of prosody that instructs vocalically capable consonants either to trill or tap, labialize, or coarticulate and burst out in simultaneous, or sequential release. The first six phones are voiced [gv⁰rbɾ]. The stops that surround the tap rush is to .1 second duration. As well the word ending /ɣvnɪs/ primes the fricatives into coarticulation. It's incredibly rare for a word longer than 5 syllables to have an antepenultant stress (section 4). There are between two and four syllables but the first /v/ isn't syllabic.

At approximately .7 seconds time come a group of voiced consonants [brɾ] and a voiceless velar fricative [ɣ], preceding a sonorant /v/, before the rounded, stressed, nasal, final syllable [nɪs]. Unlike the first /v/, the second /v/ bilabializes with the stress, nasality and slight rounding of vowel in the final syllable. The second /v/ is longer, higher and more bilabialized [β], because it comes before the nasal,, alveo-dental onset of the stressed syllable [n] and the velum raises more smoothly when the lips are bunched. Tone rises towards [I] and is stressed because only vowels [I ε α ɔ u] are capable of receiving stress.

We put this word [gv⁰rbɾɣβ'nɪs] together with Butskhrikidze's quote, “optimal combinations are consonants with non-identical manner” (2002 pg 87), and suggest they also like combinations with non-identical place, to illustrate a generalization about how consonant clusters come together. We also see coarticulation with a simultaneous release in short clusters, like the two word initial oral stops in the word /bgera/ Aronson (1990).

2. Consonant System

Among 28 consonants phones, there are three pairs of voiced and voiceless fricatives /s z/, /ʃ ʒ/ and /ɣ x/, one voiced labio-dental fricative /v/, one voiceless glottal fricative /h/, five triads of aspirated, ejective and voiceless oral stops or fabricates /p^h p' b/, /t^h t' d/, /ts̄ ts' dz̄/, /tʃ̄ tʃ' dʒ̄/ and /k^h k' g/ (affricates are treated like oral stops because their articulators are set the same way), one “merged” triad /q'/, two nasals /m n/, a trilled or tapped alveolar /r/, and an alveolar lateral approximant /l/.

Much like the orthho-morpho collusion, agglutinative add-ons like /al, ar, em, ia/ have restricted all of the affricates except for [ts], to lexical morphemes.

“ a) Consonants appearing only in lexical morphemes: /p p' t' k tʃ dz ts' tʃ' dʒ z ʃ ʒ χ' x h/ b)
 Consonants appearing in lexical and grammatical morphemes: /b t d g k' ts s γ v m l r n/”

We kept the /χ'/ in Butskhrikidze's quote to illustrate her view, that “the letter /χ'/ has also been transcribed as a uvular stop /q'” (2002 pg 79), but we use /q'/ to illustrate our theory that perhaps in a time when Literary Georgian was less formalized, three consonants were pronounced on the uvula, a voiced stop, an ejective and voiceless aspirated stop and without a doubt, groups of Georgians today are pronouncing the ღ [γ] in the popular spin-the-wheel guess-the-letter gameshow იღბლოანი ბორბალი 'Igbliani Borboli' as [χ] sometimes. Uvular sounds can be pronounced hard, wikipedia says [q'] is harder than [k'] and also that [k'] is harder than [k] but we are more likely to believe that allophony is relevant to mood or semantics rather than hardness is capable of giving any other meaning than emphatic in Georgian.

The Mkhdruli letters ბ ლ can sometimes be pronounced on the uvula. /x γ / could also come out as / χ ʁ / and the letter ყ that corresponds with [q'] can sometimes be pronounced as a fricative. “The [q'] behaves like the fricative /x/ and its voiced counterpart, in that it can form a particular type of complex segments known as harmonic groups when combined with anterior consonants,” (Butskhrikidze 2002 pg 87).

Figure 2
Consonant
phonemes

	<i>Bilabial</i>	<i>Labio-dental</i>	<i>Dental / Alveolar</i>	<i>Alveo-palatal</i>	<i>Velar</i>	<i>Uvular</i>	<i>Glottal</i>
Stop	p ^h p' b		t ^h t' d		k ^h k' ɡ	q'	
Affricate			ts ^h ts' dz	tʃ ^h tʃ' dʒ			
Nasal	m		n				
Tap/trill			r/r				
Fricative		v	s z	ʃ ʒ	x y		h
Lateral approximant			l				

2.1 The Triads

Aspirated, ejective and voiced oral stops group up at their place of articulation to form triads and

there are five. The tongue is at rest for the bilabial stops [p^h p' b]. The ejective [p'] is the furthest point of articulation from the glottacization that coordinates it. The alveolar ridge host triads of both stops [t^h t' d] and affricates [ts^h ts' dz] but the apex is usually interdental. The aspirated fricatives [tʃ^h] and [tʃ^h] consist of a stop, a fricative and an aspirated release. An aspirated stop release is followed by a period of noisy voicelessness. This period might last a tenth of a second or less. A stop can follow a consonant [ts^h d] but not visa-versa *[dts^h] *[dʒβd] (Butskhrikidze 2012).

For these three-series, voice onset time (VOT) distinguishes aspiration from voice and a rise in mouth pressure distinguishes ejectivity but it's not an easy distinction for foreigners to make. “The Georgian voiced obstruents are almost always perceived as glottalized or voiceless [by foreign listeners]” Žgent'i (1952) and ejectives have been similarly described as “mild” by Vicenik (2010) who also said that, “Voiced stops really only showed voicing when surrounded by vowels.”

The tongue is usually set behind the teeth to pronounce the ejective [t'] and coordinated with the glotticization, it pushes into the closure and pulls back rapidly for the stop release. The glottal action of [t^h t' d n] deals VOT, ejectivity, voicing that may be epenthazized or nasal. “These coronal occlusives are variously described as apical dental, laminal alveolar, and dental”, (Shosted and Shikovani 2006). The anterior affricate triad [tʃ^h tʃ^h dʒ] are alveo-palatal.

The same stops are often in CVCV patterns like დედა [deda] 'mother & მამა [mama] father. These can be embedded between vowel in lightly inflected words. Words like ტიტა [t'it'a] 'tulip' or თითი [t^hit^hi] 'finger' can have stress on the first or second syllable but stress is soft, often marked only by tone raising (section 5).

Two similarities in manner of articulation between [t^h t' d] and [ts^h ts' dz] are place and stop onset position. One difference is offglide. The affricates carry that articulatory phenomena to the alveo-palatal triad [tʃ^h tʃ^h dʒ]. The leading theory is that affricates came into Georgian as a mergers of stop phones and fricative phones. In literary Georgian, the word [sts'avla] meaning 'to study' has been epenthazized in the Imeruli dialect. The affricate loses its offglide [st'avla] 'to study' (Butskhrikidze 2012). She also gives evidence of this theory from Old to Modern Georgian.

The voicing of these coronal stops and affricates, aspiration and ejectivity present a unique challenge for learners. Voice onset timing might reveal some tricks to teach. Sequencing glottacization with articulation within consonant clusters is certainly daunting. The aspirated consonants [p^h t^h k^h] sound like the familiar names Pop, or Tom or Kevin. And [ts^h] might be heard at the ends of words like *bats* or *nuts*.

2.2 Glottacization for Ejectivity

Georgian ejectives are milder than many other Transcaucasian ejectives. Their articulation comes from a glotalic, egressive airstream. The glottis is closed, the stop occlusion is set and the entire larynx is lifted by the stylohyoid and digastric muscles, which raises pressure in the oral cavity between the place of articulation and the closed glottis. The stop is released, the glottis opens and the pressurized air rushes out. If a finger is placed gently on the neck, above the Adam's apple, the speaker will feel the thyroid cartilage raise (Bauman-Waengler 2009).

The pressure that pushes the air past the stop comes from the mouth rather than the lungs. These phones are articulated with a coordinated contraction of the muscles in the neck and throat, which raise the hyoid bone and the larynx. This is often just called a glotticization (Grawunder 2012).

The voicelessness of the onset clears the sonic space for the characteristic pop! Or hiss! To prime an ejective affricate [ts' tʃ'] in anticipation for the glottal release, its oral stop must be completely closed

before the glotticization and the release is a coordinated articulation. It would be interesting to study if the Georgian speaker's tongues lower parallel to the alveodental place of articulation or if they separate dorsally or apexally.

The articulators for the stop [t'] are set with the tip of the tongue interdental and most of it's front dorsal contact with the alveolar ridge. Simultaneous with the glotticization, the tongue pushes the blade between the teeth to complete the closure and open it again. English word boundary effects might make spit take [spit̚ t'eik] or bit torrent [bit̚ t'ɔɪ̯t̚ɹ̥] sound similar. The [p'] might be heard at the end of the British English pronunciation of the name Phillip but even those might be stronger than Georgian ejectives *[p!].

There may an element of decay at work in parallel with the softness of the ejectives. “Voicing lag was the only acoustic measure that significantly differentiated all three stop phonation types,” (Vicenik 2010). There's a lot more to say about the work of Wysocki and Vicenick's research with five female subjects's clips of labial, alveolar and velar stops. The primary distinction was voicing lag.” We disagree with this assertion and think that more research is necessary.

The sole uvular phoneme can be ejective, affricated ejective, fricative or so short and posterior that it's a glottal stop.

2.3 Other consonants

There are also nasals /m n/, apical, laminal and post-dorsal fricatives / s z ʃ ʒ x ɣ /, a voiced labiodental / v /, a voiceless glottal fricative / h / and a uvular phoneme / q' / that distributes into at least a triad of phones [χ q̣χ' ʁ] plus [ʔ]. Further back, the glottal fricative is voiceless [h] and only comes word initially like in [hamsi] 'anchovy'. There is a lateral approximant /l/ and an alveolar trill / tap /r/.

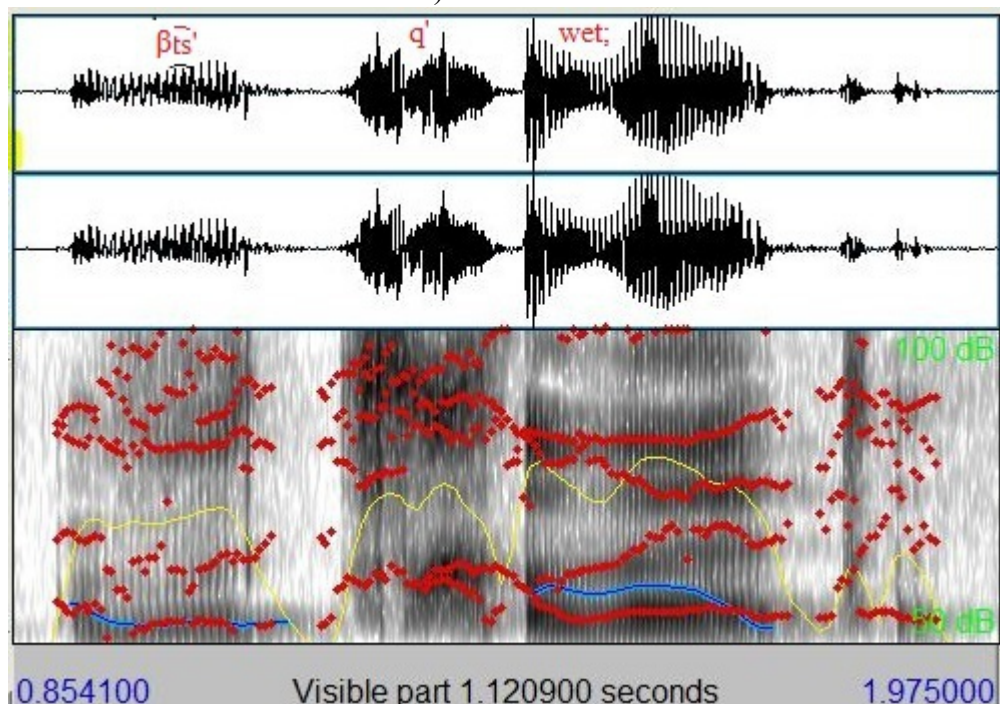
Sonorant consonants (nasals, liquids and /v/) can take on vocalic qualities but there is a debate about stress in Georgian words. Robbins asserts that no consonants are ever stressed so they cannot be the nucleus of a syllable while Butskhrikidze maintains that syllables can

Fricatives can be weak when embedded between other consonants. In the word /gvrbrdyvnis/ (figure 1) the first /r/ is a prosodic marker that temporally, and based on intensity, delineates a syllabic /r/. The next /r/ clusters into the quadriripartite segment, constricted and tapped. Leader researcher Marika Butskhrikidze said about the two most common syllabic consonants /v/ & /r/, “Two claims are made: a) Georgian sonorants are phonetically syllabic in consonant sequences. The claim is based on phonological processes, distributional patterns, and historical and comparative evidence. This especially concerns the most sonorous consonant /r/ b) Combinations of C + /v/ can be treated as complex labialised segments, I.e. C^w. The claim is based on phonological, distributional and historical evidence. Reduplication data also substantiate this claim” (Butskhrikidze 2002 pg 88)

Reduplication data also substantiate this claim” (Butskhrikidze 2002 pg 88)

Figure 3 [ϕ̣ts̚'q'wet']

Ejectives can be embedded into a nucleus like /vts̚'q'wet/ in



which /q/ has its own prosodic moment [βts'q'wet'] 'tear, snap' (1st pers. Sing. Pres.) Ejectives show up as either points of redoubled intensity or as a light frication off glide.

2.4 Allophony

Only a partial selection of class 2 consonants are analyzed, or ones that are found in both lexical and inflectional morphemes.

/d b / Consonants in word final morphemes are devoiced.

/n m/ Two environments for nasals are 1) word initial and before a voiceless consonant, and 2) after aspirated stops, affricates and voiceless fricatives. In these environments dental and bilabial nasals are devoiced. Equally affect dental and bilabial nasals.

/r/ Voiced alveolar trills are devoiced and tapped after /s/. If there's a strict rule, fricatives can not be followed by a stop, so /r/ comes in between them in many of the morphemes in the vocal samples.

/v/ Initially and in between vowels, it is a weak labio-dental fricative [v] and in some speakers, it's can be pronounced as a bilabial [β]. When followed by voiceless consonants, it's generally pronounced as a devoiced bilabial [v̥]. When preceded by an obstruent consonant, it becomes bilabial velar [w]. When pronounced between consonants, the voiced frication sizzles to the occasion.

/s z ʃ ʒ/ Preceding stops, /sk/ can coarticulate [kʰɛli] and alveo-dental articulation is crowded. Coarticulation adds bilabial or velar color to any one of these sibilants.

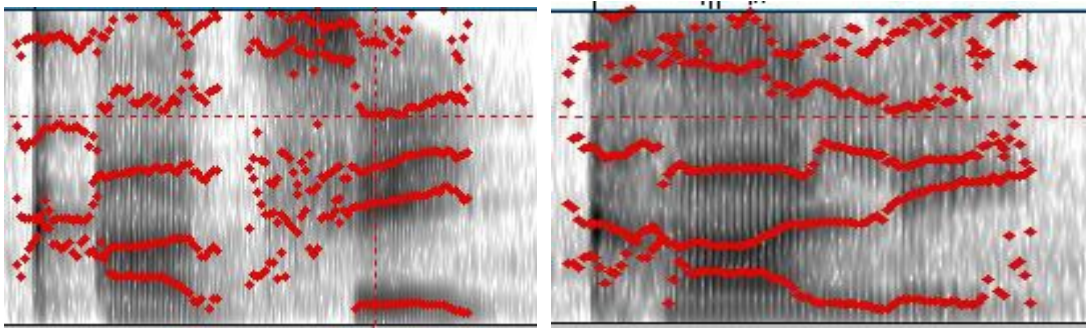
/x ɣ/ The voiced one is ფრანგული 'რ /paranguli 'r/ 'French 'R" Some dialects pronounce these fricatives uvular.

3 Vowels

There are five vowels; two front vowels /i/ and /ɛ/ , two rounded back vowels /u/ and /ɔ/ and low neutral vowel /a/ that's generally fronted but goes to [ɑ] before velarized /l/ and uvular ejectives.

Prat analysis cross referenced with forment charts shows fronting and allophonic distribution in /a/ from the distinctions in the upper forment in [k'atsi] 'man' and [kali] 'woman'.

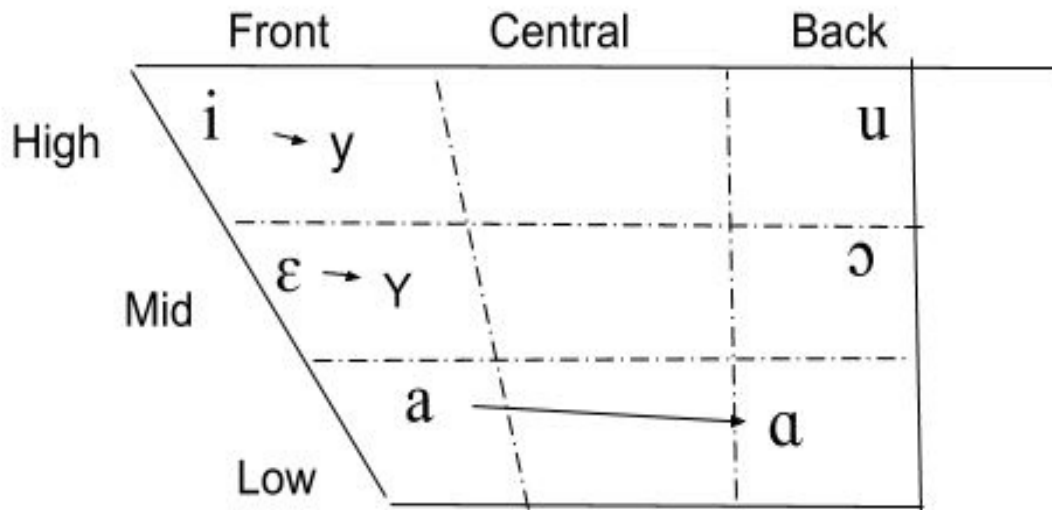
(Figure 3) [k' a ts^h i] (Figure 4) [k a l i]



We checked formants qualities from a database hosted by University of Manitoba. The /a/ also gets nasalized as in [mãmãm] 'father' ergative.

The high front vowel /i/ is said with spread lips. Some word initial /i/ sounds such as [igbliani borboli] can be joined by a y-glide [ygbliāni] there's a hard border between the inflectional morphemes [i] and [a], the only environment for adjacent vowels. “Phonologically there are no diphthongs, all vowels, irrespective whether they are immediately preceded or followed by another vowel being able to carry stress and therefore constituting individual syllables,” (Robins 1952). If each adjacent vowel can carry stress independently, we don't think that vowels can transfer nasalization left *[ygbliāni].

(Figure 5) Georgian Vowels and allophones



/ε/ also gains a y-glide word initially as in the typical Georgian name Erekle or Erxtel [Yrɛkli] or [Yrɛtɛ]. Normally /ε/ is mid, but Rogers discussed a fronter variety [ɪ] before vowels. We consider this vowel epenthesis or assimilation and not allophony owing to the fact that “Foreign listeners found /ia/ indistinguishable from /ea/ (Rogers 1952).

Butshkrikidze asserts that “The high vowels /i/ and /u/ are considered as more marked than the other vowels since they do not undergo any changes or deletion,” (2002 pg 82). All vowels next to uvular [q'] are pronounced in creaky voice (Vicenic 2010)

Another two methods that Georgian morphology selects consonant clusters to the left is epenthesis or shortening to a sonorant consonant, {[mindori] to [mindvris] ‘field’ ø [xoxobi] to [xoxbis] ‘pheasant’} (Butshkrikidze 2002) on the other hand we have treatment of the loanword lotus as a nominative name, {[lotus] to [lotusi] ლოტუსი} with the /u/ resisting deletion against a case suffix and /i/ attaching.

This [i] is a very productive morpheme for place-names like Tbilisi, Kutaisi and the ethnonym, Sakartaveli. The plurals infixes -eb- has been fixed in at a lower level than the nominative [i] that's used for place and company names /lotusebi/ 'lotuses'. Morphemes seem to fix in almost any possible way but it's just a Georgian set of rules.

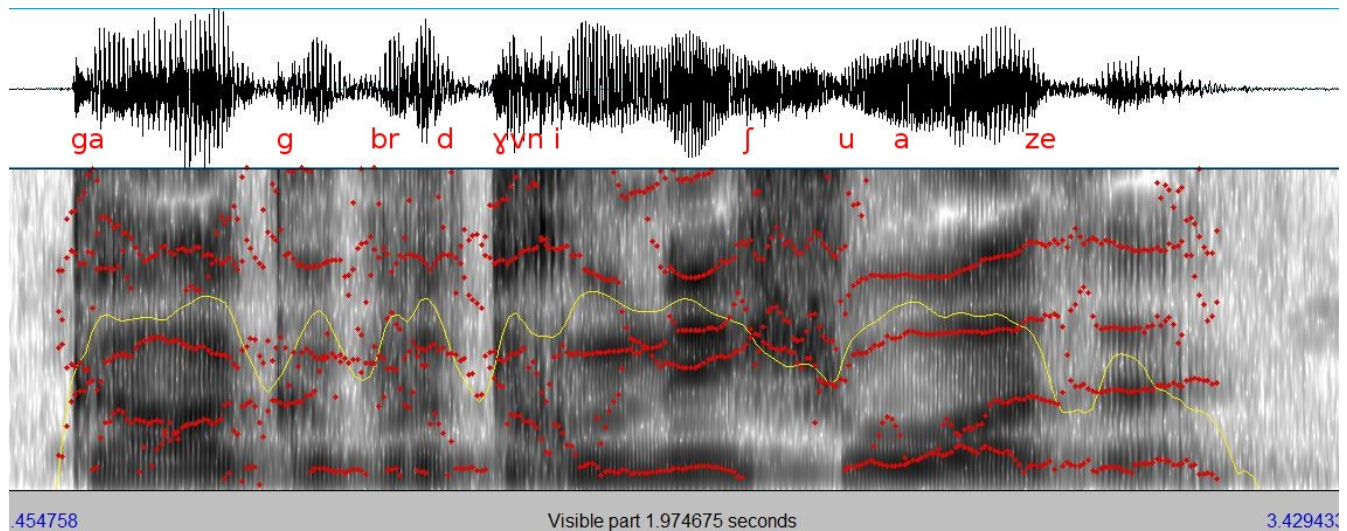
Verbs are nearly always circumfixed in a rowed system called screeves. A screeve is a set of morpheme like [m], [g] and [h], which fix around the verb stem. Infixing creates new syllabic constituencies. It generates syllables and stress, and although all the vowels are building least two

inflectional morphemes, /u/ is rarely used and never used in CVCV save for the word /dzudzu/ 'breast' (Robins 1952). Screeves are for tense, aspect, mood and though they're not stressed, they're sensitive to change their affix if the word final morpheme is a vowel or a consonant.

4. Stress and phrasing

We looked at how vowel morphemes delete vowels when they change case and we looked at a word with a particularly dense consonant cluster /gvrbrdyvnis/. Let's now look at a differently inflected form of the same word, with a new form and most of the same morphemes.

(Figure 6) /gagbrdyvni shuaze/



Georgian is an agglutinate language a syllable-timed language. We've been looking at some very extreme and marginal words to exemplify what a word *can* do in terms of morpheme building, clustering and coarticulation. Lexical stems are simpler, often CVCV, CCV and nouns commonly are CVC[i] or CVC[a] like the ablative inflected [k'ats^ha] 'There is a man'. Man and woman, nominative /k'ats^hi kali/ (figs 3 & 4) decline and change word final morphemes, usually vowels. Verbs often end in [i] or the epenthized [ia] which may be the phone breakdown for both [ia] and [ea]. In very inflected words, VV is possible word initially with vowel reduplication as a phonemic morpheme, /aafɛnebt/ 'You will build', and /afɛnebt/ 'You build'. Although the former has four syllables and the latter has three /aaf The prior word initial vowel must be longer or re pronounced. Vowels are only adjacent at morpheme boundaries.

Noun declension pluralizes /k'atsi kali/ 'man and woman' (figures 3 & 4), to k'atsebi kalebi/ with the infix -eb- but the stress stays on the first syllable. This has an effect on how Georgian is timed. "The minimal word is disyllabic," (Butskhrikidze 2002 pg 142). The hard rules mostly attract word stress to the first syllable and it's never the on the ultima (Jun 2007).

5. Conclusion

We don't know if a word stem front pulls stress strong enough to induce vowel fronting. We also don't know how a word takes and loses morphemes. We know coarticulation negotiates morpheme boundaries and that a lot is possible where a word has two syllables, one is said with a higher pitch than the other, "unstressed syllables tend to descend in pitch toward the end of the word." (Robins & Waterson 1952)

If defined broadly, we can say that not only verb screeves infix and circumfixes coordinante a wide

range of of pressurized, and articulatory points on a prosodic mapping that includes, morpheme, word and phrase. Georgians letters were designed according to Greek order of alphabet. They go in the same order and Georgian kids have been learning learn ani, bani, gani, doni, eni, vini, zini, since they heard it from the Ancient Greeks. Their second capitol Kutaisi is where Jason stole the golden Fleece from, and he sailed all the way back to Lubljana on the Danube. Georgian people are also a bit like the Welsh. In the late colonial era that we find ourself, the proud Transcaucasian garden of old languages, an all singing polyphony of thousands of years of voices, has subtle grandure of an ancient culture with a superb mapping of phonological variety and articulatory range that first and foremost, works as a perfectly functioning language.

I'd like to thank Shoto for providing his creaky voice to the researchers.

Bibliography

Borise L, Zientarski X. Word Stress and Phrase Accent in Georgian. *Proceedings of Tonal Aspects of Languages (TAL) 6*. 2018

Butskhrikidze, Marika. The Consonant Phonotactics of Modern Georgian door Marika Butskhrikidze. *LOT* lotpublications.nl/Documents/63_fulltext.pdf Proefschrift. 2002

Butskhrikidze, Marika. R Drop in Modern Georgian. *Elsevier Lingua* <https://doi.org/10.1016/j.lingua> 2017

Clark, J E, Colin Yallop & Janet Fletcher. An Introduction to Phonetics and Phonology. *Oxford: Blackwell*. 2006 Print

Grawunder, Sven, Adrian P. Simpson, & Madzhid Khalilov. Phonetic characteristics of ejectives– samples from Caucasian languages. *Turbulent sounds: An interdisciplinary guide: 209-244*. (2010)

Jun, Sun-Al, Chad Vicenick & Ingvar Lofstedt. Intonational Phonology of Georgian. *UCLA Working Papers in Phonetics No. 106 pg 41-57*. 2007

Robins, R., & Waterson, N. (1952). Notes on the Phonetics of the Georgian Word. *Bulletin of the School of Oriental and African Studies*,14(1), 55-72. doi:10.1017/S0041977X00084196

Vicenik, Chad. “An Acoustic Study of Georgian Stop Consonants.” *Journal of the International Phonetic Association*, vol. 40, no. 1, 2010, pp. 59–92. JSTOR, www.jstor.org/stable/44527003.

Vowel Formant charts on University of Manitoba's website
<https://home.cc.umanitoba.ca/~krussll/phonetics/acoustic/formants.html>