Child Language Acquisition and a Mechanistic View of Language Change

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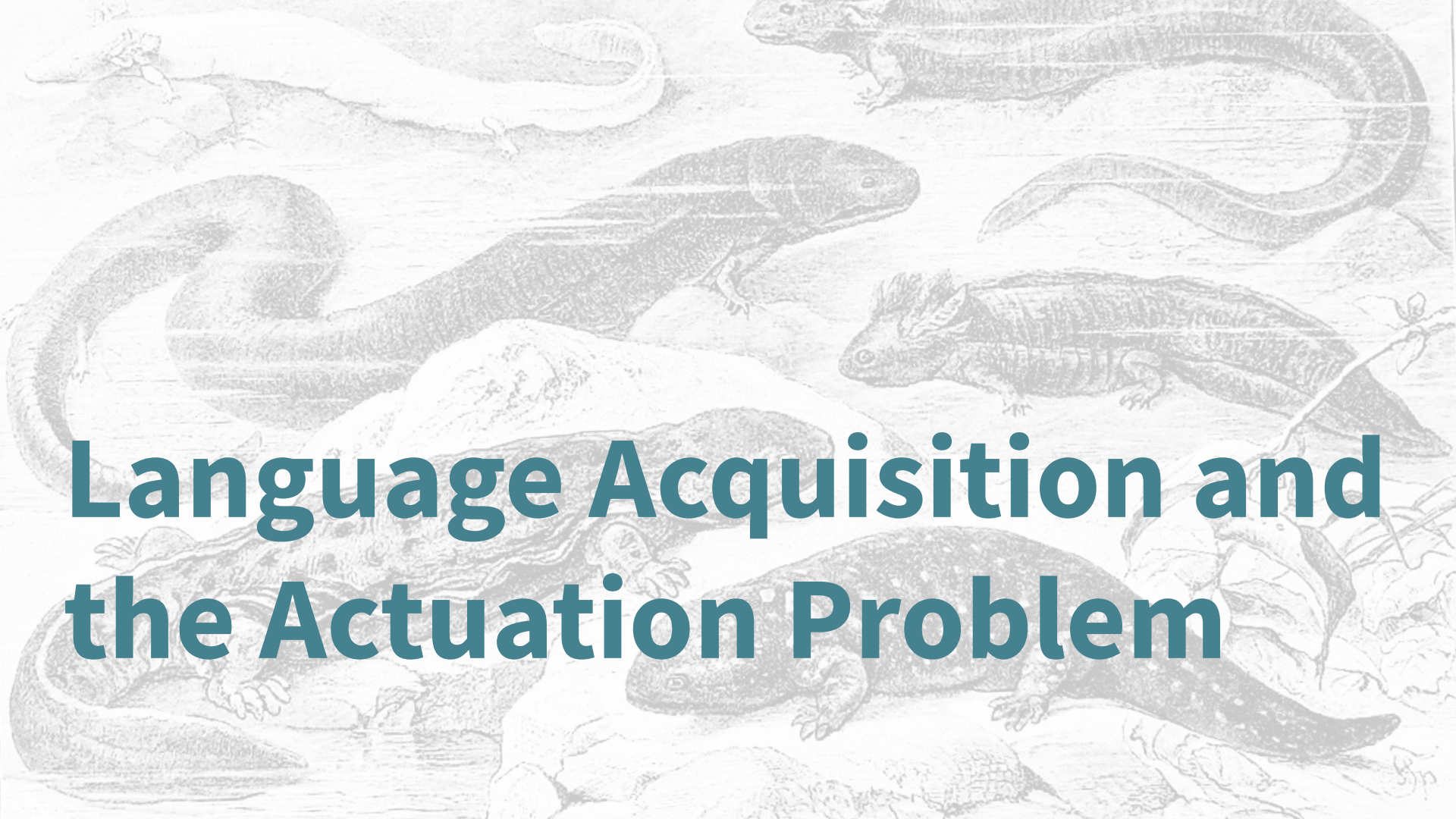
Outline

- Language Acquisition and the Actuation Problem
- Generalization Learning as a Specific Mechanism of Change
  Case Study: “Elsewhere Reversal” in Tehrani Armenian
- A Process-Centered View of Language Change



Language Acquisition and the Actuation Problem

Language Change by Language Acquisition

- First language acquisition is one of the primary drivers of language change[1]
- Plays a role in both innovation and propagation

The general idea

- Minor "errors" in acquisition accrue over successive generations
- This eventually yields population-level change, which may be dramatic

→ **Studying acquisition is a way to get at an understanding of the mechanisms of change (i.e., "Why and by what means does language change?")**

[1] Paul 1880, Sweet 1899, Halle 1962, Kiparsky 1965, Andersen 1973, Baron 1977, Lightfoot 1979 *et seq*, Labov 1989, Niyogi 1996 *et seq*, Kroch 2005, Yang 2002 *et seq*, Labov 2007, van Gelderen 2011, Cournane 2017, Kodner 2020, *inter multa alia*

Some Principles of Acquisition-Driven Change

“Language Change” and “Child Language Acquisition”

- Both are actually collections of distinct phenomena
- Certain aspects of acquisition drive certain types of change
- Many aspects of change are not driven by acquisition

→ Every claim, implicit or explicit, in the following format is wrong:
“Pretty much all language change accounted for by [my research focus]”

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Which changes are driven by some aspect of acquisition?

By what means does acquisition drive these change?

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Individuals vs Populations

- **Learning and the grammar(s) we acquire are crucially individual-level.**
  Can be studied as cognitive science
  i.e., a study of internal mental capacities, representations, and processes
- **Change is crucially population-level. Populations are subject to variation**
  i.e., structured heterogeneity,[1] studied under sociolinguistics

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The tension between individuals and change is fundamental to the study of language change,[1] biological evolution, and many other fields.

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Innovation vs Propagation

Two different sides of change that should not be conflated

Innovation - An Individual Phenomenon

- **Where/how/with whom does an innovative variant originate?**
- **Language acquisition, individual creativity…**
- **The moment of innovation rarely appears in the historical record**

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- Language acquisition, individual creativity…
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Propagation - A Population Phenomenon

- How/why/through whom does an innovative variant spread?
- Both through the population and through an individual's linguistic system
- This may appear in the historical record, especially later stages

To a Very Rough Approximation…

Processes of child language acquisition are more relevant for what I call “discrete” rather than “continuous” changes

Discrete Changes

Centered on actuation

- The kinds of changes generative theoreticians discuss
- Categorical properties of the grammar virtually fixed over individuals’ lifetimes[1]
- New or lost structures or constructions

[1] Andersson 1995, Sankoff & Blondeau 2007, Nycz 2013

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Continuous Changes

Often centered on incrementation

- The stereotypical subjects of variationist sociolinguistics[2]
- Positions in the vowel space, usage frequencies, optionality
- Spread through communities
- Often variable over lifetimes
- Often known to be driven by young adults

[1] Andersson 1995, Sankoff & Blondeau 2007, Nycz 2013
[2] Weinreich et al 1968 again…

Discrete and Continuous Changes

Actually two sides of one coin

- Once a discrete innovation enters the population, it becomes variation[1]
- Underlies the basic premise of variationist sociolinguistics:
  "The study of variation is the [continuous] distribution of discrete choices"[2]
- And the concept of competing grammars in historical syntax and morphology[3]

A classic strength of DiGS:

Observing continuous changes to study discrete changes

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The interesting part of the discrete aspects of language change lies closer to actuation than incrementation[4]

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Actuation: Connecting the Individual and Population

Actuation = Innovation + uptake into the speech community[1]

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

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The Actuation Problem[2]

- **We can never know the exact circumstances at the moment that any particular innovation or actuation occurred**
- **Sociolinguists often (rightly?) have a negative outlook on actuation research**
- **The attested "innovators" of a change are probably actually early adopters**[3]

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We can actually approach solving actuation…asymptotically.

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Learner Innovation ≠ Learner Error

Innovations need not be due to “errors”

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Errors - “Blame the Child”

- **The learner does not act correctly on its input “a buggy algorithm”**

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→ **What counts as correct? How does the child (or how do we!) tell?**

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- **The learner does not act correctly on its input “a buggy algorithm”**

→ **What counts as correct? How does the child (or how do we!) tell?**

→ **What empirical evidence do we have for mechanisms of change if it is just something internal to some child’s head?**

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Non-errors - “Blame the Environment”

- The learner acts correctly but is dealt a bad input sample
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- Change in the face of severely underspecified input or even trivial variation

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→ We can study change by studying acquisition as a well-behaved system.
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→ When innovations are in response to the linguistic environment, historical data becomes evidence for causes, not just outcomes of change

Acquisition in the Past

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

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But where can we get data about acquisition in the past?

- We can't run experiments on subjects who are no longer alive
  With appropriate caution, we can project experimental results back to the past

Not a unique problem – All laboratory experiments must be projected onto the outside world

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- We can't do corpus or modeling work on ancient child-directed speech (CDS)
  There is none! Overwhelmingly, modern languages don't have CDS either…

A similar issue faced in other historical sciences…

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

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Yes! Sometimes it can! (Kodner, 2019, 2023)

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Four Features of First Language Acquisition

1. **All children receive unique input yet exhibit gross developmental uniformity**[1]
2. The type frequency of a pattern is crucial for acquisition of generalizations, as opposed to token frequency or attestation of specific items[2]
3. Token frequencies correlate with relative order of acquisition[3]
4. Early learner vocabularies are small[4]

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As a result,

- Applying a frequency cutoff to lemmas in CDS approximates a “typical” child
- Insight taken by type frequency-based models of acquisition[5]

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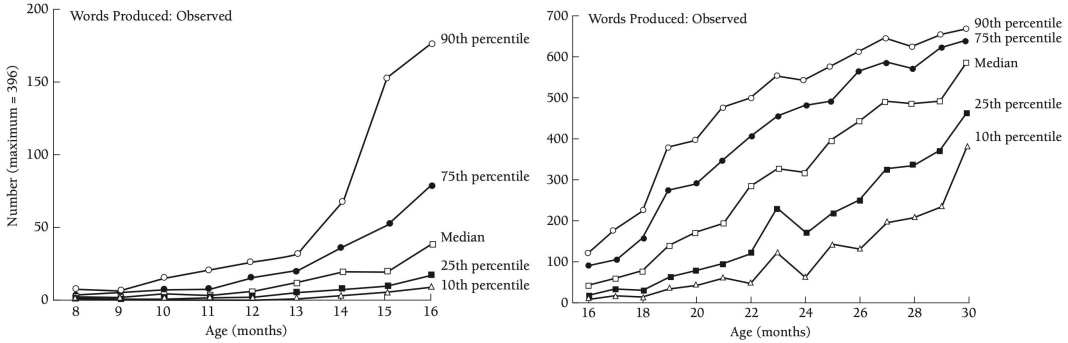
Child Lexical Knowledge

- 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
- 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[3]	$\mu = 429, \sigma > 100$



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

Four Main Results

1. **Frequent vocabulary is more likely to be consistent across genres, so trimming infrequent vocabulary tends to make estimated lexicons much more similar**
2. Type frequencies of specific morphophonological and syn-sem patterns become indistinguishable between CDS and non-CDS when 1) is applied
3. Semantic overlap between CDS-derived lexicons is within the range of lexical overlap across genres
4. Patterns of morphological sparsity are similar across CDS and adult corpora

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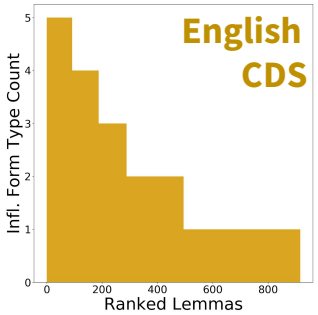
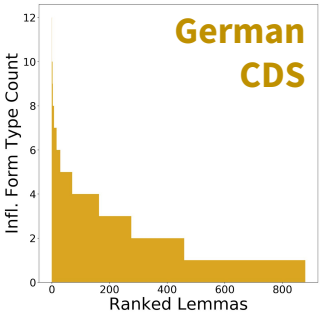
Paradigm Saturation

CDS - Child Directed Speech (CHILDES)
UD - Adult (Universal Dependencies)
UD - Universal Dependencies (but dead)

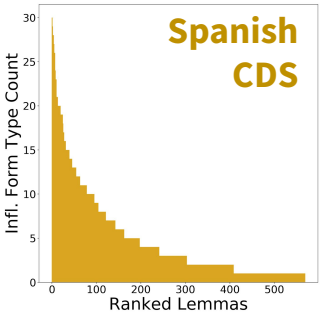
CHILDES English PS



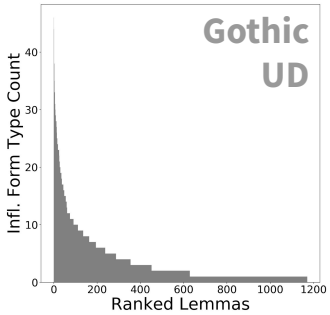
CHILDES German PS



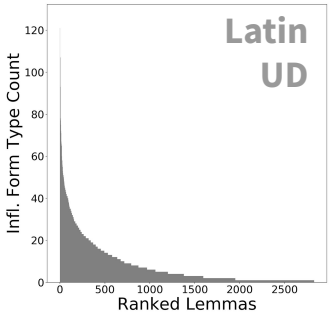
CHILDES Spanish PS



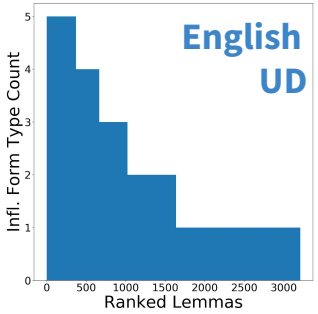
UD Gothic PS



UD Latin PS



UD English PS



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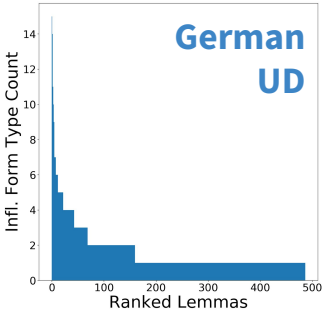

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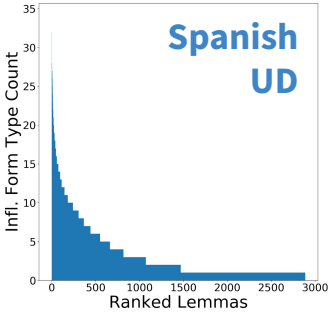

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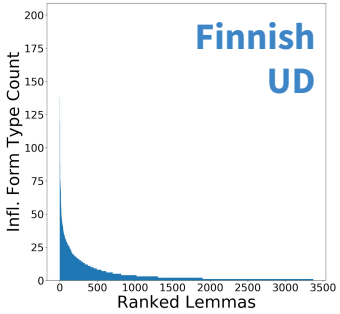
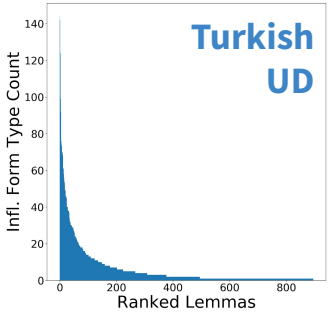
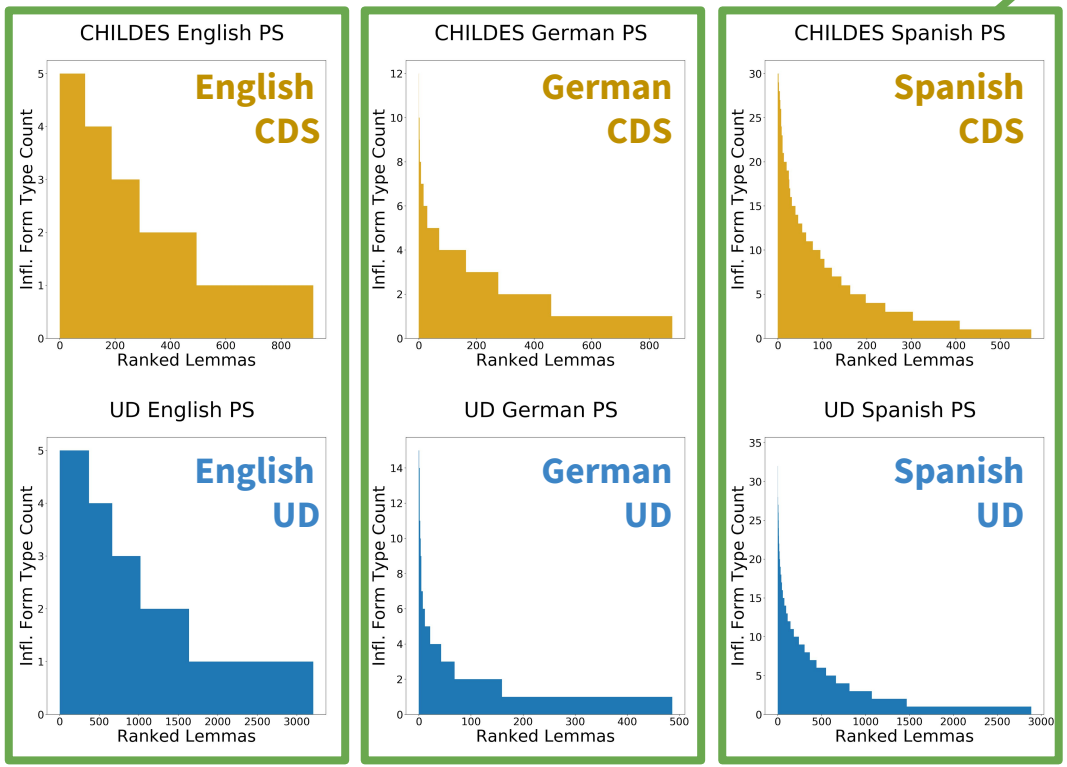


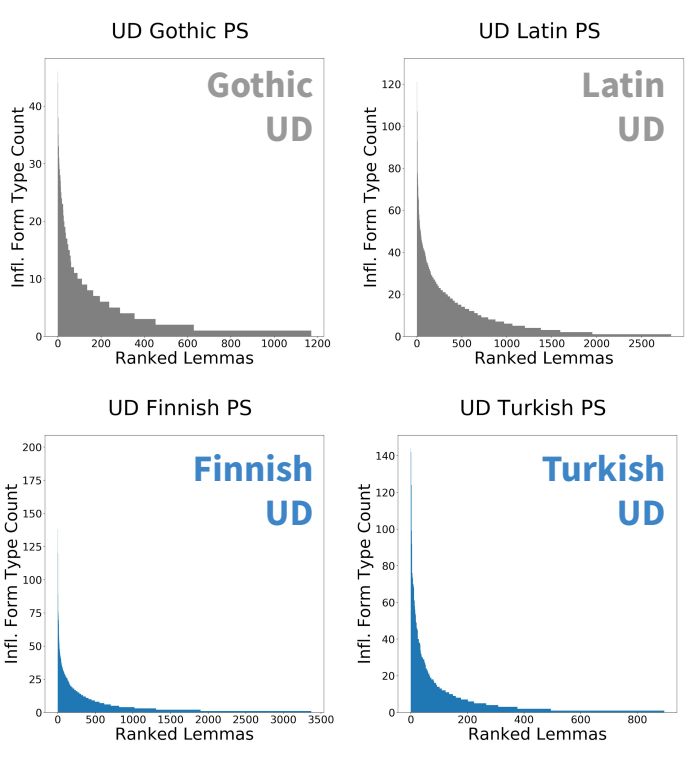
UD Turkish PS



Paradigm Saturation

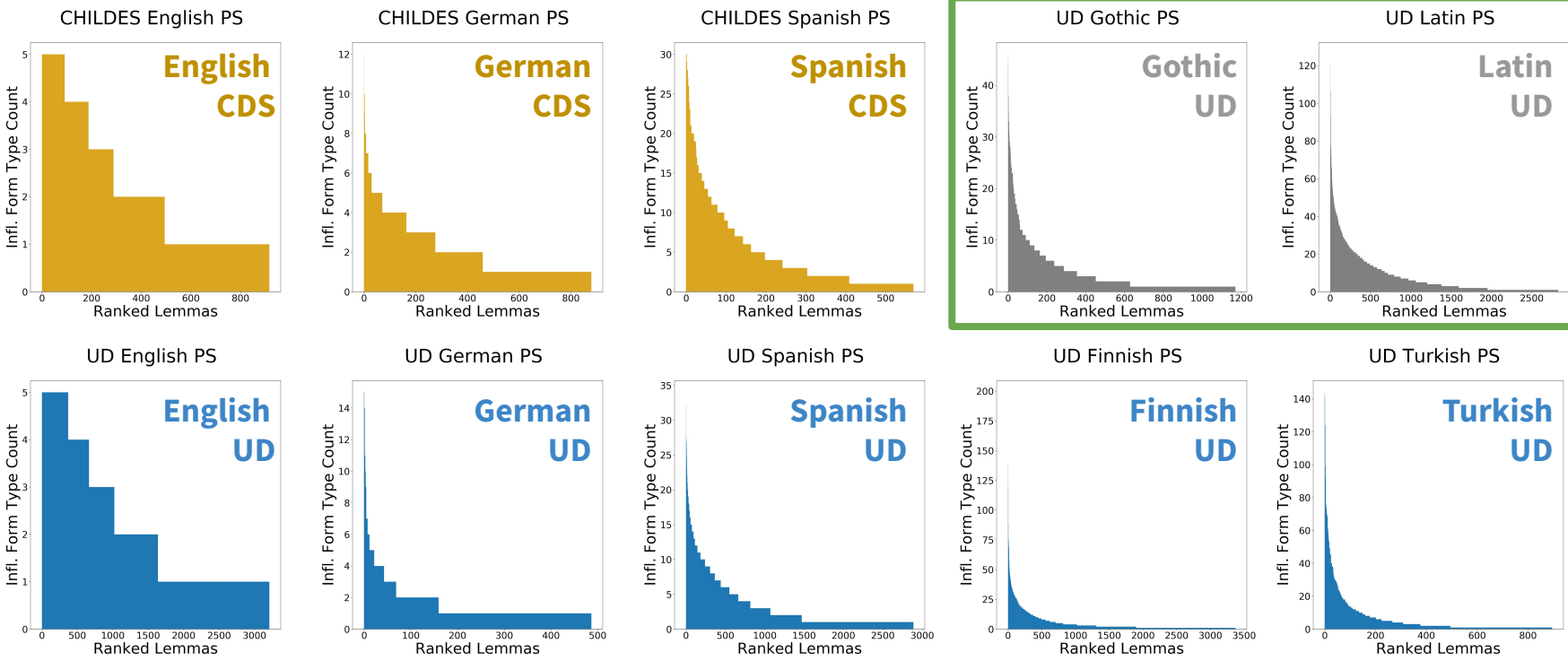
CDS and UD distributions correspond by language



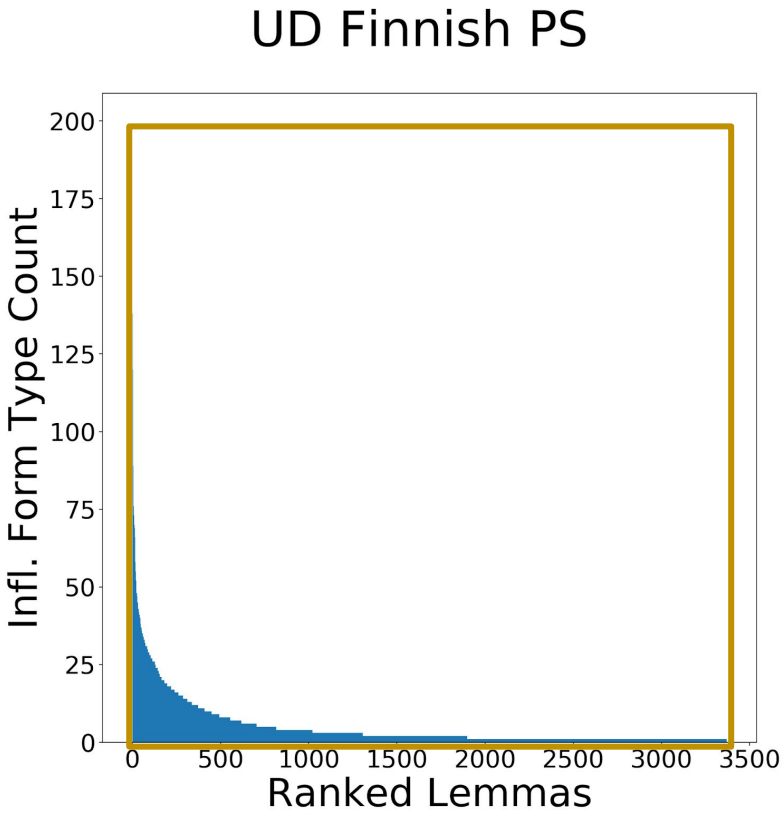


Paradigm Saturation

Historical corpora behave just like any other in this respect



A different way to read these plots



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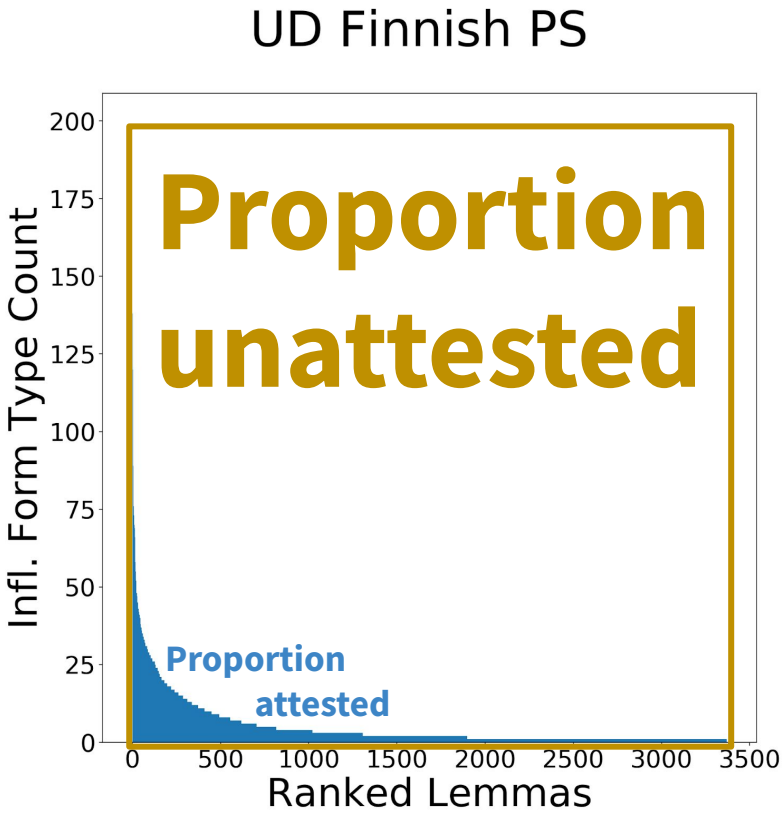

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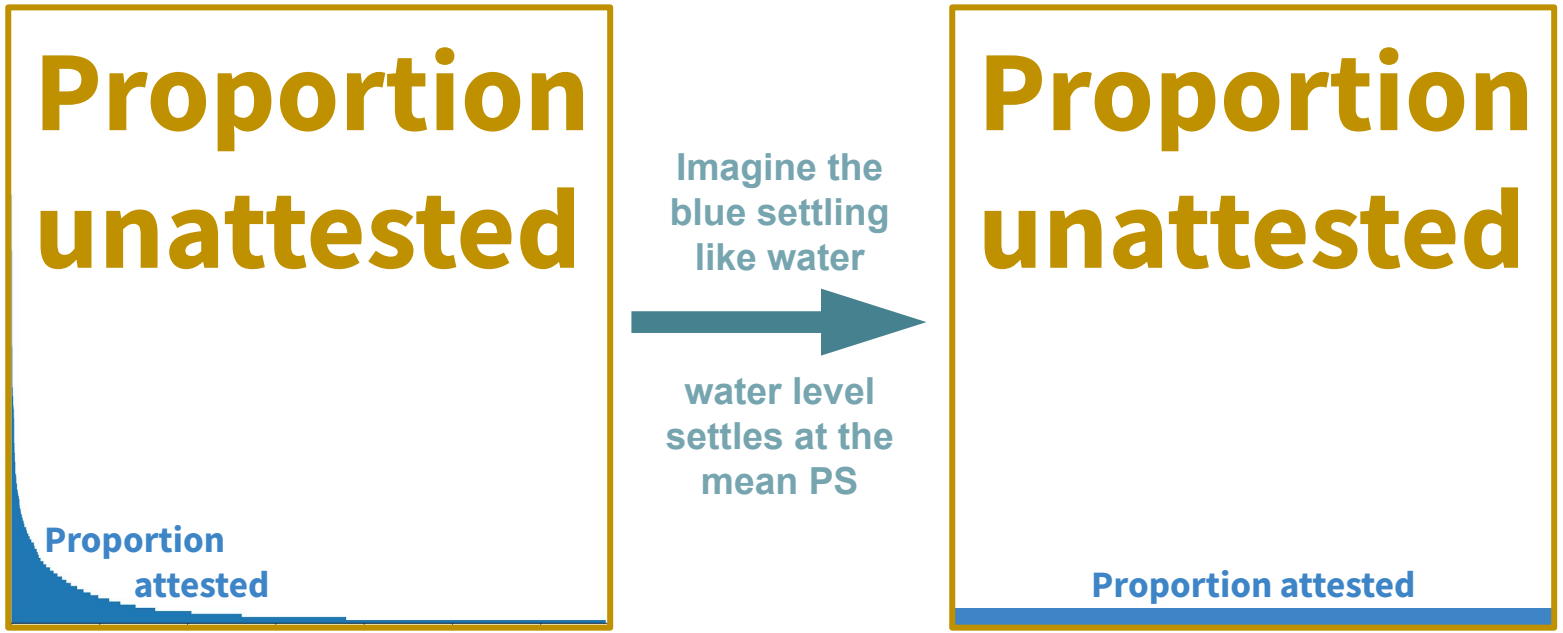
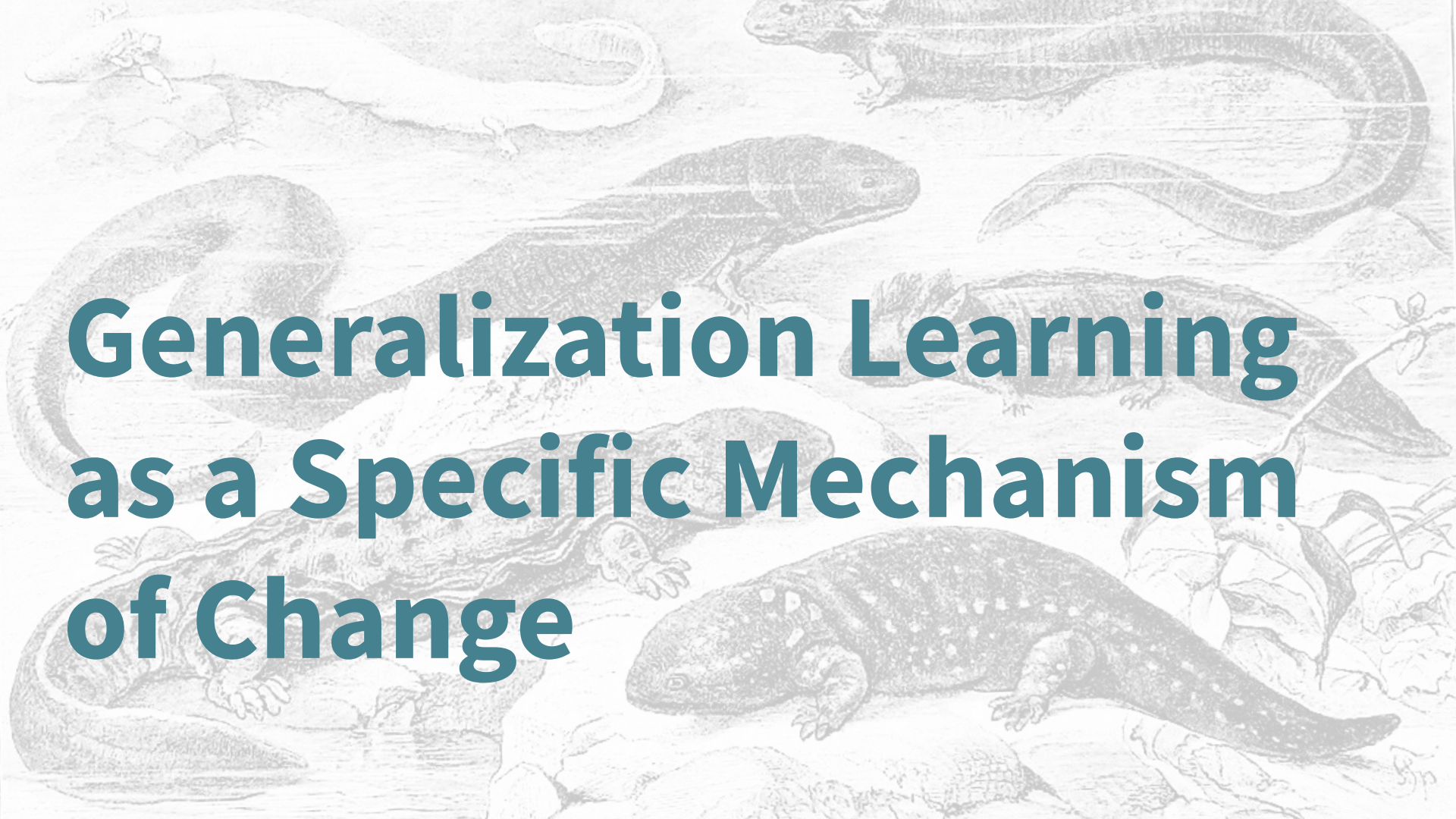


Conclusions

- **Though CDS and non-CDS differ in the ways that any genres differ,**
- **They are quantitatively similar (sometimes statistically indistinguishable!) over various linguistic dimensions…**
  when frequency-trimmed to approximate learner vocabulary sizes

With appropriate pre-processing, historical and modern adult-derived corpora may be reasonably used to approximate child linguistic experience



Generalization Learning as a Specific Mechanism of Change

Actuation and the Paradox of Language Change[1]

If children are so good at acquiring language,
how are they so bad at it?

[1] term coined by Niyogi & Berwick 1997

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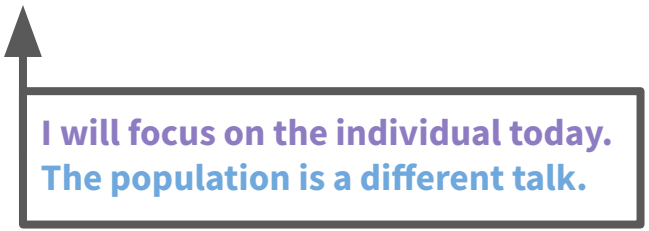

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…and precise models of the relevant aspects of acquisition

Today we focus on the Tolerance Principle[3], a model of generalization learning

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The Tolerance Principle (Yang 2005, 2016)

- A concrete model for the acquisition of linguistic generalization
- A cognitively-motivated **evaluation metric** over linguistic hypotheses
- Separates the algorithmic aspects of acquisition from the representations over which generalizations are formed

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- Separates the algorithmic aspects of acquisition from the representations over which generalizations are formed

Has been applied to a wide range of generalization-learning tasks

- Inflection in Arabic, Cree, English, Frisian, German, Icelandic, Polish, Spanish…
  (Yang 2005, 2016, Belth et al 2021, Björnsdóttir 2021, Munshi 2021, Merkuur 2021, Henke 2022,...)
- Dutch, English, and Latin derivational morphology (Yang 2016, van Tuijl and Coopmans 2021, Kodner 2022)
- Argument structure constraints in English, Icelandic, and Korean
  (Yang 2016, Irani 2019, Lee & Kodner 2019, Nowenstein et al 2020, Pearl & Sprouse 2021, Li 2024)
- 'Root infinitive' phenomenon (or lack thereof) in English, French, Hebrew and Spanish (Payne 2022)
- Phonological 'rules' in English (Sneller et al 2018, Richter 2021, Dresher and Lahiri 2022)
- Formal aspects of phonological representation (Belth 2023, 2024)

and many more…

The Tolerance Principle (Yang 2005, 2016)

- A concrete model for the acquisition of linguistic generalization
- A cognitively-motivated **evaluation metric** over linguistic hypotheses
- Separates the algorithmic aspects of acquisition from the representations over which generalizations are formed

And has gained backing from a range of psycholinguistic experiments

(Schuler, Newport & Yang 2017, Koulaguina & Shi 2019, Emond & Shi 2021, 2023, Li & Schuler 2023)

And end-to-end computational learning implementations

(Belth, Payne, Beser, Kodner & Yang 2021, Payne 2022, Belth 2023, *and we have more in prep!*)

The Tolerance Principle (Yang 2005, 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

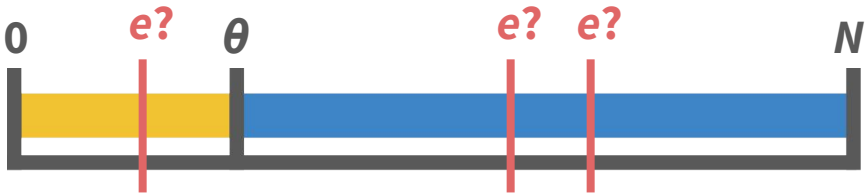
→ *N* and *e* grow as the learner's vocabulary grows

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

→ This predicts observed learning trajectories

Visualization of the Tolerance Principle

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



If *e* is below *θ*,
acquire pattern as rule
Otherwise, do not form rule

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- *N* grows over an individual's development, *θ* grows more slowly

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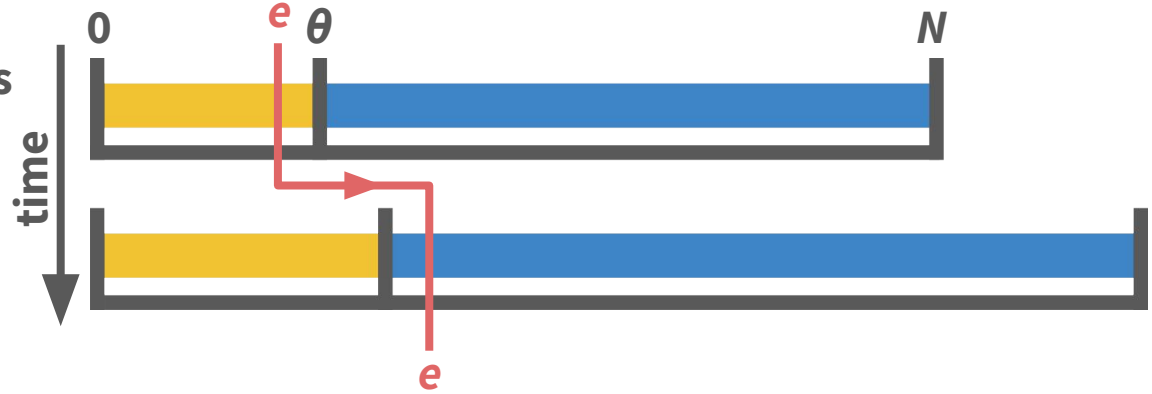

- *N* grows over an individual's development, *θ* grows more slowly
- If *θ* grows faster than *e*, a pattern may fall into productivity
- If *e* grows faster than *θ*, a pattern may fall out of productivity

The Tolerance Principle and Language Change

Phonology

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Semantics

A shared mechanism:

Innovations through generalization learning during language acquisition

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Many types of change:

Cross-cutting traditional levels of the grammar

A shared mechanism:

Innovations through generalization learning during language acquisition

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Cases of secondary split

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Innovations through generalization learning during language acquisition

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Cases of secondary split

Cases of analogical extension

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A shared mechanism:

Innovations through generalization learning during language acquisition

Many types of change:

Cases of secondary split

Cases of analogical extension

Cases of grammaticalization, reanalysis, and bleaching…

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Semantics

A shared mechanism:

Innovations through generalization learning during language acquisition

Many types of change:

Cases of secondary split
Cases of analogical extension
Cases of grammaticalization, reanalysis, and bleaching**…and more!**

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Semantics

Many types of change:

Cases of change in a contact setting

A shared mechanism:

Innovations through generalization learning during language acquisition

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Semantics

A shared mechanism:

Innovations through generalization learning during language acquisition

Many types of change:

Cases of change in a contact setting

and specifically attrition-related

The Tolerance Principle and Language Change

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Semantics

Many types of change:

Applications that I've worked on

A shared mechanism:

Innovations through generalization learning during language acquisition

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Semantics

Many types of change:

A example for today

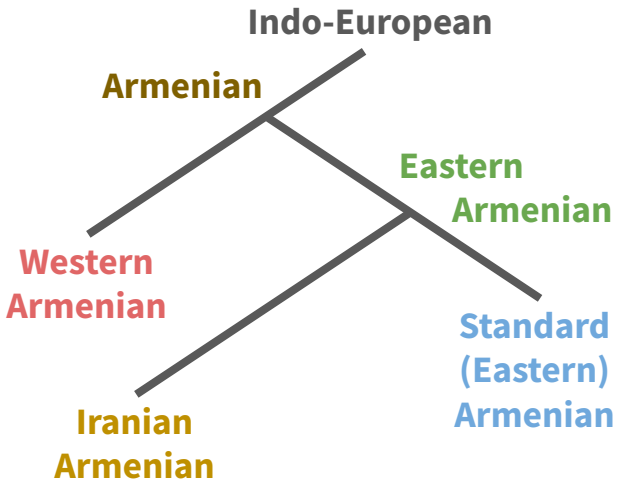
Joint work with Hossep Dolatian
Յովսէփ Տօվլէթեան

A shared mechanism:

Innovations through generalization learning during language acquisition

Հայերեն: The Armenian Language(s)

- 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



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

Standard Eastern vs Tehrani Armenian Paradigms

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

	Form	A-Class *read*	E-Class *sing*	Irreg. *eat*
Standard	INF	*kardal*	*ergel*	*utel*
	PST.PFV.3PL	*kardac'in*	*ergec'in*	*keran*
	PST.IPFV.3PL	*kardain*	*ergein*	*utein*
Iranian	INF	*kardal*	*ergel*	*utel*
	PST.PFV.3PL	*kardac'in*	*ergan*	*keran*
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In (Conservative) Std Eastern:

- **-Vc'i-** is the default way to form perfects
- Some irregular E-Class perfects show **-a-** instead of **-ec'i-**

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In (Conservative) Std Eastern:

- *-Vc'i-* is the default way to form perfects
- Some irregular E-Class perfects show *-a-* instead of *-ec'i-*

In (Innovative) Tehrani Eastern:

- Regular E-Class perfects have an ending *-a-* like conservative irregulars rather than *-ec'i-*
- **Analogical extension** from the small irregular class to the dominant one

An “Elsewhere Reversal”

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

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

	Form	A-Class *read*	E-Class *sing*	Irreg. *eat*
Standard	INF	*kardal*	*ergel*	*utel*
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	Vocab Items for Perfect
ASP[PFV] T[PST] ↔	*-Ø-a-* / LIST___
	-c’-i- / ELSEWHERE
ASP[PFV] T[PST] ↔	*-c’-i-* / TH[=*a*]____
	-Ø-a- / ELSEWHERE

Two Additional Observations

Some regular E-Class verbs already had (optional) -*a*- perfects

- **Observed in Western as well as Eastern Armenian**
- **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 disyllabic stems**

[1] Martirosyan 2009

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 analogical extension
   Conservative → Iranian
   -ec'i- ***-a-***

	Form	A-Class *read*	E-Class *sing*	Irreg. *eat*
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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 over-regularization, a normal process during acquisition**

A learner has two options after the phono change

Conservative Generalization

- *-c'-* is the default perfect
- *-a-* vowel perfect is listed

-a- remains restricted to irregulars

Predicts *ergec'in* in this case

Pre-Iranian

Form	A-Class *read*	E-Class *sing*	Irreg. *eat*
INF	*kardal*	*ergel*	*utel*
PST.PFV.3PL	*kardac'in*	*erg-?-n*	*keran*
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A learner has two options after the phono change

Conservative Generalization

- *-c'-* is the default perfect
- *-a-* vowel perfect is listed

-a- remains restricted to irregulars

Predicts *ergec'in* in this case

Innovative Generalization

- *-a-* vs *-i-* marks aspect
- *-c'-* is a property of A-class

When there is no (overt) TH, perfect = *-a-*, imperfect = *-i-*

Predicts *ergan* in this example

Pre-Iranian

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

If the phonological change set up the analogy, then

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

Predictions

If the phonological change set up the analogy, then

- **A-Class should retain *-ac'i-* perfects because its imperfect retains [aji] ✔**
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PST.IPFV.3PL	*kardain*	*ergin*	*utin*

Also applies to derived A-Class verbs
e.g., inchoatives

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Imperfect	Perfect	# of Varieties Surveyed
-ein	*-ec'in*	(Standard East.) + 24
-in	*-ec'in*	10
-in	*-(ec')in*	3
-in	*-an*	1 (Iranian)
-ein	*-an or -in*	unattested

Innovation

✔ /ei/ > [eji], no reversal

✔ /ei/ > [i], no reversal

✔ /ei/ > [i], part/opt. reversal

✔ /ei/ > [i], complete reversal

✘ /ei/ > [eji], reversal

May have reversal

Cannot have reversal

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— **Several dialects condition on transitivity**

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- If an Armenian vari…ave have the reversal ✔

This is good, but (modern and historical) grammars are really synchronic snapshots. They only imply the process of change

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✔ /ei/ > [i], part/opt. reversal

✔ /ei/ > [i], complete reversal

✘ /ei/ > [eji], reversal

— Several dialects condition on transitivity

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, 150,..., 600
- Represent verbal lexicon size and growth over the course of development[2]

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, [2] Bornstein et al 2004 reports that verbs make up a third to a half of the lexicon during childhood for several languages

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 …
Tolerable?	✘	✘	✘	✘	✘	✘	✘	✘ …

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 …
Tolerable?	*?*	✔	✘	✘	✘	✘	✘	✘

? = within 1 of θ

Extend -*a*- to all Disyllabic E-Class Intransitives? *V* < 90

N = |2σ E-Class intrans ⊂ *V*| *e* = |⊂ 2σ E-class intrans with -*ec'i*- " " "|

V	50	60	70	80	90	100	200	300 …
Tolerable?	✔	✔	*?*	*?*	✘	✘	✘	✘

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

Further extend -*a*- to all E-Class 2σ? *V* ≤ 100

V	50	60	70	80	90	100	200	300	… 600
?	✔	?	?	✔	?	?	✘	✘	… ✘

? = within 1 of θ

Further extend -*a*- to all E-Class Intransitives? *V* ≤ 300

V	50	60	70	80	90	100	200	300	… 600
?	✔	✔	✔	✔	✔	✔	✔	?	… ✘

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

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

V	50	60	70	80	90	100	200	300	… All
?	✔	✔	✔	✔	✔	✔	✔	✔	… ✔

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:

- **Calculated over all E-Class verbs in Universal Dependencies**

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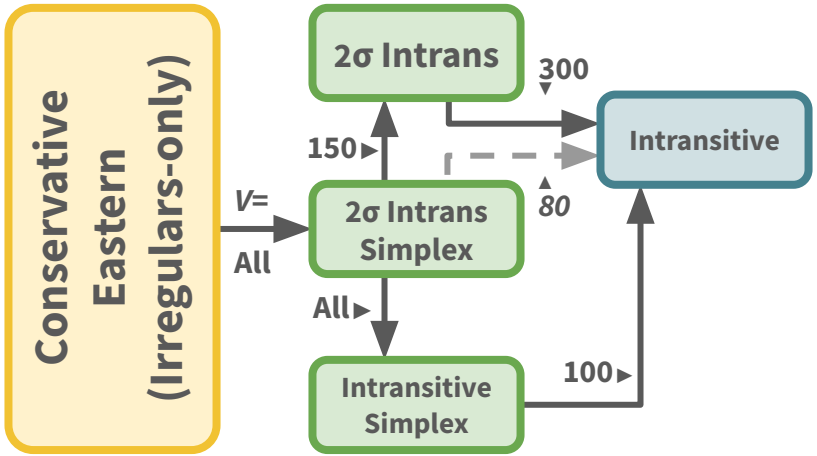

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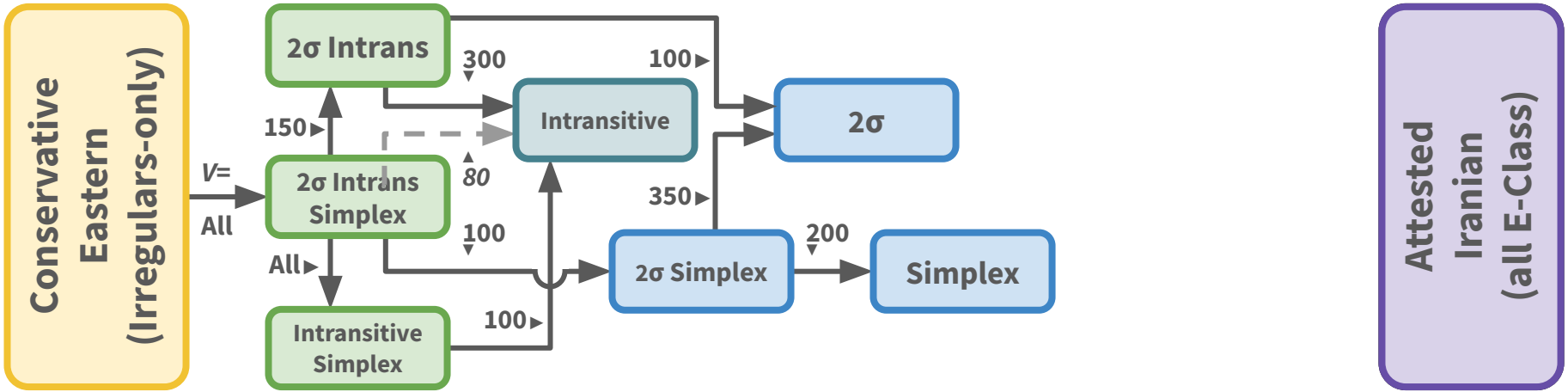

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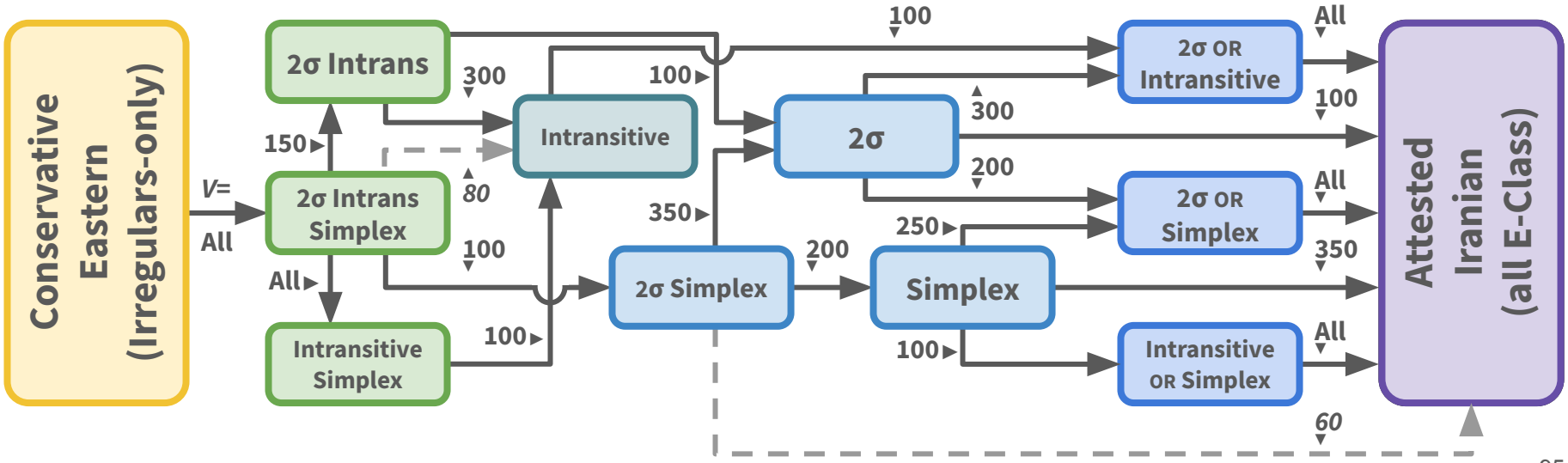

Conclusions

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

The only reason we could draw this conclusion is because we committed to a mechanism!

Conclusions

Phonological Change: A Necessary but not Sufficient 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
- Necessary but insufficient condition is backed up by a typological survey

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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
  We already found a handful of intransitive-only innovative dialects

A Process-Centered View of Change

The Tolerance Principle and Language Change

Phonology

- Nasal /æ/-tensing in Philadelphia (Sneller et al, 2018)
- Transparent /aɪ/-Raising (Kodner & Richter, ‘20)
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Semantics

Many types of change:

Cross-cutting traditional levels of the grammar

A shared mechanism:

Innovations through generalization learning during language acquisition

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Many types of change:

Cases of secondary split

Cases of analogical extension

Cases of grammaticalization, reanalysis, and bleaching…

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Innovations through generalization learning during language acquisition

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Cases of secondary split
Cases of analogical extension
Cases of grammaticalization, reanalysis, and bleaching**…and more!**

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Cases of change in a contact setting

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Semantics

A shared mechanism:

Innovations through generalization learning during language acquisition

Many types of change:

Cases of change in a contact setting

and specifically attrition-related

Why do these case studies cross-cut classifications?

An Old Idea: Taxonomies of Outcomes

- Traditional classifications are based on outcomes of change
- But these case studies share a mechanism (i.e., generalization learning)
- The relationship between outcomes and mechanisms is complex

  → they don't line up very well

  → if our goal is to figure out why and by what means language changes, classifying and reclassifying of outcomes is unlikely to get us there

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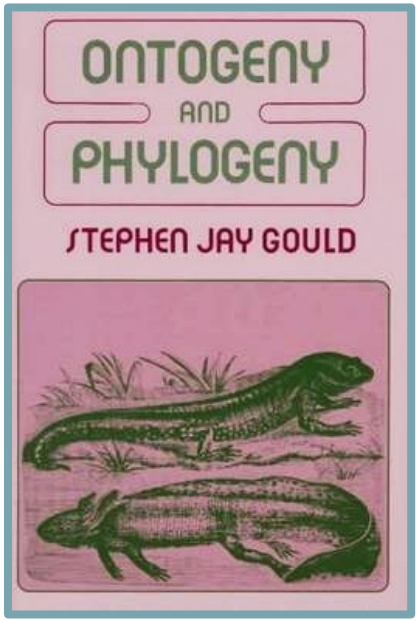
A Better Idea: A Taxonomy of Mechanisms

- It would give us a very different view of the "landscape" of language change
- Would help explicate the "why and by what means" questions of change

A Similar Problem in Biological Evolution



"The confusion between von Baer and Haeckel arises from **an unfortunate tradition in natural history, the emphasis of results rather than processes and their explanations**" (Gould, 1977, pg. 3)

"De Beer subdivides deviation according to where in ontogeny a new character appears and whether we shall consider its effect or the feature it replaces; **this confusion and proliferation [of classification schemes] illustrates the unnecessary complexities that we engender in *producing taxonomies of results* rather than *explications of processes.***"
(pg. 225, *italicization his*)

A Partial Taxonomy of Actuation Mechanisms

NOT TO SCALE!

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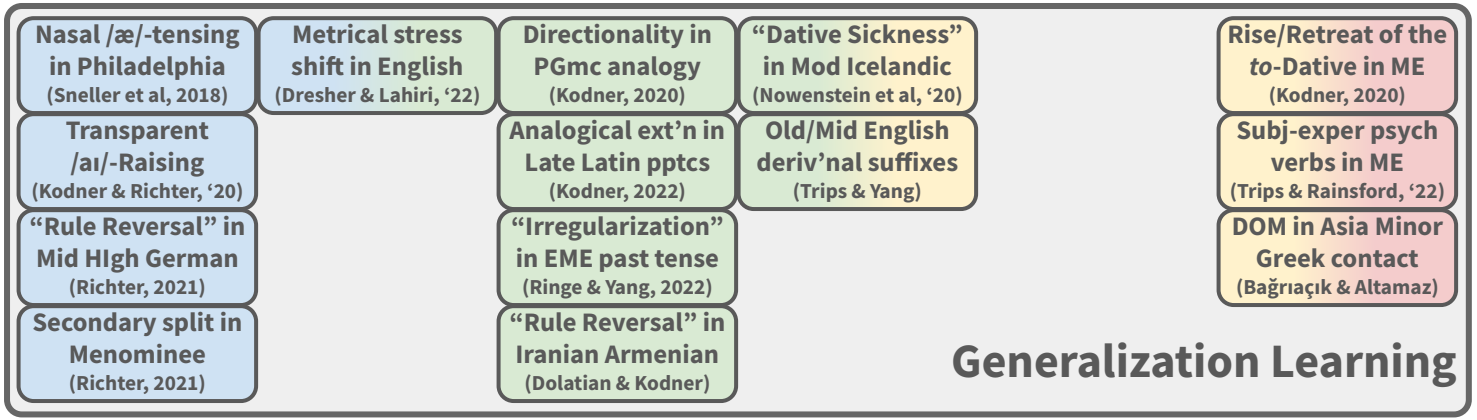

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Generalization Learning

Innovation During Language Acquisition

Misinterpretation of ambiguous input
Reanalysis side of hypo/ercorrection
Interpretation of modals (cf Cournane 2017)

Biased Hypothesis Generation
Phonological reanalysis (Kiparsky 1968)
Economy biases (cf van Gelderen 2004, Biberauer & Roberts 2016)

Maximizing Parsing Success
Vowel mergers (cf Yang 2009)
Variational learning (Yang 2002)

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Phonetic side of hyp.correction

Sociolinguistic accommodation

"Deliberate" creativity

Mechanical priming effects

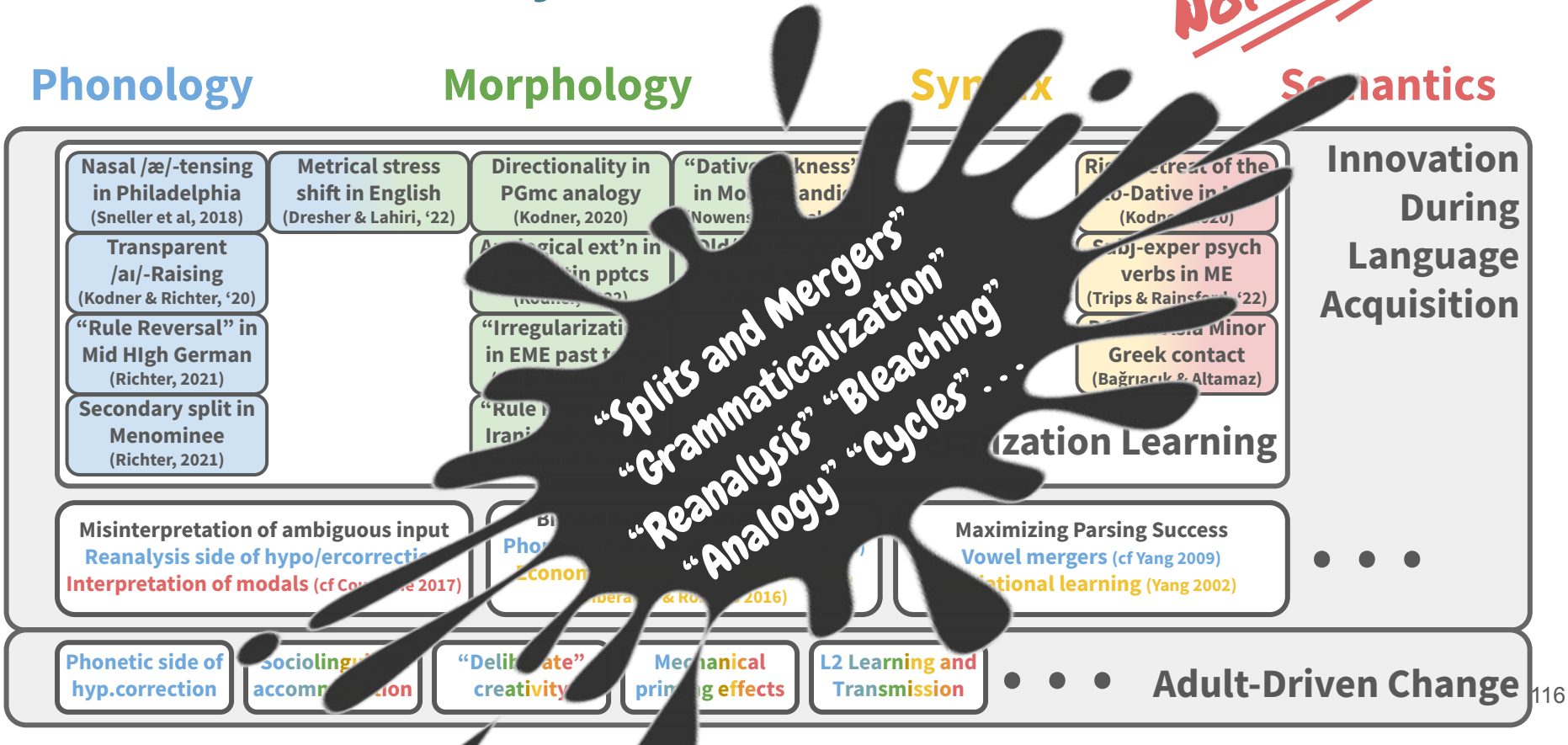
L2 Learning and Transmission

• • •

Adult-Driven Change

A Partial Taxonomy of Actuation Mechanisms

NOT TO SCALE!



A Partial Taxonomy of Actuation Mechanisms

NOT TO SCALE!

Phonology Morphology Syntax Semantics

Theoretical analyses are not diachronic mechanisms

Theoretical Analyses (per se)

Phonetic side of hyp.correction | Sociolinguistic accommodation | "Deliberate" creativity | Mechanical priming effects | L2 learning and transmission | Adult-Driven Change

[1] Weinreich, Labov & Herzog (1968)

A Partial Taxonomy of Actuation Mechanisms

NOT TO SCALE!

Phonology Morphology Syntax Semantics

Theoretical analyses are not diachronic mechanisms

They are **implementations** of synchronic states

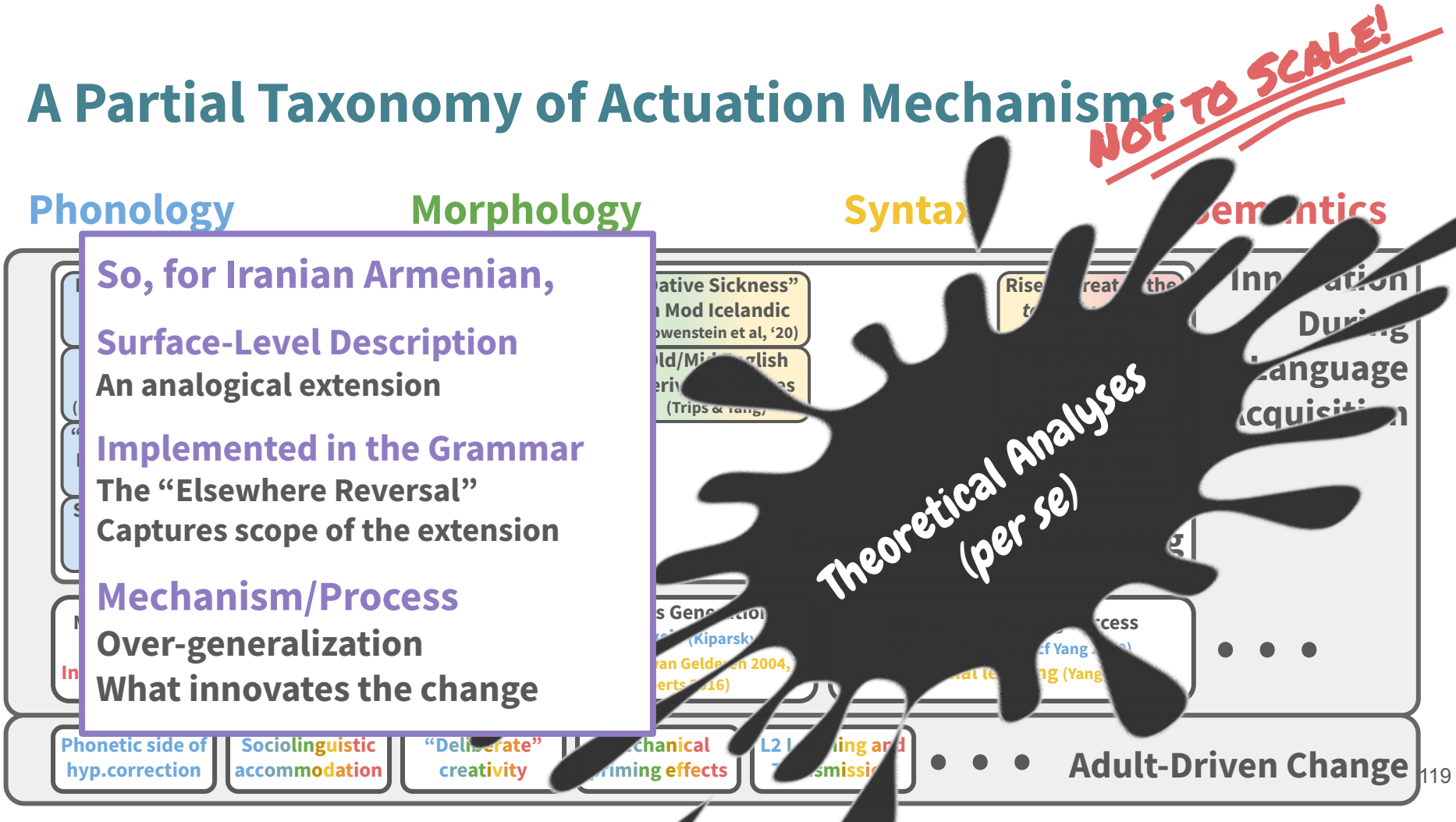
…so they're hugely important as part of diachronic explanations
Constraint & Embedding Problems[1]

…but they aren't processes

Theoretical Analyses (per se)

Phonetic side of hyp.correction | Sociolinguistic accommodation | "Deliberate" creativity | Mechanical priming effects | L2 learning and transmission | • • • | Adult-Driven Change

A Partial Taxonomy of Actuation Mechanisms

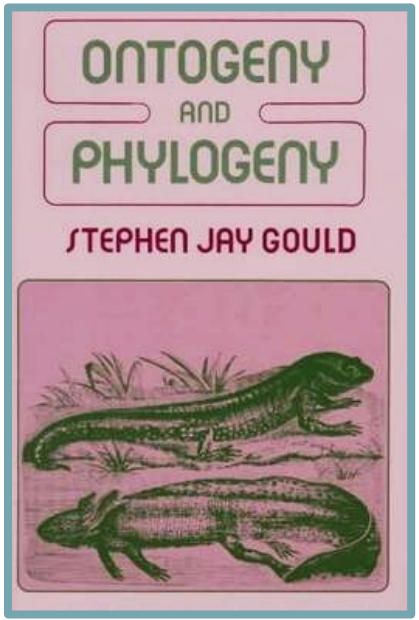


How can we develop an explication of mechanisms?

Old theories do not collapse under disconfirmatory evidence alone

"Natural history does not refute its theories by cataloguing empirical exceptions to them (while working within a paradigm that engendered the theory in the first place)." (pg. 167)

"The data of natural history are so multifarious, complex, and indecisive that simple accumulation [of data points] can almost never resolve an issue. Theory must play a role in guiding observation, and theory will not fall on the basis of data accumulated in its own light." (pg. 6)



How can we develop an explication of mechanisms?

- **Cognitive science**, **language acquisition**, and **theoretical linguistics** provide a wealth of models for learning, processing, and representation
- **Traditional historical linguistics**, **sociolinguistics**, and **corpus linguistics** provide a wealth of data on language use and human interaction
- **Cognitive**, **quantitative**, **algorithmic** models like the Tolerance Principle reveal connections between disparate surface phenomena

Child Language Acquisition and a Mechanistic View of Language Change

The End

Thank you!