

Does Armenian have glottalized IOR ejective stops?

Bert Vaux

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Today's plan

- the great Proto-Indo-European debate and the relevance of putative glottalized/ejective stops (T') in Armenian
- the what/when/where of Armenian T'
- why T'? arguments for the T series being glottalic
- instrumental studies of the T(') series
- where can/should we go from here?

two reconstructions of Proto-Indo-European

“Standard Theory” (Mayrhofer 1986)

series 1	series 2	series 3
*T	*D	*Dh

“Glottalic Theory” à la Kortlandt 2012

series 1	series 2	series 3
*T	*T'	*D(h)

does Armenian support one or the other?

“Standard Theory” (Mayrhofer 1986)

PIE	series 1	series 2	series 3
	*T	*D	*Dh
	↓	↓	↓

standard transcriptions of Armenian

	series 1	series 2	series 3
Sivas	Th	D	Dh
Erevan	Th	T	Dh

we leave this (only apparent) parallel for another day.

“Glottalic Theory” à la Kortlandt 2012

	series 1	series 2	series 3
	*T	*T'	*D(h)
	↓	↓	↓

Armenian according to Sievers et seqq.

	series 1	series 2	series 3	
	Th	D	T'	Janik
	Th	T'	Dh	Erevan
	Th	T'	D	Tiflis

if true, this might provide striking support for the Glottalic Theory.

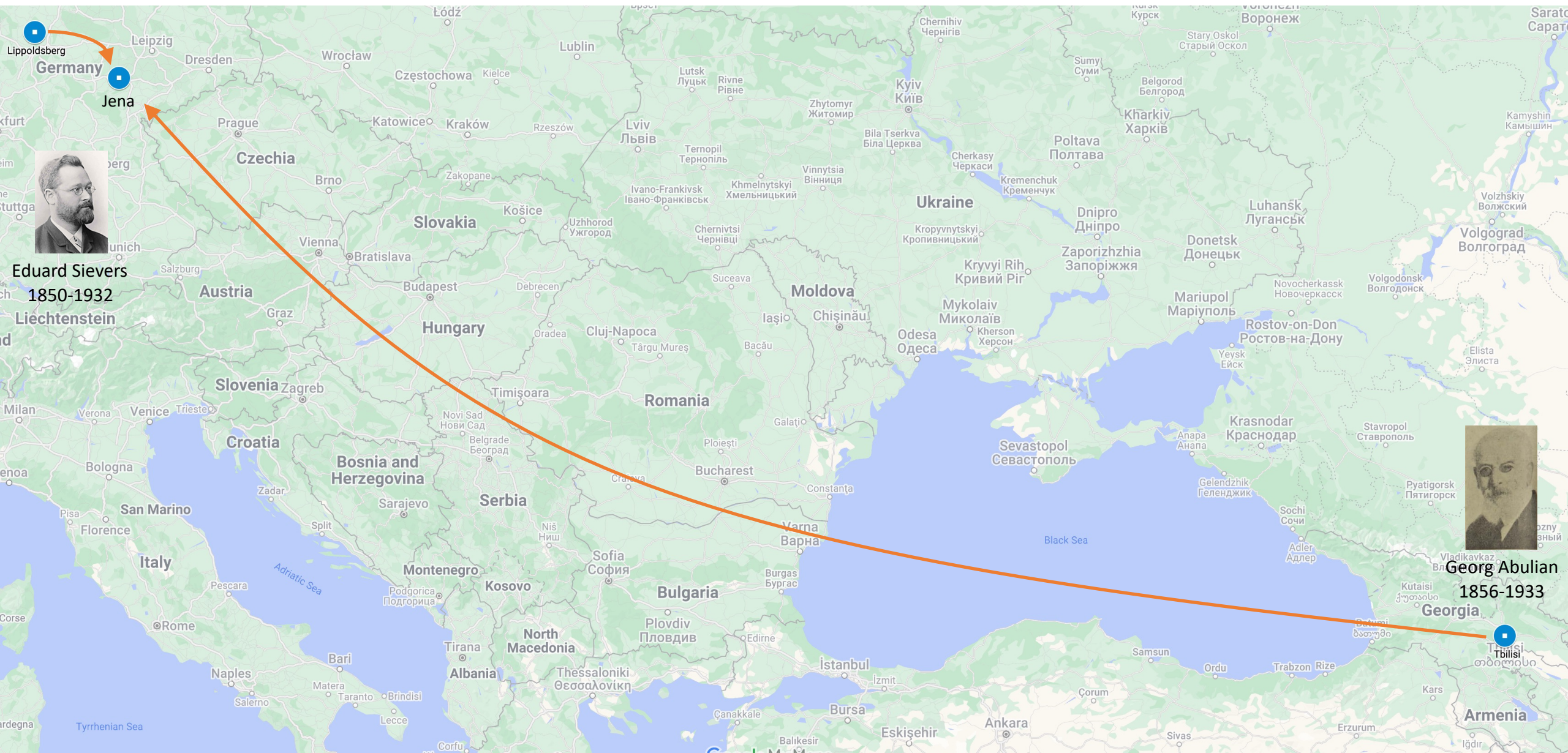
the empirical crux of the mystery: is this t
glottalized/ejective?



<tun> 'you.sg'

the what/when/where of T'

our starting point: Sievers and Abulian, 1876



Sievers apud Hübschmann 1876:55-56

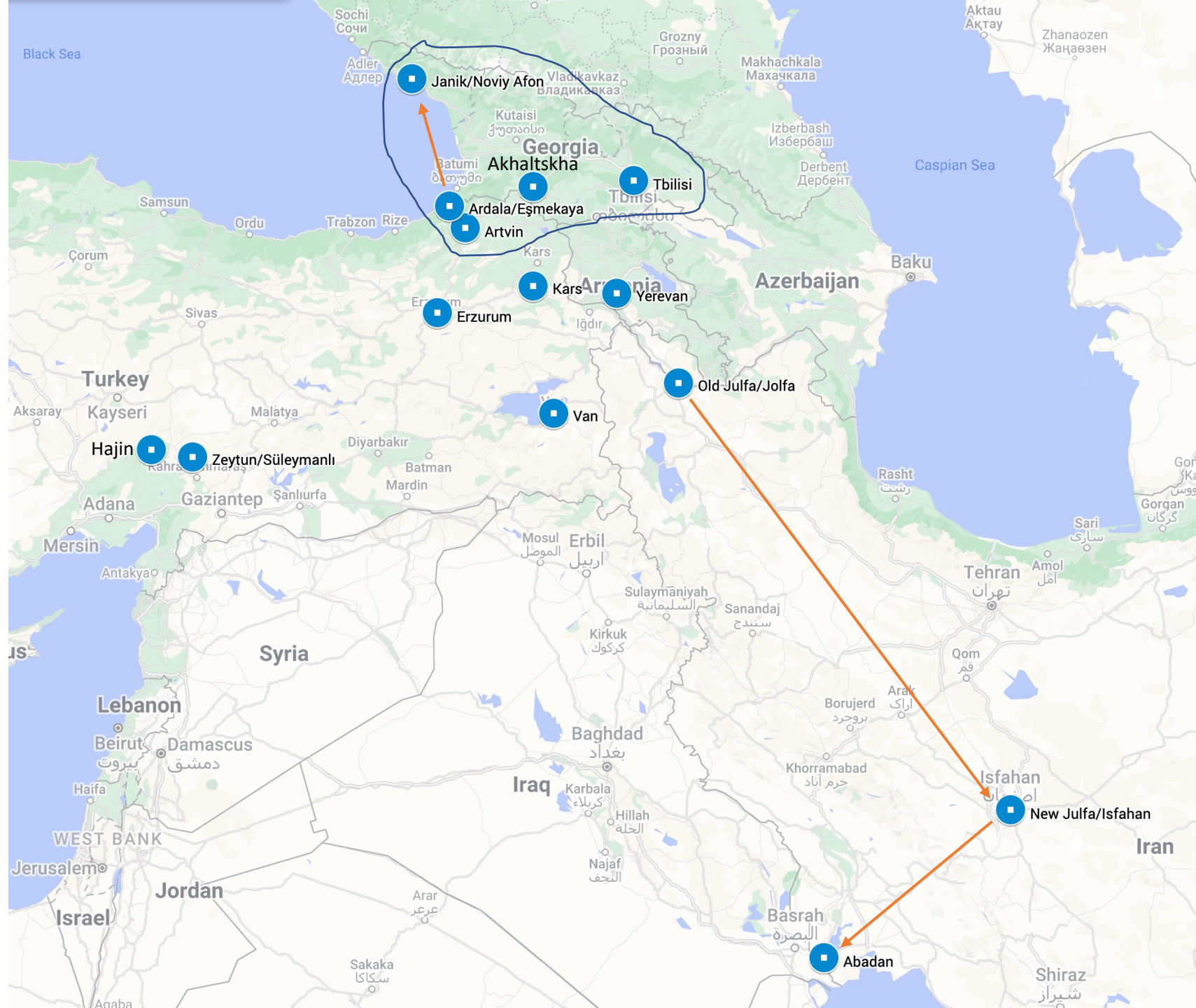
- Hübschmann asked Sievers to describe the articulation of the Armenian T series for his article on the transcription of Classical Armenian. Sievers:
 - “The tenues differ from the usual European ones in that they are actually spoken with a larynx seal. The larynx rises quite considerably each time, 1/2-3/4 of an inch, for the sake of the burst. The acoustic effect is then significantly different than the European (Slavic, Romance, etc.) unaspirated tenues (which are not formed with larynx closure): the burst itself, as a kind of scratching noise, is often much more clearly separated from the following vowel than in the European, so that one sometimes has a formal pause between consonant and vowel.”
- but in an 1896 letter to Schuchardt he says about Georgian ejectives:
 - “the throat burst is clearly separated from and follows the mouth burst (in contrast to the simultaneous burst of the two closures in Tbilisi Armenian)”
- problem: unreliability of auditory inference of glottal closure (Harris 1999:2041)

what is this putative T' exactly?

- Seyfarth and Garellek 2018: “glottalization [in Armenian] has referred to:
 - glottal constriction with a pulmonic airstream mechanism
 - Pisowicz 1997
 - ejective articulation with a glottalic airstream mechanism
 - Allen 1950, Ladefoged and Maddieson 1996:67; Baronian 2017, Pisowicz 1998.”
- after Sievers, many other Armenian varieties were claimed (normally without phonetic evidence) to have a T' series:...

dialects claimed to have T' series

circle encloses dialects in contact with speakers of Caucasian languages with ejectives (Abkhaz, Georgian, Laz, Mingrelian)



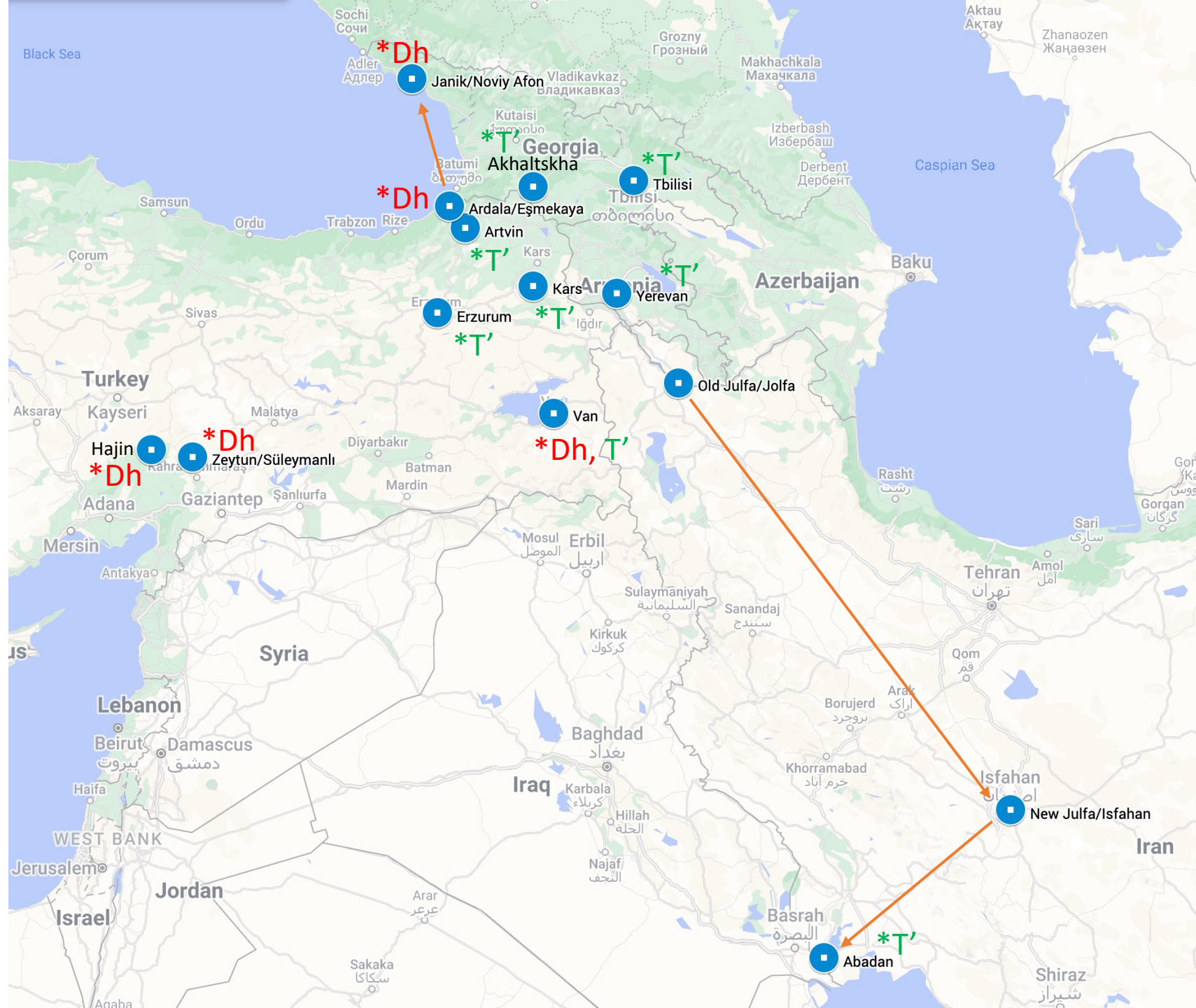
why T'?

arguments for the unaspirated voiceless series being glottalized/ejective

Arguments for Armenian <T> being glottalized

- non-phonetic:
 - treatment of Russian loans, e.g. R печь peč' 'oven' : A p^hetʃ^h (Pisowicz 1976)
 - dialects outside of Caucasus having T' (Pisowicz 1976, Kortlandt)
 - avoidance of exchange rule D ↔ T in Group 4 dialects (Kortlandt)
- phonetic:
 - ear evidence
 - Sievers 1876; Tomson 1887, 1890; Adjarian 1911; Allen 1950; Pisowicz 1976...
 - eye evidence
 - Sievers 1876
 - instrumental evidence:...

IE source of
(putative) T'



Russian loans

- pech 'oven' < Azeri peç [p^hetʃ^h] (Khachatryan and xx 1977)
- loans directly from Russian into Armenian regularly have ptk > ptk, e.g. R. potolók 'ceiling, upper limit' > Arm. [patalok]

“evidence” for Van, Erevan having T’

- Pisowicz

does closed glottis entail glottalized/ejective?

- Grammont 1933
- Harris 1999

instrumental phonetic studies of T'

Schirru 2012

	voiced H2–H1	voiceless H2–H1	voiced A1–H1	voiceless A1–H1	voiced A3–H1	voiceless A3–H1
speaker 1	4.5	5.2	11.8	18.3	–9.3	–1.7
speaker 2	3.9	5.8	8.2	18.7	–12.1	1.2
speaker 3	1.6	3.2	5.9	12.9	–21.1	–5.2
speaker 4	1.9	6.2	10.6	18.1	–20.8	–16.2
speaker 5	–1.5	3.4	2.4	8	–28.2	–15.9
mean	2.2	4.8	7.9	15.4	–18	–7.3
<i>p</i> -value	0.00007		0.0000003		0.00003	

TABLE 3 Erevan; average spectral tilt values in voiced and plain voiceless stops (5 speakers, 6 minimal pairs).

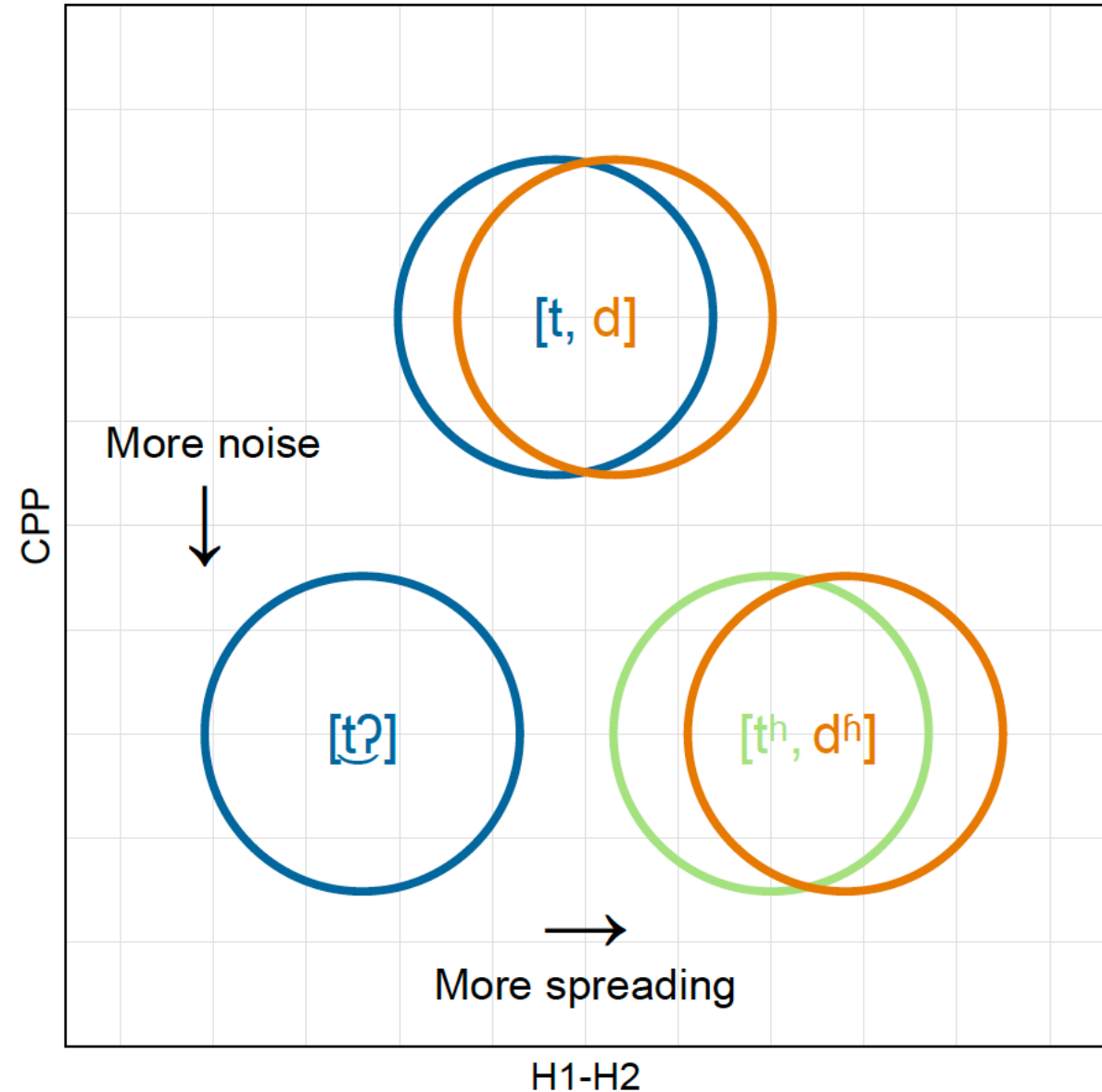
- methods:
 - 5 speakers from Erevan, 225 T tokens of initial <D T Th>
 - spectral tilt: H2-H1, A1-H1, A3-H1
- findings wrt glottalization/ejectivity:
 - ≤ 4 ejective tokens having acoustic correlate of a double release (glottal and oral)
 - he takes spectral tilt diffs between <T> and <D> to indicate stiff vs slack voice quality
- problems:
 - author's assessment of ejectivity is impressionistic rather than instrumental (cf. Allen 1950)
 - spectral tilt alone cannot be used to determine the absolute degree of glottal constriction. Because the <D> series is likely breathy and thus has higher spectral tilt than if it were modal-voiced, the finding that voiceless T has lower spectral tilt is consistent with both a modal (neither glottalized nor breathy) or a glottalized T series (Seyfarth and Garellek 2018).

Seyfarth and Garellek 2018

- assumption:
 - “for glottalized plosives, the voice quality of adjacent vowels is creakier *when the glottal constriction gesture associated with the closure overlaps with adjacent sounds*, which makes glottal constriction perceptible near an otherwise-silent closure”
- methods:
 - 8 speakers from Erevan, 111 TVC words each
 - spectral tilt: H1–H2 (the difference between the amplitudes of the first two harmonics of the spectrum)
 - cepstral peak prominence (CPP), a measure of harmonics-to-noise which correlates with both aspiration noise and vocal fold irregularity
 - f0 onset: to check for “tense voice”
- reasoning:...

S&G's reasoning

“If voiceless T involves glottal constriction ($[\text{t}ʔ]$; or as an ejective $[\text{t}']$), this would be indexed by lower H1–H2 than both D^h and T^h , but with a similarly low CPP because of irregular voicing.”



S&G's findings

- The voiceless unaspirated plosives are modal for six speakers and tense for two.
- Speakers F18, F19, F20, F21, F22, and F49—“no acoustic evidence of glottal constriction”:
 - highest CPP values for the voiceless series
 - H1*–H2* falls from the vowel onset and levels off as it reaches the vowel midpoint
 - no glottalized onsets (defined as the presence of irregular pitch periods in the waveform) identified during manual inspection of the voiceless plosive waveforms.
- speakers M25 and M30—“consistent with tense voice (but not ejectives)”:
 - similar CPP values for all three series
 - T has lower H1*–H2* than Dh and Th
 - “H1*–H2* and CPP values that were **consistent with** glottalization for the voiceless unaspirated series”
 - “there is evidence that the T series involves tense voice, a specific subtype of creaky voicing characterized by its **increased** vocal fold constriction (like prototypical creaky voice) but also higher f0.”
- NB male-female divide (but S&G say nothing should be inferred from this)

S&G note for future research

- “Although voice quality is difficult to perceive or to measure directly during an oral stop closure—and impossible during a voiceless one—future instrumental work might explore the timing and degree of glottal constriction via articulatory glottography during the closure interval.”

Toparlak 2022

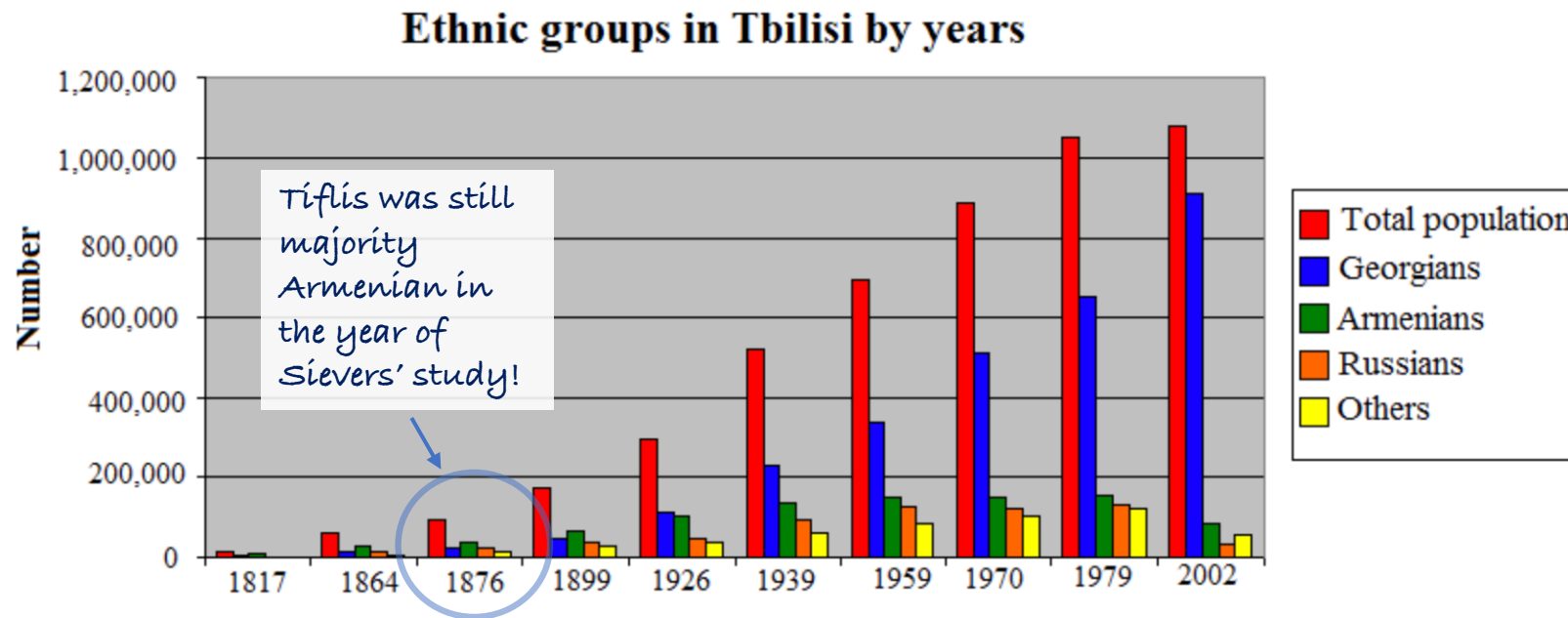
- method:
 - electroglottography (EGG) to visualize the contacts of the vocal folds
 - intraoral pressure and oral airflow using “a portable machine EVA2”
 - 3 speakers, 397 tokens in initial/medial/final position for <D T Th>
- findings:
 - some speakers produce final T as ejective
 - though stops in initial, medial, and final position were studied, no data for intraoral pressure or EGG data were presented for initial position

where should we go from here?

Armenians in Tiflis	Erevan
1873-76	37,610 11,938
2011-14	53,409 1mill.

Tiflis (Tbilisi)

- the main dialect agreed to have had Caucasian-style glottalization is Tiflis.
- unfortunately this dialect now appears to be dead. 🙄



Armenia in 1873:
329,266 Armenians
132,125 Azeris

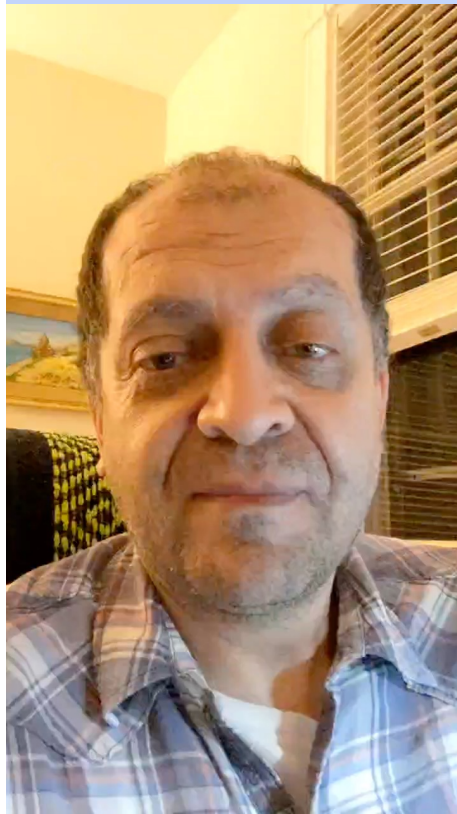
Armenia in 2011:
3mill Armenians
0 Azeris

- but some armenologists believe that its pronunciation features (rather than those of Erevan) became part of Standard Eastern Armenian, including glottalization (Schirru 2012), so S&G's study may be relevant.

Investigating glottalization in Janik

- “Dzhanik has a ternary system of stops and affricates: voiced, voiceless aspirated and voiceless unaspirated. The latter sounds are tense, and when put under emphasis (e.g., when a speaker is asked to repeat himself), they are pronounced with what sounds as weak glottalization, though it is not quite clear whether glottal (ejective) coarticulation is involved, e.g. [tʃʔehez] ‘bride’s dowry’, [tʃʔũn] ‘thou’, [pʃʔerimɣu] ‘I (shall) bring hither’” (58-9)

Hamshen Armenians in Abkhazia



Chirikba's versions:

[tʰehez] 'bride's dowry' 🔊

[tʰün] 'thou' 🔊

[pʰerimgu] 🔊

Conclusions

- Once we clear away the cacophony of indirect reports, problematic interpretations of non-phonetic facts, and impressionistic observations, there turn out to be only three instrumental phonetic studies of the Armenian T(') series with regard to the glottalization question, only two of which are directly relevant to our question and sufficiently explicit to be usable.
- Both are acoustic rather than articulatory, and limited to Erevan.
- Neither finds clear and compelling evidence for the T series being glottalized or ejective.
- How can we build on this?
 - articulatory evidence (laryngoscope (ouch)? EGG (inferential)?)
 - more dialects claimed to have T', ideally controlling for external influences (diasporic situation in glottalic or non-glottalic milieu, age, gender, education...)

References

- Mayrhofer, Manfred. 1986. Lautlehre (Segmentale Phonologie des Indogermanischen). Indogermanische Grammatik, ed. by Jerzy Kuryłowicz and Manfred Mayrhofer, vol. 1:73-181. Heidelberg: Winter.