A Case of “Elsewhere Reversal” in Iranian Armenian Verbs

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Outline

Description of the Change

- Armenian varieties
- Armenian verbal morphology
- The “Elsewhere Reversal”

Accounting for the Change

- Indirect facilitation by a phonological change
- Support from Armenian variety typology
- A quantitative acquisition-based analysis

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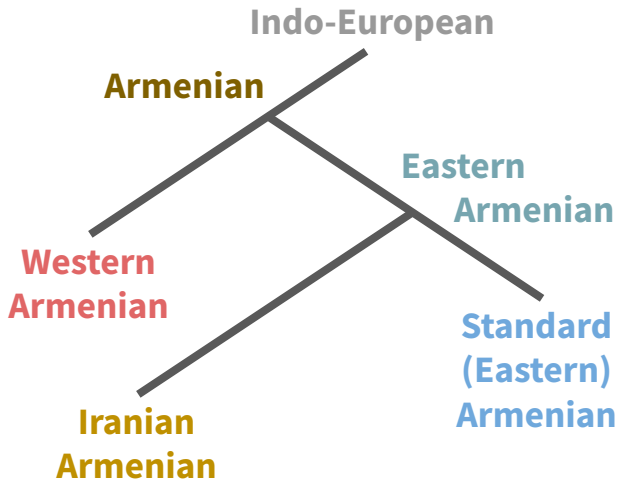
- A branch of Indo-European spoken indigenously in the southern Caucasus and eastern Anatolia
- A large diaspora in former Ottoman, Soviet, and Persian territories as well as the USA
- Two primary branches: Western and Eastern
- Our focus is Tehrani Iranian Armenian spoken in Tehran and Los Angeles Eastern, similar to Standard Armenian



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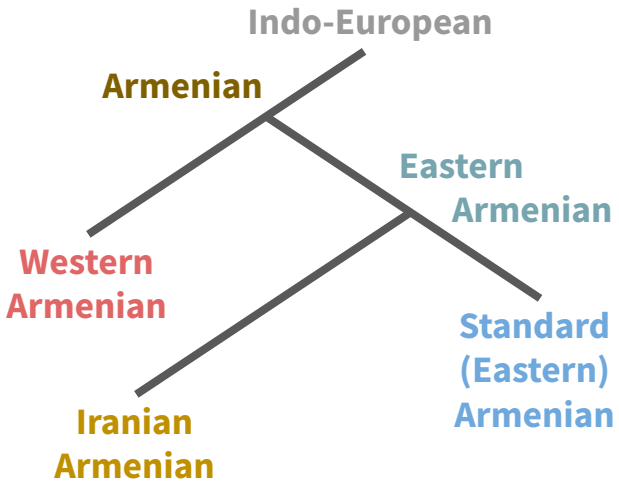

Standard Eastern Armenian is conservative in the relevant paradigm, so we use it as a proxy for pre-modern Iranian Armenian

Armenian Verbs

- Distinguishes perfectivity in the past tense
- Two inflectional classes by theme vowel: A-Class, E-Class. E-Class is the largest

Standard

Form	A-Class *read*	E-Class *sing*
INF	*kardal*	*ergel*
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	Vocab Items for Perfect
ASP[PFV] T[PST] ↔	*-Ø-a-* / LIST___
	-c'-i- / ELSEWHERE
ASP[IPFV]T[PST] ↔	*-Ø-i-*

An Iranian Innovation

- Regular E-Class perfects have an ending *-a-* instead of *-ec'i-*
- They pattern like the E-Class irregulars of conservative varieties

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A case of analogical extension

A morphological pattern has spread from a smaller irregular class to a larger regular class!

An ‘Elsewhere Reversal’

The conditioned and default realizations seem to have flip-flopped!

- *-c’-i-* was the default, now it’s limited to A-Class
- *-Ø-a-* was limited to irregulars, now it’s the default

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ASP[PFV] T[PST] ↔	*-c’-i-* / TH[=*a*]____
	-Ø-a- / ELSEWHERE

Two Additional Observations

Some regular E-Class verbs already had -*a*- perfects

- Observed in Western as well as Eastern Armenian
- They coexist with -*ec'i*- perfects (sometimes only in the 3rd person singular)
- Tend to be high-frequency verbs ('*do*,' '*bring*,' '*give*,' '*say*,'...)

Outside of Iranian Armenian, -*a*- perfects are more common in

- Intransitive verbs[1]
- Verbs with monosyllabic roots

[1] Martirosyan 2009

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There are actually two changes here…

1. **A Phonological Change**
   Hiatus glide insertion > Deletion
   Conservative > Iranian
   /ei/ > [eji] /ei/ >[i]

2. **A Morphological Change**
   The perfect Elsewhere Reversal
   Conservative → Iranian
   -ec'i- ***-a-***

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Proposal: Indirect Causation

1. **The phono change made a novel alternative morpho generalization available to learners**
2. **A speaker adopting this novel generalization could spread *-a-* to regular E-Class verbs via normal over-regularization**

Two Options after the Phonological Change

Conservative Generalization

- ASP[PFV] ↔ ∅ / LIST___
  ASP[PFV] ↔ *-c'-*
- ASP[IPFV] ↔ ∅
- T[PST] ↔ *-a-* / LIST___
  T[PST] ↔ *-i-*

Predicts *ergec'in*

Innovative Generalization

- ASP[PFV] ↔ *-c'-* / TH[=a]___
  ASP[PFV] ↔ ∅
- ASP[IPFV] ↔ ∅
- T[PST] ↔ *-a-* / √-ASP[PFV]___
  T[PST] ↔ *-i-*

Predicts *ergan*

There are many ways to implement this. The idea is:
When there is no (overt) TH, perfect = *-a-*, imperfect = *-i-*.

Pre-Iranian

Form	A-Class *read*	E-Class *sing*	Irreg. *eat*
INF	*kardal*	*ergel*	*utel*
PST.PFV.3PL	*kardac'in*	*erg-?-n*	*keran*
PST.IPFV.3PL	*kardain*	*ergin*	*utin*

Predictions

If the phonological change set up the Elsewhere Reversal, then

- **A-Class should retain -*ac'i*- perfects because its imperfect retains [aji]**
- **If an Armenian variety has the Elsewhere Reversal, it must also have /ei/>[i]**
- **If an Armenian variety has /ei/>[i], it may or may not have have the reversal**

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Imperfect	Perfect	# of Varieties Surveyed
-ein	*-ec'in*	(Standard Eastern)
-in	*-ec'in*	10
-in	*-(ec')in*	3
-in	*-an*	1 (Tehrani Iranian)
-ein	*-an or -in*	unattested

Innovation

✔ /ei/ > [eji], no reversal

✔ /ei/ > [i], no reversal

✔ /ei/ > [i], optional reversal

✔ /ei/ > [i], complete reversal

✘ /ei/ > [eji], reversal

The Actuation Problem

Under what conditions was the novel grammar innovated?

- **The Actuation Problem.**[1] **We can never know exactly for sure**
  …But we can approach a solution asymptotically

[1] Weinreich, Labov, & Herzog 1968

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Helps to have a precise definition of actuation[2]…

Actuation = Innovation + uptake into the speech community

(The hand-off from an individual-level process to a population-level one)

[1] Weinreich, Labov, & Herzog 1968, [2] Labov, Yaeger, & Steiner 1972

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…And a model of innovation

Adopting a learning model provides insight into under what conditions the novel Iranian Armenian grammar could have been learned

[1] Weinreich, Labov, & Herzog 1968, [1] Labov, Yaeger, & Steiner 1972

The Tolerance Principle (Yang 2016)

- A concrete model for the acquisition of linguistic generalization
- An evaluation metric over linguistic hypotheses
- Developed in the context of the Past Tense Debate
  But has since been applied across levels of the grammar

Serves as our innovation model

- The TP provides a model for learner over-regularization
- Over-regularization is the individual-level analogue to diachronic analogy

The Tolerance Principle (Yang 2016)

How many exceptions is “too many” exceptions?

Given a hypothesized generalization operating over some class, quantitatively define the number of exceptions below which the generalization is tenable

N = number of types that should obey the generalization

e = number of types that do not obey the generalization

θ = max # of exceptions that can be tolerated

Exceptions are tolerable if

$$e < \theta$$

$$\theta = N / \ln N$$

N and *e* Vary over Individual Development

- *N* and *e* are properties of each individual
- *N* is the number of class members a child has learned so far
- *N* and *e* grow as the learner's vocabulary grows

Can learn generalizations over small *N* not possible over large *N*

Visualization of the Tolerance Principle

N = types it should apply to
e = types that are exceptions
θ = tolerance threshold

e falls in [0, *N*] and may be less than or greater than *θ*

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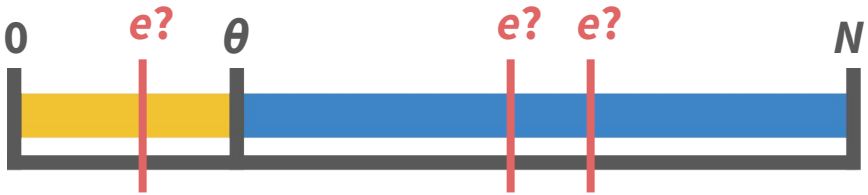

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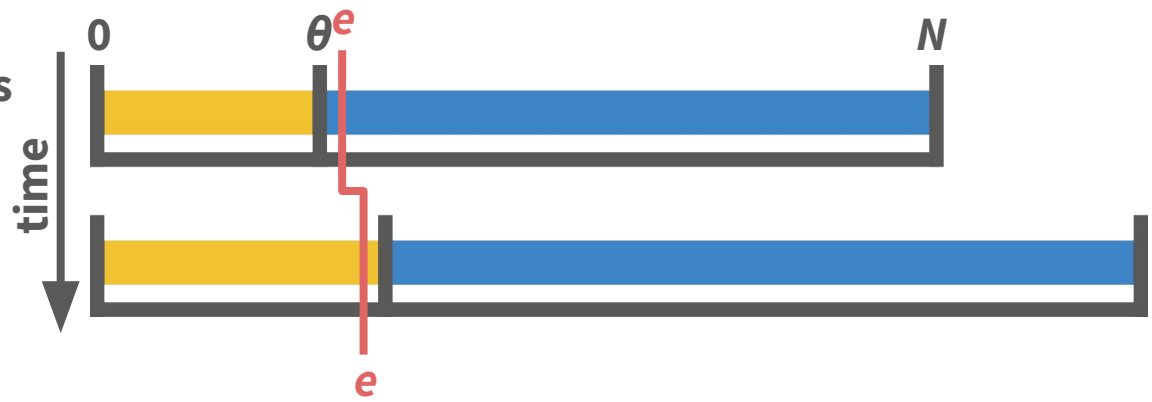

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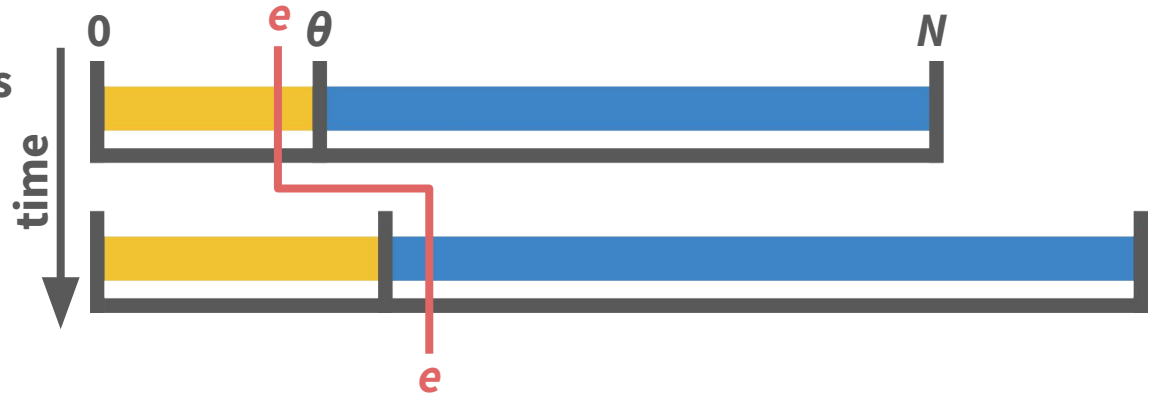

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- If *e* grows faster than *θ*, a pattern may fall out of productivity

Acquisition in the Past

- **Children in the past must have acquired language in the same way that modern children do**
  a straightforward application of uniformitarianism[1]
- **We can reason about acquisition in the past in the same way we do now**

[1] Labov 1972 as applied to linguistics, Walkden 2019

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Can non-child-directed speech corpora be substituted for child-directed speech to study the relevant problem?

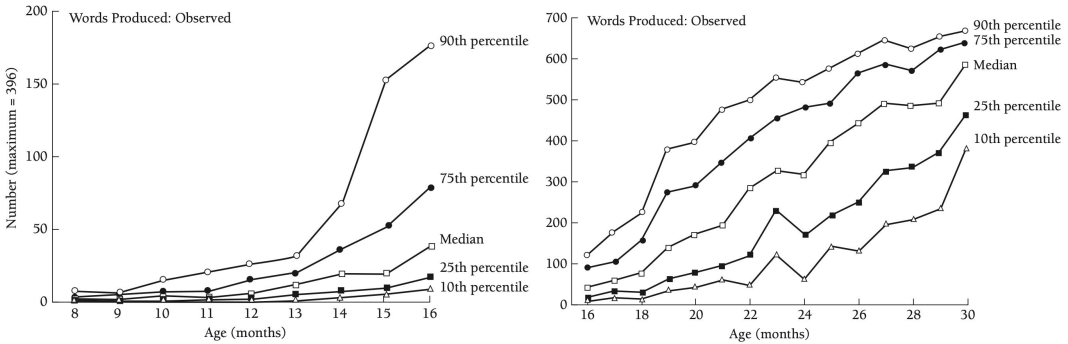
Yes, for the purposes of lexical acquisition[2]

[1] Labov 1972 as applied to linguistics, Walkden 2019, [2] Kodner 2019

Child Lexical Knowledge

- Learners' vocabularies grow over the course of development
- There is significant individual variation, but consistent trends[1]
- **Only on the order of 10^2** for English and German learners by around age 3
- Observed across many languages,[3] **≤ half of these are verbs[3]**
- Children have the foundations for language-specific grammars by this point

Language	Estimated |Vocab|
English 2;10-3;0[1]	525-1,116
German 2;6[4]	$\mu = 429, \sigma > 100$



[1] Fenson et al 1994, Hart & Risley 2003, [2] Hart & Risley 2003, [3] Bornstein et al 2004, [4] Szagun et al 2006, Plots from Fenson et al 1994

Methodology

Estimate learner vocabularies in increasing increments

- Verbs extracted/annotated from an Eastern Armenian frequency dictionary[1]
- Vocabularies estimated by taking the top *V* for *V*=50, 60,...,100, 200,..., 600

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Explore feasible incrementation pathways

- What novel generalizations (if any) can be tolerated at each *V* size?
- These are **feasible incrementation pathways** for the Elsewhere Reversal as new cohorts successively extend over-generalizations

[1] Ղազարյան 1982

Data Summary (Std East)

- E-Class accounts for most verbs
- Irregular, monosyllabic, and intrans. constitute large subsets of E-Class

V	E-Class All	Std E *-a-*	E-Class Irreg	E-Class 1σ	E-Class Intrans
50	33	8	15	26	10
60	41	10	17	32	11
70	47	10	18	36	16
80	56	12	23	42	20
90	63	12	24	46	23
100	72	12	28	49	28
200	161	13	54	106	64
300	243	16	79	144	97
400	332	17	112	176	144
500	416	17	143	217	189
600	508	19	175	250	229

Data Summary (Std East)

- E-Class accounts for most verbs
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We take irregular E-Class verbs with *-a-* perfects in Standard as the initial state (**blue column**) and ignore optional *-a-* verbs (conservative assumption)

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1. Initial Over-Generalization

Extend -*a*- immediately to all E-Class?

N **= |E-Class ⊂** ***V*****|** **e = |⊂ E-class with -*ec'i*- perfect in Standard|**

1. Initial Over-Generalization

Extend -*a*- immediately to all E-Class? Impossible.

N = |E-Class ⊂ ***V***| ***e*** = |⊂ E-class with -*ec'i*- perfect in Standard|

V	50	60	70	80	90	100	200	300
N (***e***)	33 (25)	41 (31)	47 (37)	56 (44)	63 (51)	72 (60)	161 (146)	…
Tolerable?	✘	✘	✘	✘	✘	✘	✘	✘

1. Initial Over-Generalization

Extend *-a-* immediately to all E-Class? Impossible.

$N = |\text{E-Class} \subset V|$ $e = |\subset$ E-class with *-ec'i-* perfect in Standard$|$

V	50	60	70	80	90	100	200	300
N (*e*)	33 (25)	41 (31)	47 (37)	56 (44)	63 (51)	72 (60)	161 (146)	…
Tolerable?	✘	✘	✘	✘	✘	✘	✘	✘

Extend *-a-* to all Irregular E-Class? Possible at $V < 100$

$N = |\text{Irreg E-Class} \subset V|$ $e = |\subset$ Irreg E-class with *-ec'i-* perfect in Standard$|$

V	50	60	70	80	90	100	200	300
N (*e*)	15 (7)	17 (7)	18 (8)	23 (11)	24 (12)	28 (16)	54 (39)	…
Tolerable?	✔	✔	✔	✔	*?*	✘	✘	✘

? = within 1 of θ

1. Initial Over-Generalization

Extend *-a-* immediately to all E-Class Intransitives? Only *V* < 70

N = |E-Class intrans ⊂ *V*| *e* = |⊂ E-class intrans with *-ec'i-* perf in Std|

V	50	60	70	80	90	100	200	300
N (*e*)	33 (25)	41 (31)	47 (37)	56 (44)	63 (51)	72 (60)	161 (146)	…
Tolerable?	?	✔	✘	✘	✘	✘	✘	✘

Extend *-a-* to all Irregular E-Class Intransitives? *V* < 200

N = |Irreg E-Class intrans ⊂ *V*| *e* = |⊂ Irreg E-class intrans with *-ec'i-* " " "|

V	50	60	70	80	90	100	200	300
N (*e*)	15 (7)	17 (7)	18 (8)	23 (11)	24 (12)	28 (16)	54 (39)	…
Tolerable?	✔	✔	✔	✔	✔	✔	✘	✘

2. If -*a*- Spread to all Irregular E-Class, then…

Further extend -*a*- to all E-Class Monosyllables? *V* < 70

V	50	60	70	80	90	100	200	300	400
N (*e*)	26 (12) ✔	32 (16) *?*	36 (20) ✘	42 (23) ✘	46 (26) ✘	49 (27) ✘	106 (64) ✘	144 (91) ✘	… ✘

Further extend -*a*- to all E-Class Intransitives? *V* < 200

V	50	60	70	80	90	100	200	300	400
N (*e*)	10 (5) ✔	11 (5) ✔	16 (9) *?*	20 (9) ✔	23 (11) ✔	28 (14) *?*	64 (30) ✘	97 (41) ✘	… ✘

Further extend -*a*- to all E-Class 1σ Intransitives? *V* < 400

V	50	60	70	80	90	100	200	300	400
N (*e*)	10 (5) ✔	11 (5) ✔	16 (9) *?*	20 (9) ✔	23 (11) ✔	23 (11) ✔	28 (14) *?*	28 (14) *?*	… ✘

3. If -*a*- Spread to all Irreg and 1σ E-Class, then…

Further extend -*a*- to all E-Class? *V* < 400

V	50	60	70	80	90	100	200	300	400
N (*e*)	33 (6) ✔	41 (8) ✔	47 (9) ✔	56 (10) ✔	63 (13) ✔	72 (17) ✔	161(42) ✔	243(72) ✔	… ✘

Further extend -*a*- to all E-Class Intransitives? All *V*

V	50	60	70	80	90	100	200	300	400
N (*e*)	10 (1) ✔	11 (1) ✔	16 (1) ✔	20 (1) ✔	23 (2) ✔	28 (2) ✔	64 (9) ✔	97 (15) ✔	… ✔

This process was repeated iteratively to uncover feasible incrementation pathways

Feasible Pathways for Analogical Extension

If V=100 is used as the min $|V|$ needed for incrementation:

- **Several pathways for incrementation to the Elsewhere Reversal**

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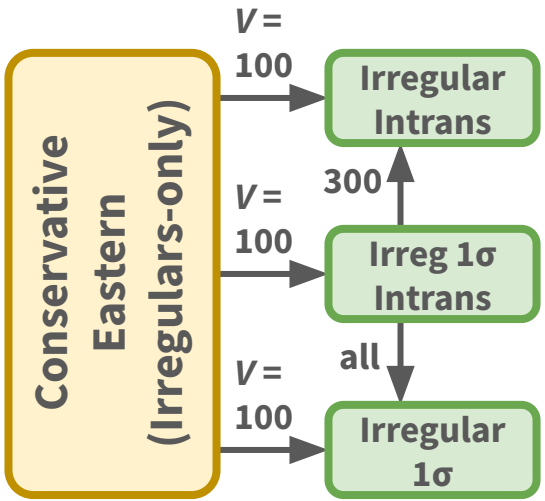

Attested Iranian (all E-Class)

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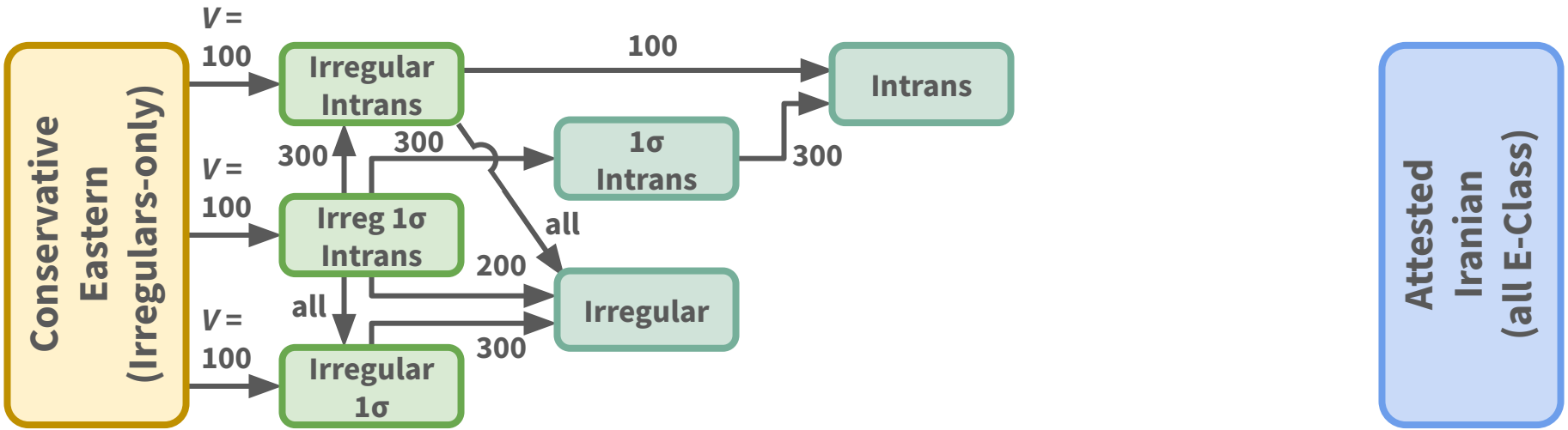
- **Several pathways for incrementation to the Elsewhere Reversal**



Feasible Pathways for Analogical Extension

If *V*=100 is used as the min |*V*| needed for incrementation:

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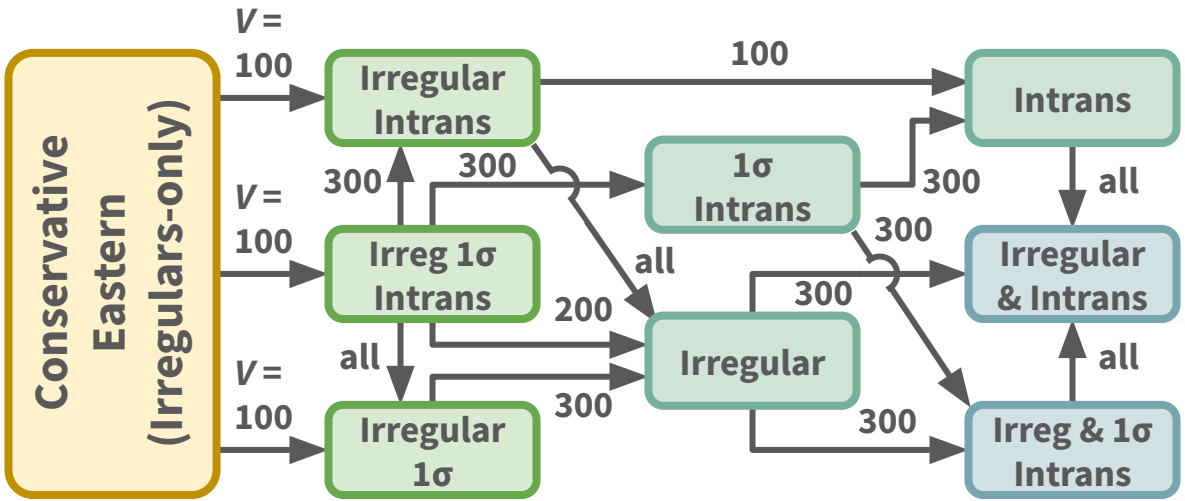
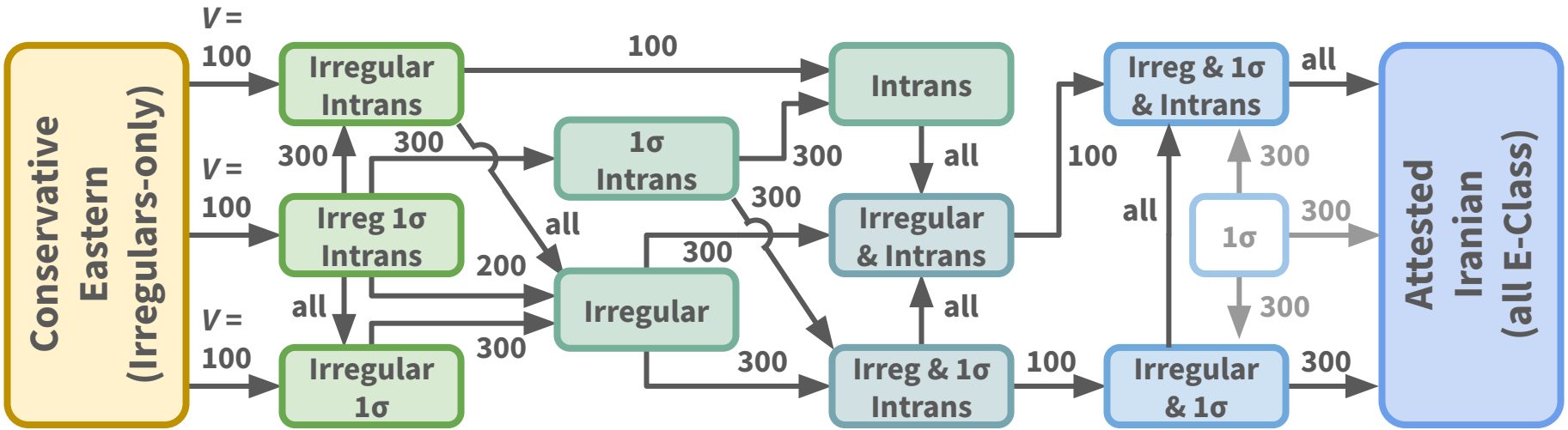


Attested Iranian (all E-Class)

Feasible Pathways for Analogical Extension

If V=100 is used as the min $|V|$ needed for incrementation:

- Several pathways for incrementation to the Elsewhere Reversal



Conclusions

Analogical Extension: Just Fortuitous Analogical Leveling

- **Analogical change is the population-level diachronic extension of individual learner over-generalization**
- **Leveling and extension share an identical mechanism**
  Extension is just quantitatively less likely to be actuated

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The Elsewhere Reversal: An epiphenomenon

- Elsewhere reversal is a description of the change based on a particular theoretical analysis, not a mechanism of change
- Similar ontological status to phonological rule reordering itself probably an epiphenomenon

Conclusions

Phonological Change: A Sufficient but not Necessary Condition

- **A phonological change is implicated in permitting this morphological change**
  But only indirectly, through learner innovation
- **Change is a contingent process. Acquisition and social factors come into play**
  This change did not *have to* happen just because it could happen
- **Sufficient but necessary condition is backed up by a typological survey**

Conclusions

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Precise Predictions: A Directed Search for Armenian Varieties

- The quantitative learning approach here makes precise predictions
- We now have a lead for what to look for in related Eastern Armenian varieties
  What did the grammars mean when they described "optional" *-c'*-?

The End.

Questions?

Thank You!

- PLC Organizing Committee and Reviewers
- UCLA Armenian Workshop Participants