Approaching Actuation

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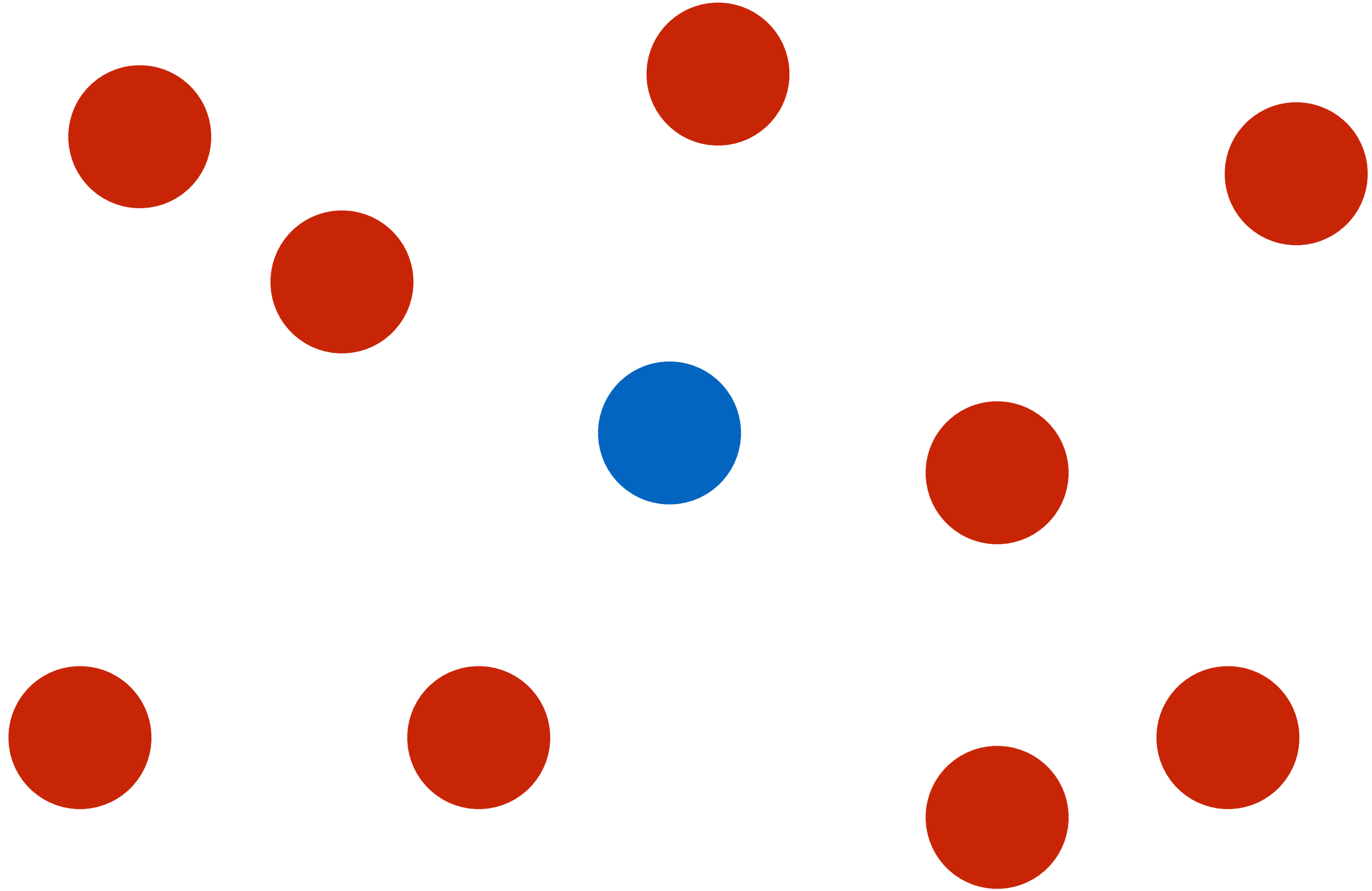
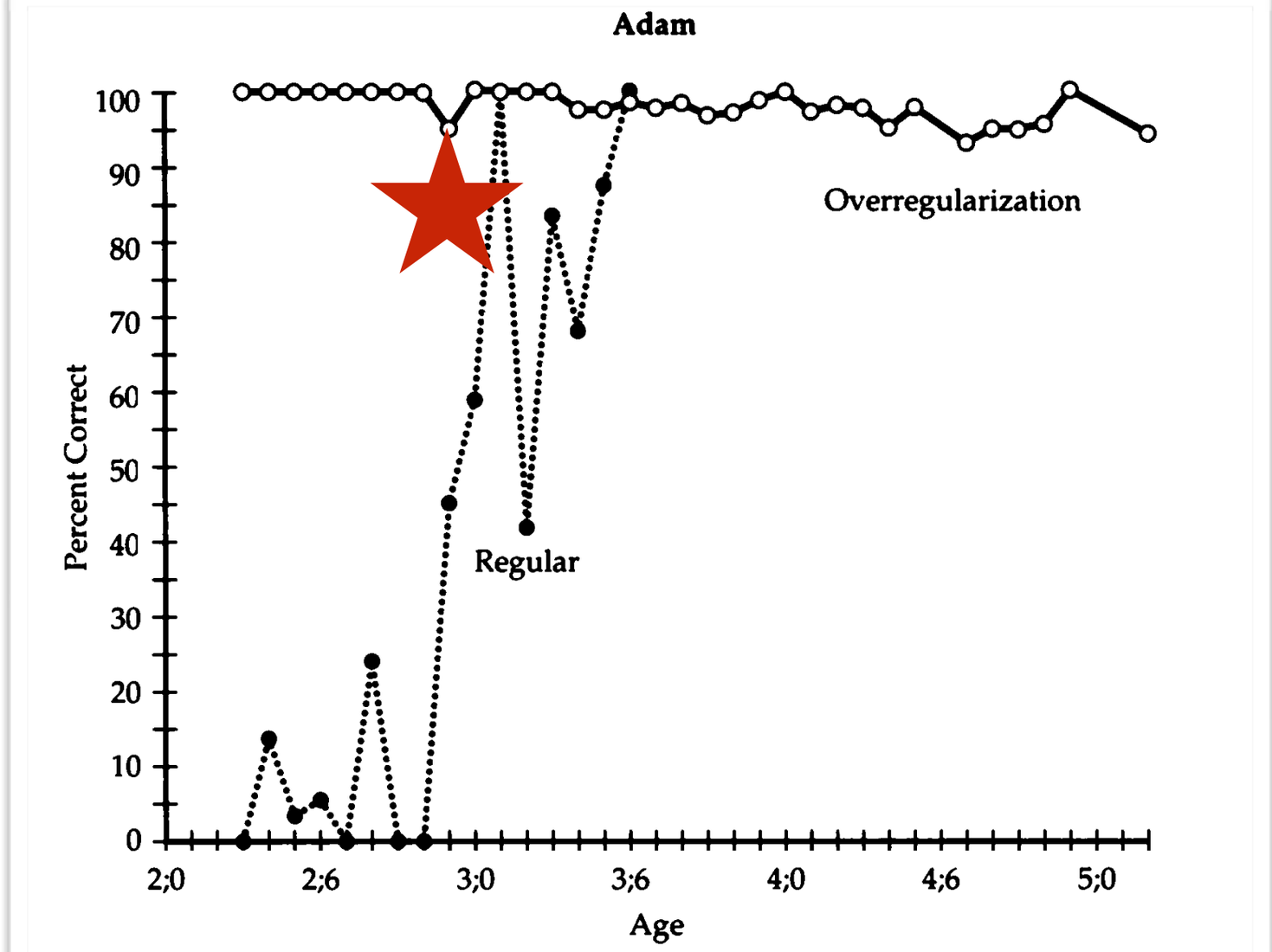
Actuation

- Weinreich, Labov & Herzog (1968)
- Origin of linguistic variation:
  - “they are there all along”: e.g., the biological space of grammar (WLH’s constraints)
  - Arise from linguistic transmission (i.e. experience dependent learning and generalization)



Tipping Point



"Add -d" is not an innate UG option!

How to Generalize

- Let **R** be a rule applicable to **N** lexical items out of which **e** do not follow **R**. **R** is productive iff

$$e = \frac{N}{\ln N}$$

- The number of tolerable exceptions must be relatively small: otherwise the learner must lexicalize everything
  - English past tense: e = 120, N must be greater than 800 for **-ed** to be productive
  - Emergence of “-d” as a productive rule takes place only after the child’s regulars overwhelm irregulars

When Exceptions Overwhelm

- Polish **singular** masculine genitives take either -*a* or -*u* as suffix but neither seems to be the default based on a suite of tests (Dabrowska 2000).
  - **Plurals** take -*ow* as the default, with exceptional -*i/y* suffix
- Analysis of child-directed Polish in CHILDES

suffix	type freq.	productive?	ave. token freq.	error %
-a (sg.)	**837**	**no**	7.17	1.28%
-u (sg.)	**516**	**no**	8.8	0.24%
-ow (pl.)	**551**	**yes**	6.5	0.41%
-i/y (pl.)	**61**	**no**	11.4	**15.53%**

Parameters and Exceptions

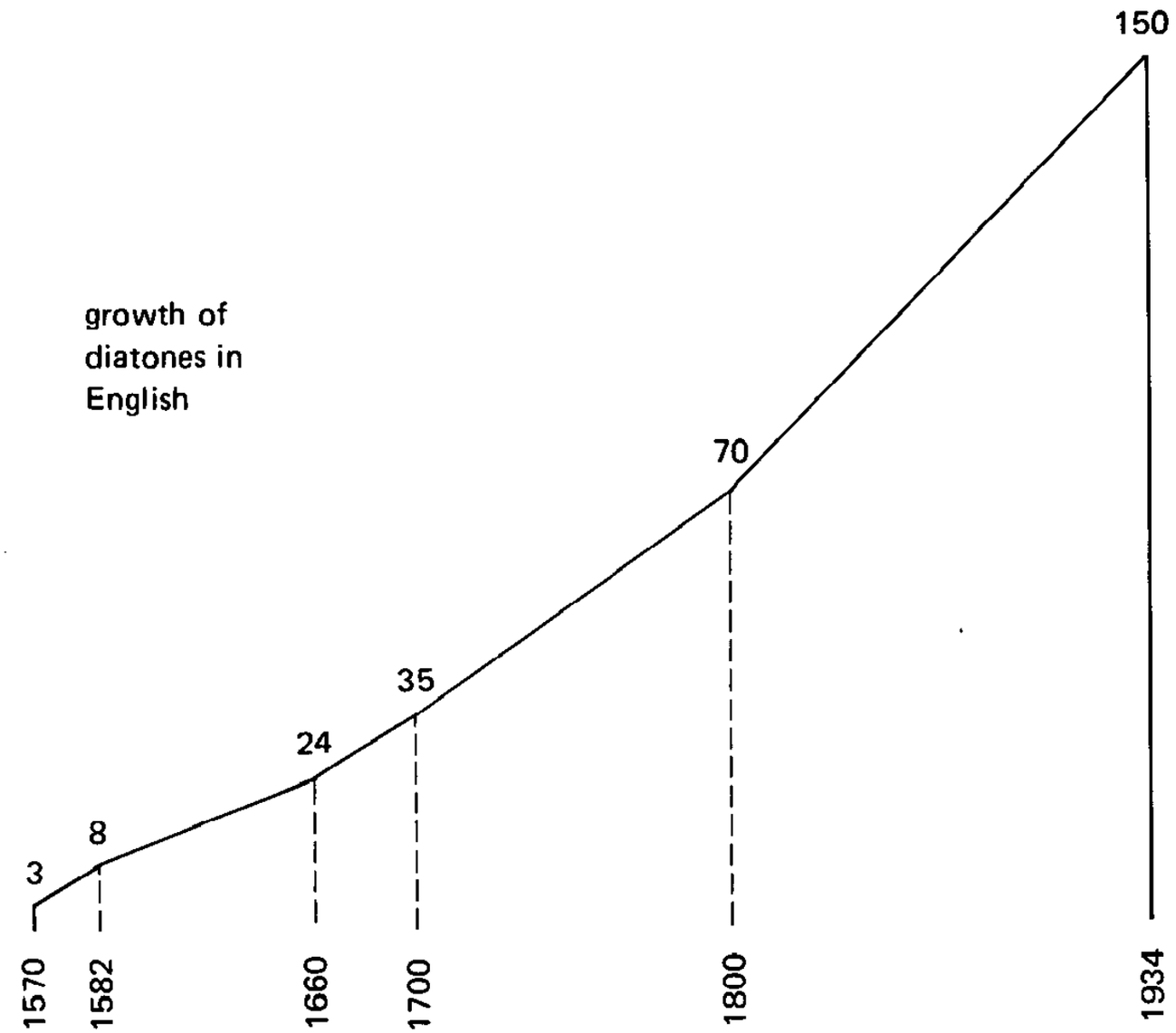
une *vieille* amie ‘a friend for a long time’
une amie *vielle* ‘a friend who is aged’

- Newmeyer (2004): parameters are wrong because they have exceptions
- A 200,000 word French directed corpus; adjectives tagged and lemmatized
- 20 exceptional adjectives
- 120 “regular” adjectives: 80 would suffice
- The default parameter value (or rule) can be maintained and the rest are lexicalized

Two case studies

- The learner creates systematic regularities which lead to change
- PERmit (noun) vs. perMIT (verb): diatonic stress
- Dative alternations
  - John donated a painting to the museum
  - *John donated the museum a painting

Diatonic Stress



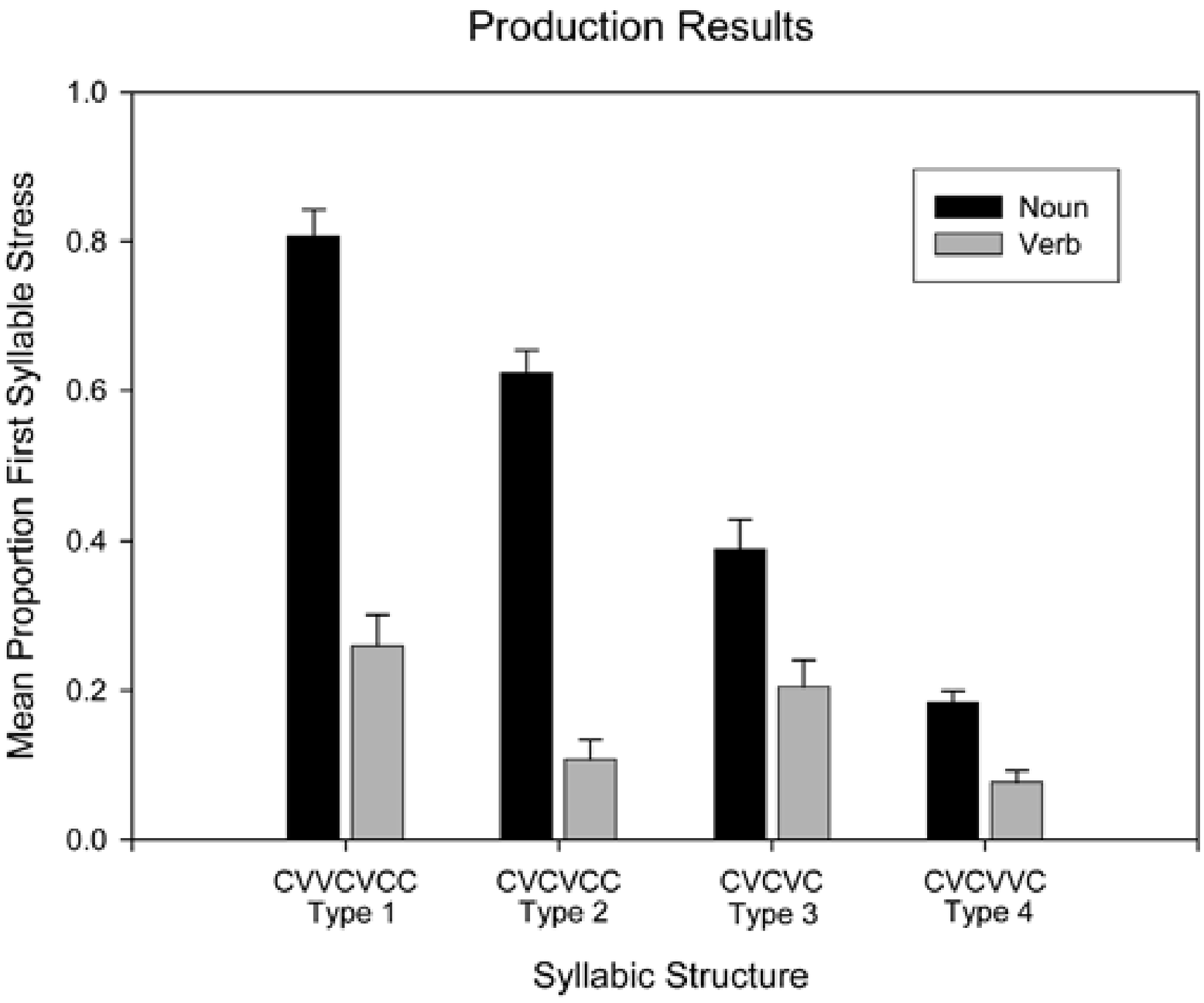
N-V pairs	Total	Isotonic	Diatonic	% of Diatones
Disyllabic	1315	1165	150	11
Polysyllabic	442	372	70	16
Total	1757	1537	229	13

Sherman (1975)

English Stress

- The majority (>80%) of words are stress initial (Cutler & Davis 1987)
- Over 90% of bisyllabic nouns are trochaic, and about 70% of bisyllabic verbs are iambic (Bock & Kelly 1988)
- But English stress system is **not** a simple rule with 10% of exceptions

Bisyllabic Nonce Words



Guion et al. 2007 (*Language and Speech*)

Previous Work

- A paradigm case for lexical diffusion (Wang 1969 etc.)
  - Language change proceeds on a word by word basis, rather than through a systematic grammar
    - Heavily influenced the phylogenetic approach to language classification
- The role of frequency: Words (N/V pairs) with lower frequencies tend to change first (develop diatonic stress first; Phillips 1984, Bybee 2002, Lieberman et al. 2007)

Theories of English Stress

- Halle (1998): σ1 σ2
- Nouns
  - If σ1 has VV or VC+ then it's stressed (kingdom, beetle)
  - Else if σ2 has VV then it's stressed (device)
  - Else σ1 is stressed (atom)
- Verbs
  - If σ2 has VV or VCC+ then it's stressed (revise, eject)
  - Else σ1 is stressed (ambush)

14% vs. 6%

- Legate & Yang (2012: Tribute volume for Carol Chomsky)
- Words that appear at least once per million in child directed English (excluding proper names): 5763
- Initial stress: 4960 (**14%** exceptions): above threshold
- Halle (1998): 5408 (**6%** exceptions): below threshold
- Only the Halle (1998) account can **productively** tolerate the amount of exceptions

Hypothesis

- Diatonic stress shifts for words that are **predicted** to have divergence N/V stress
- **(1, 2): construct**
- (1, 1): ambush
- (2, 2): amount
- **(1, 2): reject**
- (1, 1): whisper
- (2, 1): 👻 (Sherman 1975, Sonderegger & Niyogi 2013)

Data

- CELEX homographic N/V pairs
- CMU Pronunciation Dictionary to obtain diatonic pairs
- SUBTLEXus corpus for word frequencies

- Halle (1998) predicts whether a specific N/V should shift or not
- 781 multisyllabic N/V pairs, 90 are diatonic (11.5%)
- 668 bisyllabic N/V pairs, 85 are diatonic (12.7%)

Predicting Diatones

	Predicted Diatonic	Predicted Isotonic
Attested Diatonic	62	23
Attested Isotonic	140	443

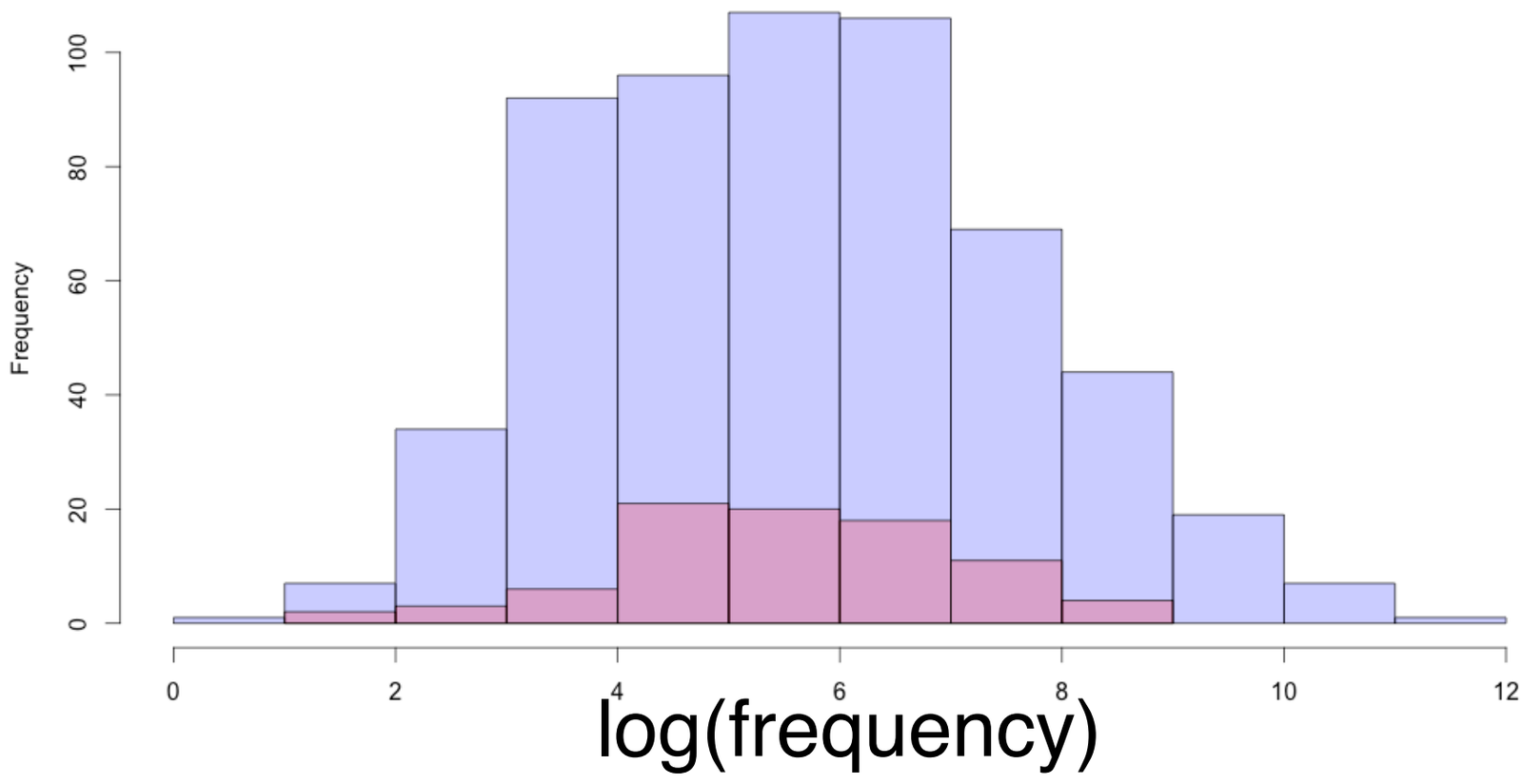
Fisher's exact test: $p<0.001$, odds ratio = 8.50

Lexical Frequency?

Predictor	Coef.	S.E.	*p*
(Intercept)	-3.470	0.688	<0.001 ***
log(Freq)	0.089	0.111	0.422
Halle (1998)	3.159	0.855	<0.001 ***
log(Freq) x Halle 1998	-0.179	0.141	0.204

Isotonic

Diatonic



*(2, 1)

- No N/V pair has ever surfaced as (2,1) but there are still plenty of 2 nouns (**today**) and 1 verbs (**follow**)
- If a word does not follow the structural description of a productive rule, then no amount of lexical similarity can trigger change
- This seems like a radical statement for proponents of analogy but the child language evidence for lexically based analogy is virtually non-existent (Berko 1958, Marcus et al. 1992, Xu & Pinker 1995, Clahsen et al. 2002, Yang 2002, Guasti 2004 …)

Baker's Paradox

a. John threw the ball to Bill.
   John threw Bill the ball.

b. John told Bill the story.
   John told the story to Bill.

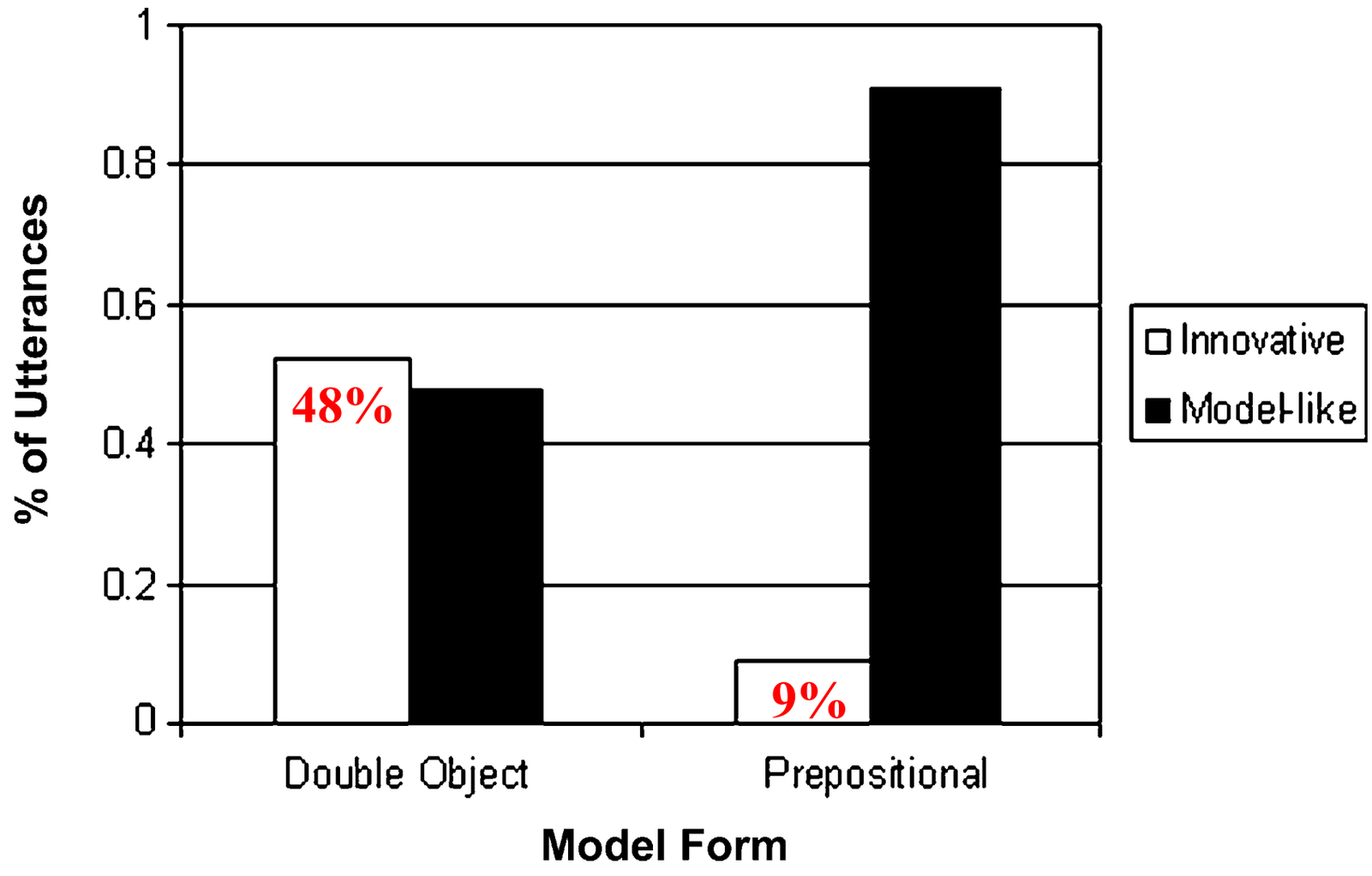
c. John pushed the tea to Mary.
   *John pushed Mary the tea.

d. John donated the painting to the museum.
   *John donated the museum the painting.

- How to generalize just enough? (I texted him my apology)

Extension

- I pilked the cup to Petey ⟹ I picked Petey the cup
- I gorped Toby the key ⟹ I gorped the key to Toby



Conwell & Demuth (2007, *Cognition*)

Dative Acquisition

- Pinker (1989): weakly conservative learning
- Broad Range Rules: semantic properties necessary for dative constructions
- Narrow Range Rules: subclasses with different productivity
  - “future giving”: offer, promise, bequeath, leave, refer, forward, allocate, guarantee, award, reserve …
  - “continuous causation of accompanied motion”: pull, carry, push, schelp, lift, lower, haul …
  - “telecommunication”: telegraph, fax, telephone, email, wire …

Datives cross linguistically

	Greek	English	Warlpiri	Hebrew	Icelandic	Mandarin	Yaqui	Fongbe
Give-type	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Future having	Yes	Yes	ND	Yes	Yes	Yes	ND	ND
Send-type	Yes	Yes	Yes	Yes	Yes	No	No	ND
Bring/take	Yes	Yes	Yes	Y/N	Yes	No	ND	ND
Throw-type	Yes	Yes	Yes	Yes	No	No	No	No
Push-type	No?	No?	No	No?	ND	No	ND	ND

Datives must be acquired inductively on specific linguistic data

Children do not learn datives instantly (Snyder & Stromsworld 1995)

Double Object and P Construction

- Two million words of child directed English
- Extracted all “dativizable” verbs from the list from Gropen et al. (1989) and Levin (1993)
- Manually documented whether a verb was used in Double Object and/or Prepositional Construction Construction at least once

50 DOC-able verbs

- **give, pass, hand, sell, pay, trade, lend, loan, serve, feed**
- **throw, toss**, flip, kick
- **send, mail, ship**
- **bring, take**
- **offer, promise, leave, refer, forward, allocate, guarantee**, award
- **tell, show, ask, teach**, **write, read**, quote
- **bake, make, build, cook, sew,** knit**, toss, fix, pour**
- **get, buy, find, steal, order,** win, earn, grab

Productivity of DOC

- N = 50 (e=**13**): 40 participate in DOC, **10** have not
  - DOC is a productive process in English
- DOC $\Longrightarrow$ PC: N=42, 40 participate in PC, **2** do not
  - Every DOC verb can be extended

*donate the museum the painting

- Latinate verbs generally don't participate in DOC: children show sensitivity to these morphological/phonological properties in novel verb extension tasks (Gropen et al. 1989)
- Only a tendency:
  - Latinate: **assign**, **advance**, **award**, **guarantee**, **reserve …**
  - Germanic: **shout, trust, lift, pick,** …
- Levin (1993): 70 Latinate verbs, only 10 participate in double object construction (cannot be studied with CDS)
  - Non-productivity is productive
  - **assign**, **advance**, **award**, **guarantee**, **reserve** are positive counterexamples that we lexicalize

Approaching Actuation

- We now have reasonable descriptions, possibly even theories, of how children learn languages
- Linguistic data for acquisition is finite and subject to sampling effects
- Children will arrive at a range of productive hypotheses (e.g., e<N/ln N), some of which will be ironed out, some will remain, including those that differ from the previous generation
- Examination of the statistical composition of historical data may give us clues of variants that got actuated