Phonological variation and generative linguistics

Katalin Balogné Bérces

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& Catholic University in Ružomberok (KU), Slovakia

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The present talk is a shortened and revised/updated oral version of BBK 2019. “Fonológiai variáció és generatív nyelvelmélet” [Phonological variation and generative linguistics]. Általános Nyelvészeti Tanulmányok XXXI: 29–56. (in Hungarian)

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Special thanks are due to a group of **doctoral students** at PPCU DSL who had originally inspired the idea of an elective seminar on *language variation in generative phonological theories*, and who, then, attended when it happened in 2017: ***Tamás Erdei, Ágnes Kalivoda, Ágnes Langó-Tóth, Ágnes Piukovics, Laura Menta Szilágyi and Bálint Tóth***. Our discussions **helped me** clarify/understand many aspects of the topic.
Please tell them that in 2024, I still remember them and acknowledge them, and that in this talk, unfortunately, there will not be a single mention of Imdlawn Tashlhiyt Berber ☺

Contents

"research methodology, e.g. theoretical and methodological issues"

→ how formal-generative phonological theory handles variation

(vs. usage-based approaches [see later] and variationist sociolinguistics)

- Background 1: forms of linguistic variation
- Background 2: the current landscape of phonological theory
- Inter-speaker variation and generative phonology
- Intra-speaker variation and generative phonology
- Conclusions

Background 1: forms of linguistic variation

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- (at least) two types of classification:
- (i) user-related vs. use-related variation:
  - **user-related variation**: dialects, sociolects, ethnolects: associated with geographical settings or social groupings: the habitual language of a particular user in a specific geographical or social context
  - **use-related variation**: spoken and written varieties, styles, registers: associated with particular communicative situations, purposes, or levels of formality (divisions within a single regional or standard variety)
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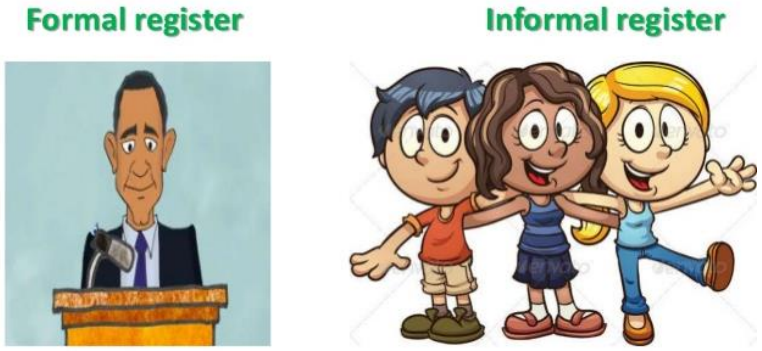

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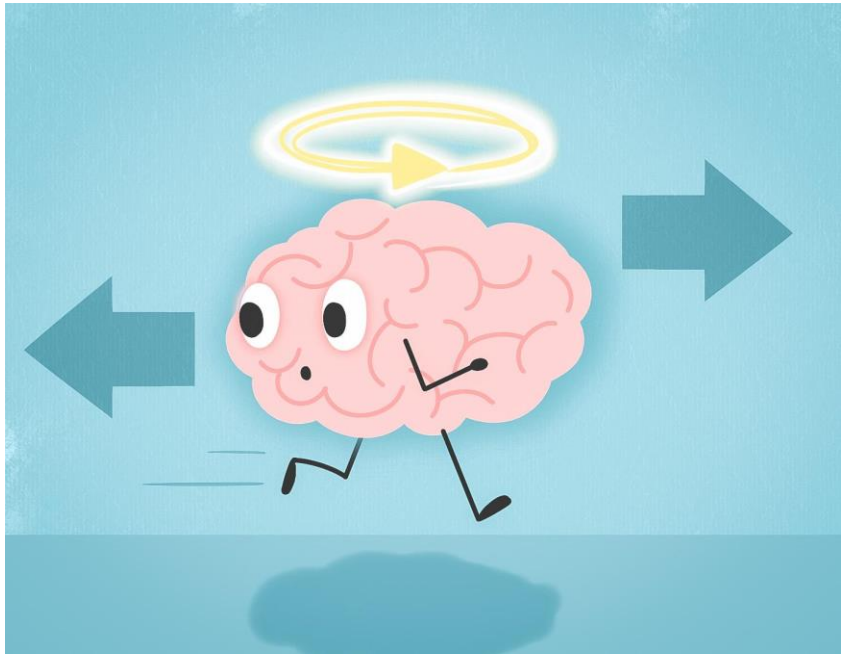

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  - but it is also common for the **same** speaker to apply regular **code-switching** between two dialects (e.g., a vernacular and a standard)

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inter-speaker vs. intra-speaker variation

Background 2: the current landscape of phonological theory

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- four strands in current phonological models (Honeybone 2011a; BBK – Honeybone 2020):
  - **Rule-Based Phonology**: linear rule format: "X becomes Y in the context of Z"
  - **Representation-Based Phonology**: let's draw diagrams ☺
  - **Constraint-Based Phonology**: constraint ranking
  - **Usage-Based Phonology**: lexical/textual frequency ⟶ exemplars; corpora + labphon + statistical evaluation; paradigms and analogy

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Background 2: the current landscape of phonological theory

- formal/generative/structural/theoretical ling's (~Chomsky):
- the *knowledge* that generates our potential outputs, not our *actual* outputs (recall Surányi (yesterday)), infinite creativity
- "Colorless green ideas sleep furiously" and "The slithy toves did gyre and gimble in the wabe" -- not detectable in corpora

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> Theoretical linguistics is thus faced with two questions (two problems?): how should it deal with inter-speaker variation and how should it deal with intra-speaker variation? Theoretical linguists of different persuasions have argued that both or neither or only one of these two should be taken into account as they work to figure out the nature of speakers' grammars.

(Honeybone 2011b)

Background 2: the current landscape of phonological theory

	Nominative	Genitive (m.s.)
Lob 'praise'	[loːp]	[loːbəs]
Bund 'federation'	[bʊnt]	[bʊndəs]
Weg 'path'	[veːk]	[veːgəs]
brav 'well-behaved'	[braːf]	[braːvəs]
Haus 'house'	[haʊs]	[haʊzəs]
Rap 'rap music'	[rap]	[rapəs]
bunt 'colourful'	[bʊnt]	[bʊntəs]
Rock 'skirt'	[rɔk]	[rɔkəs]
steif 'steif'	[ʃtaɪf]	[ʃtaɪfəs]
weiß 'white'	[vaɪs]	[vaɪsəs]

(Honeybone 2011a)


Genitiv
ins Wasser,
weil es
dativ ist.

[pun:] Geh nicht tief ins Wasser, weil es da tief ist.

Background 2: the current landscape of phonological theory

“batter”	[bǽr̩r]
“petal”	[pɛ́r̩l]
“atom”	[ǽrm̩]

Recall:

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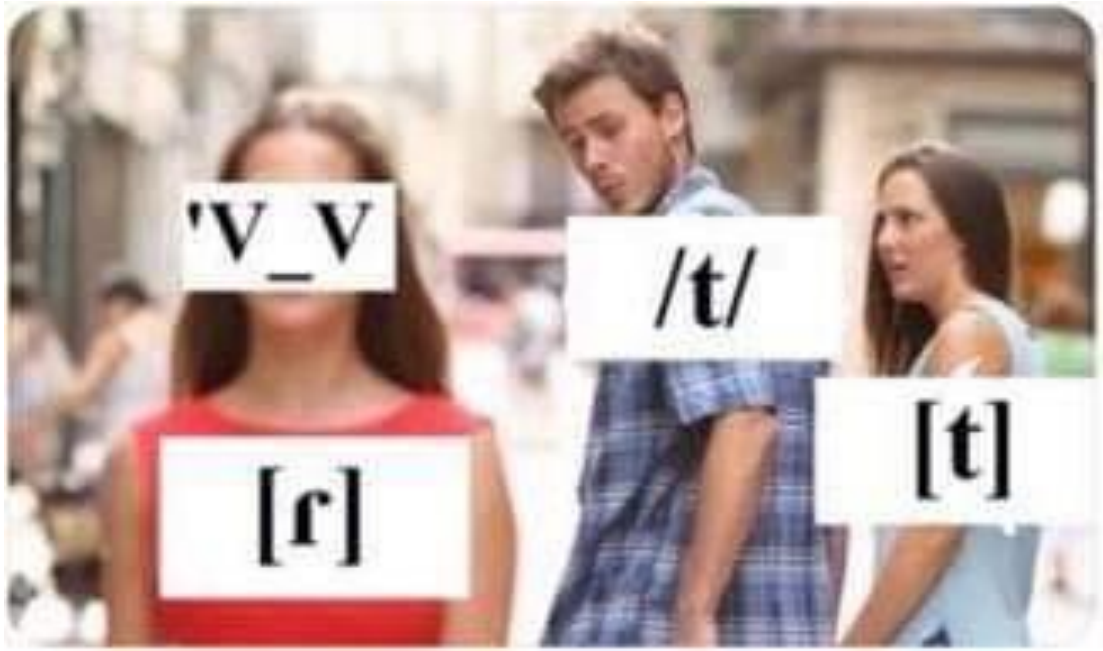
Background 2: the current landscape of phonological theory: Rule-Based Phonology

$$[+\text{ voice}] \rightarrow [-\text{ voice}] \ / \ \_\_\#$$

Background 2: the current landscape of phonological theory: Rule-Based Phonology

[+ voice] → [– voice] / __#



$$\begin{bmatrix} +\text{stop} \\ +\text{consonant} \\ +\text{alveolar} \end{bmatrix} \rightarrow [\text{ɾ}] \; / \; \begin{bmatrix} +\text{vowel} \\ +\text{stressed} \end{bmatrix} \_\_\_\_ \begin{bmatrix} +\text{vowel} \\ -\text{stressed} \end{bmatrix}$$

Background 2: the current landscape of phonological theory: Constraint-Based Phonology

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e.g., Optimality Theory (OT)

Background 2: the current landscape of phonological theory: Constraint-Based Phonology

*FINALOBSTRUENT/VOICE (*FOV),
= final obstruents may not be specified for [voice]

(Honeybone 2011a)

Background 2: the current landscape of phonological theory: Constraint-Based Phonology

*FINALOBSTRUENT/VOICE (*FOV),
= final obstruents may not be specified for [voice]

This conflicts with faithfulness constraints:

IDENT(voice)
= the value of [voice] must be the same in input and output

MAX
= everything in the input must have a correspondent in the output, ruling out deletion.

(Honeybone 2011a)

Background 2: the current landscape of phonological theory: Constraint-Based Phonology

input	A	B	C	D	…
candidate$_1$		*!			
☞ candidate$_2$			*	*	
candidate$_3$	*!				

A, B, C, D	constraints
*	violation of a constraint
*!	fatal violation
☞	optimal candidate
	irrelevant constraints for the evaluation of a candidate

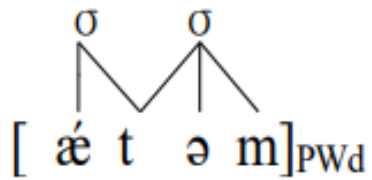
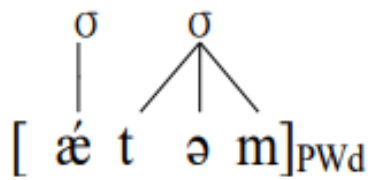
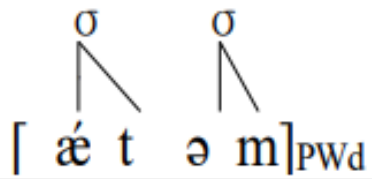
/bʊnd/	*FOV	MAX	IDENT(voice)
bʊnd	!*		
☞ bʊnt			*
bʊn		!*	

/bʊnd + əs/	*FOV	MAX	IDENT(voice)
☞ bʊn.dəs			
bʊn.təs			*
bʊ.nəs		!*	

(Honeybone 2011a)

Background 2: the current landscape of phonological theory: Constraint-Based Phonology

Tableau 5. atom [æɾəm]

candidates	ONSET	ALIGN-RIGHT	NOASP#	ATTRACT-C
☞a. 	*			
b. 	*			*!
c. 	**!			

(http://www.aellk.or.kr/datax/thesis/11496869050.pdf)

Background 2: the current landscape of phonological theory: Representation-Based Phonology

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e.g., Government Phonology (GP)

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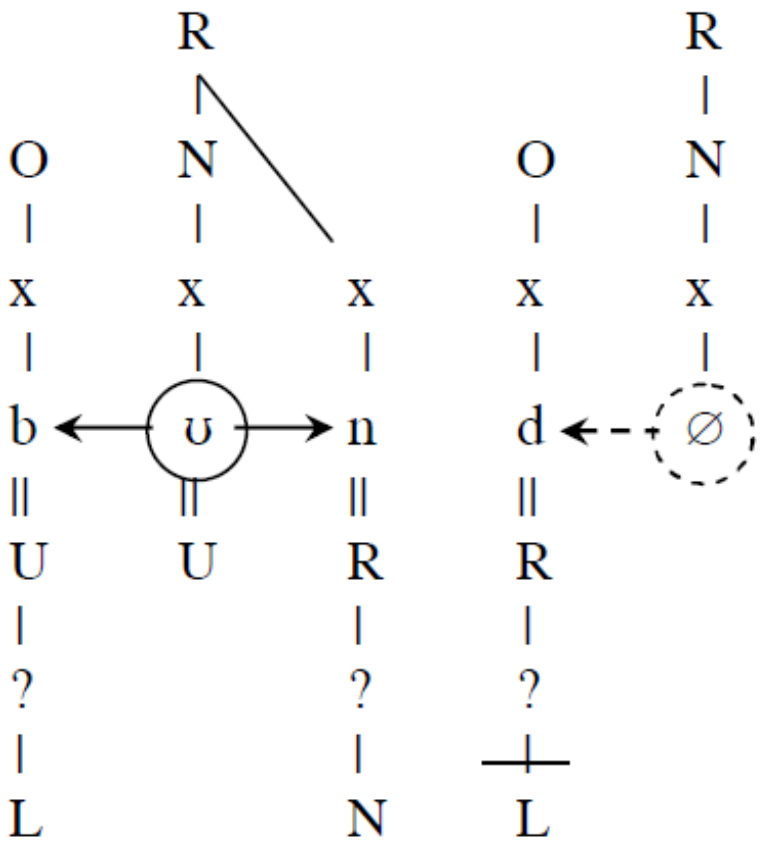


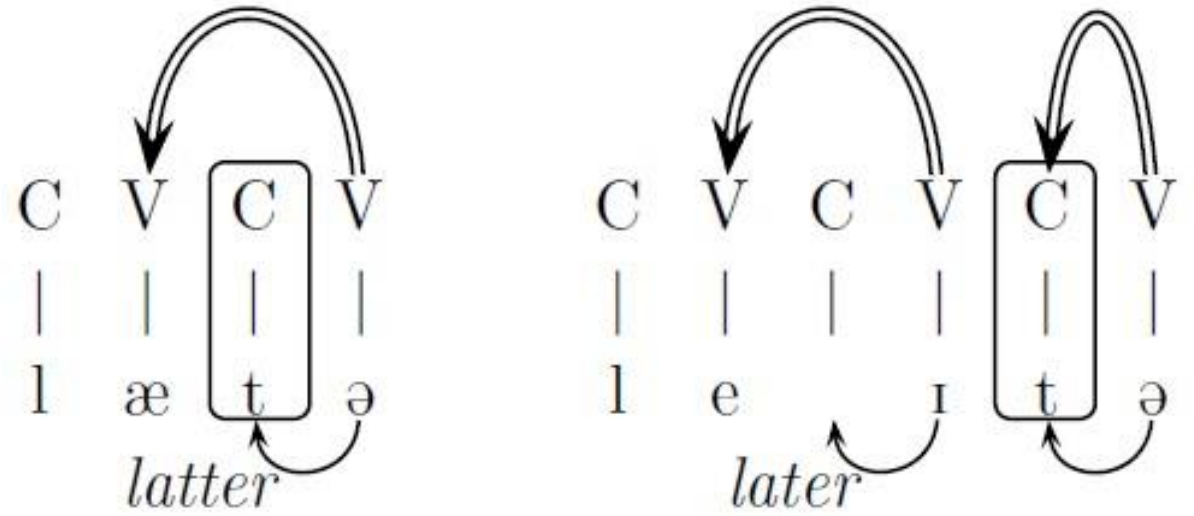
Direct licensing = circle
Licensing by DFEN parameter
Government licensing = arrows

← = 1 remove from direct licensed
←- = 1 remove from EN

(Honeybone 2011a)

Background 2: the current landscape of phonological theory: Representation-Based Phonology

(3)



(BBK 2015)

But…

- in many cases, phonological processes exhibit considerable variation
- "optional rules"
- e.g., tapping/flapping: both inter-speaker (dialectal) and intra-speaker (stylistic) variation
  - tapping/non-tapping
  - tapping to what extent?

Variation and generative phonology

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- Vaux (2008): [+optional]

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- **variable rules** (Labov 1969)

$$X \rightarrow (Y) \; / \begin{bmatrix} \alpha fea_i \\ \vdots \end{bmatrix} \begin{bmatrix} \underline{\quad} \\ \gamma fea_j \\ \vdots \end{bmatrix} \begin{bmatrix} \beta fea_k \\ \vdots \\ \delta fea_1 \end{bmatrix}$$

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- → software packages: Varbrul > Goldvarb; Rbrul
- (see OT(-like) models later)

Sali A. Tagliamonte **University of Toronto**

Goldvarb

Goldvarb Z: A multivariate analysis application for Macintosh
David Sankoff, Sali A. Tagliamonte, and Eric Smith (2018)

Goldvarb Yosemite: A multivariate analysis application for Macintosh
David Sankoff, Sali A. Tagliamonte, and Eric Smith (2015)

Goldvarb Lion: A multivariate analysis application for Macintosh
David Sankoff, Sali A. Tagliamonte, and Eric Smith (2012)

Goldvarb X: A variable rule application for Macintosh and Windows
David Sankoff, Sali A. Tagliamonte, and Eric Smith (2005)

A joint effort of:

Department of Linguistics, University of Toronto
Department of Mathematics and Statistics, University of Ottawa

(http://individual.utoronto.ca/tagliamonte/goldvarb.html)

RBRUL

by Daniel Ezra Johnson

"A tool such as Rbrul offers a compromise of the old and new that I believe will be widely used in the near future." – R. Harald Baayen

"Using mixed models and adding individual speaker as a random effect results in interesting, logical results for my data. The results are conservative, but I like that. If I don't use speaker as random, I get loads of extra factors as significant, but lots of these make no sense and simply can't be explained. This again gives me confidence in my conservative approach." – a satisfied customer

"I've been using it a lot and finding it so much easier than trying to do the same in R." – another satisfied customer

"Thanks Dan. You cast light upon my path into statistical wisdom." – another real testimonial

"I really like how you designed Rbrul. It is so user-friendly! And fast, too! Perhaps the best thing about using Rbrul is Dan's speedy responses to questions I pose to him. Thank you, Dan!" – more not-made-up feedback

"Rbrul is part of my life now." – an early (and apparently permanent!) adopter

Rbrul now has two versions, one with a text interface and one with a graphical (Shiny) interface. To access either one, first start R, then run the following command:

```
> source("http://www.danielezrajohnson.com/Rbrul.R")
```

(http://www.danielezrajohnson.com/rbrul.html)

Inter-speaker variation and generative phonology

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- generative grammar: the only true linguistic object is the **idiolect** – each speaker's own grammar
- but is it true that the analyses are **idiolectal**?
- recall final obstruent devoicing in *German*, tapping/flapping in *American English* – **dialectal**

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- in fact, Constraint-Based Phonology is inherently ***poly*lectal** (and is also suitable for modelling intra-speaker variation – see later)
- there even are **panlectal** concepts in use

(four corner points of approaches from Honeybone 2011b)

Inter-speaker variation and generative phonology

Lexical set item
FACE
GOAT
CHOICE
PRICE
MOUTH
NEAR
SQUARE
CURE

Inter-speaker variation and generative phonology

Lexical set item	AuE vowel	IE vowel/s
FACE	æɪ	e
GOAT	əʉ	o
CHOICE	ɔɪ ~ oɪ	ɔɪ
PRICE	ɑe	aɪ
MOUTH	æɔ	aʊ
NEAR	ɪə	ɪə(r)
SQUARE	ɛə	eə(r)
CURE	ʊə	ʊə(r)

(http://dx.doi.org/10.1111/j.1467-971X.2009.01623.x)

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SQUARE	ɛə	eə(r)
CURE	ʊə	ʊə(r)

/r/

English English speakers typically use [ɹ]
North American speakers may use [ɹ] or [ɻ]
Scottish speakers typically use [ɾ] and [ɹ]
(some) Northumbrian speakers (still) use [ʁ] (see Påhlsson 1972)
an increasing number of speakers in (especially South-Eastern) England use [ʋ]
(see Foulkes & Docherty 2000)

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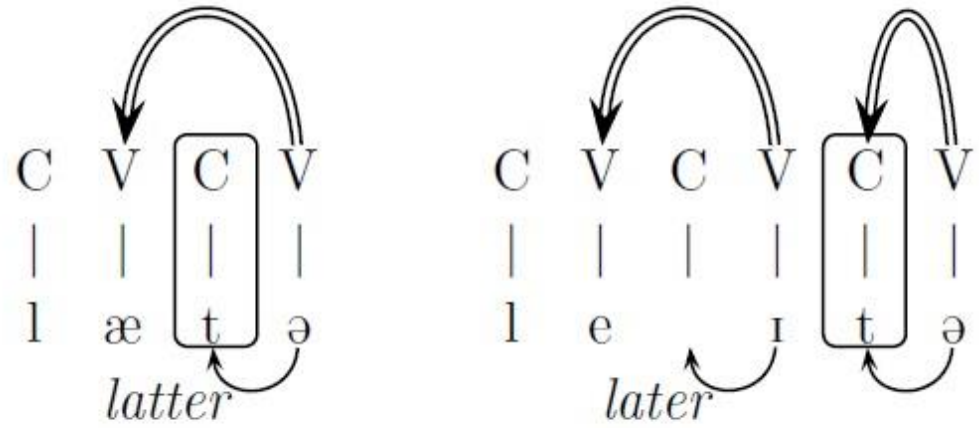
- in fact #2, many representation-based analyses are polylectal (UR)

(four corner points of approaches from Honeybone 2011b)

Inter-speaker variation and generative phonology

(3)



"subsystems"

Therefore, we expect exactly the same situation to hold: in a system in which government is dominant lenition will exhibit a wider distribution, with all governed consonants (= weak and semi-weak positions alike) lenit-ing. However, in a system where licensing is able to modify the effects of government, only governed C's (= the weak position, within the minimal domain) lenite; in licensed-governed C's (= the semi-weak position) leni-tion is inhibited.

(BBK 2015)

Inter-speaker variation and generative phonology

"subsystems"

[voice]	[voice]	[asp]	[asp]
spreading	spreading	spreading	no spreading
POD	no POD	no POD	no POD
Scots	Durham	Yorkshire	RP, GA, etc.

(adapted from BBK 2022)

Intra-speaker variation and generative phonology

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- minority view: intra-speaker variation occurs when a speaker has more than one grammar in their mind: **grammar competition** (*Multiple Grammars Theory*; Anttila 2007)

Intra-speaker variation and generative phonology: Constraint-Based Phonology

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- majority view: a single grammar, but
  - **partially ordered constraints** (see survey in Coetzee – Pater 2011) or floating constraints (Nagy – Reynolds 1997)

Intra-speaker variation and generative phonology: Partially Ordered Constraints

Crucial rankings, number of corresponding total orders, outcomes

Crucial rankings	*Total # rankings*	*Deletion produced?*		
		Pre-V	*Phrase-final*	*Pre-C*
a. MAX >> *CT	12	No	No	No
b. MAX-PRE-V >> *CT >> {MAX, MAX-FINAL}	2	No	Yes	Yes
c. MAX-FINAL >> *CT >> {MAX, MAX-PRE-V}	2	Yes	No	Yes
d. {MAX-PRE-V, MAX-FINAL} >> *CT >> MAX	2	No	No	Yes
e. *CT >> {MAX, MAX-PRE-V, MAX-FINAL}	6	Yes	Yes	Yes

(Coetzee – Pater 2011)

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  - **partially ordered constraints** (see survey in Coetzee – Pater 2011) or **floating constraints** (Nagy – Reynolds 1997)
  - **probabilistic models**: two basic types of solution:
    - OT constraint ranking + numerically valued constraints (Stochastic OT; Boersma 1997, Boersma – Hayes 2001)
    - constraint ranking replaced with constraint weighting, machine learning models (e.g., Maximum Entropy (maxent) models, (Noisy) Harmonic Grammar …)

OTSoft: Optimality Theory Software

Bruce Hayes
UCLA

bhayes@humnet.ucla.edu

Version 2.5 (current)

Last update to this page: April 11, 2021

Download version 2.5
Download beta version 2.6

OTSoft is a Windows program meant to facilitate analysis in Optimality Theory* and related frameworks by using algorithms to do tasks that are too large or complex to be done reliably by hand. The following functions are supported:

- constraint ranking
- constraint weighting for maxent grammars and Noisy Harmonic Grammars
- Gradual Learning Algorithm for Stochastic OT (original version and Magri-update)
- Noisy Harmonic Grammar
- diagnosis of failed constraint sets
- location of redundant constraints
- preparation of tableaux in text and HTML format
- factorial typology and t-orders
- algorithmic ranking argumentation
- conversion of input files to Praat format.

OTSoft was programmed primarily by Bruce Hayes, with contributions by Bruce Tesar and Kie Zuraw.

(https://linguistics.ucla.edu/people/hayes/otsoft/)

Intra-speaker variation and generative phonology: Stochastic OT

				0·624 ↓		
/haːdeːl-nAk/	IDENT-IO[bk]$_{rt}$	LOCAL [B]	LOCAL [ɛ]	LOCAL [eː]	DISTAL [B]	LOCAL [i]
0·624 ☞ a. haːdeːl-nɛk		*			**	
b. haːdeːl-nɔk		*		*!	*	
c. haːdaːl-nɔk	*!					

					0·376 ↓	
/haːdeːl-nAk/	IDENT-IO[bk]$_{rt}$	LOCAL [B]	LOCAL [ɛ]	DISTAL [B]	LOCAL [eː]	LOCAL [i]
a. haːdeːl-nɛk		*		**!		
0·376 ☞ b. haːdeːl-nɔk		*		*	*	
c. haːdaːl-nɔk	*!					

(Hayes – Londe 2006)

Intra-speaker variation and generative phonology: Noisy Harmonic Grammar

	/…nk…/	AGR[place] 133.82	MAX[alv] 66.18	DEP[vel] 66.18	DEP[lab] −27.43	*H*
a.	i. …nk…	−1				−133.82
	ii. …ŋk…		−1	−1		−132.36
b.	/…np…/					
	i. …np…	−1				−133.82
	ii. …mp…		−1	−1	−1	−133.36

(Coetzee 2016)

Intra-speaker variation and generative phonology: Noisy Harmonic Grammar

$$H(\text{Cand}) = \sum_{i=1}^{n} (w_i + nz_i)\, C_i(\text{Cand})$$

where C_i is the ith constraint, w_i is the weight of this constraint, nz_i is the noise associated with C_i at a given evaluation and C_i(Cand) is the number of C_i-violations of candidate Cand, expressed as a negative integer.

(Coetzee 2016)

Conclusions

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- complemented by usage-based theories + variationist sociolinx
- Constraint-Based Phonology is inherently polylectal
- … but is also suitable for modelling intra-speaker variation (probabilistic, stochastic models): variation is sometimes more of an incentive than an impediment ☺
- frequent (implicit) polylectalism in representational analyses
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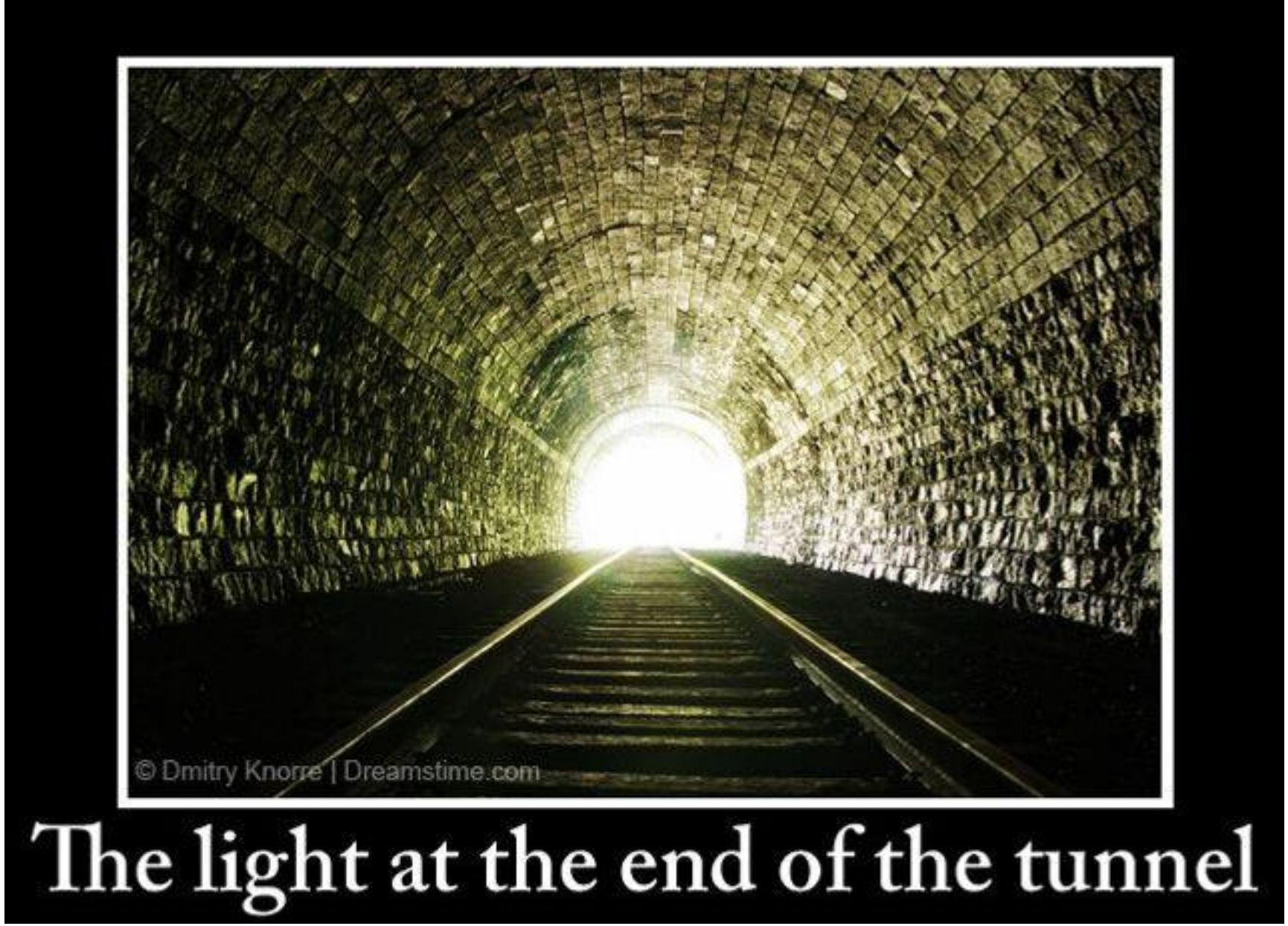
- frequent (implicit) polylectalism in representational analyses
- (perhaps even more so in substance-free approaches)
- we may have been considering / accounting for variation throughout ☺
- "research methodology, e.g. theoretical and methodological issues" – ??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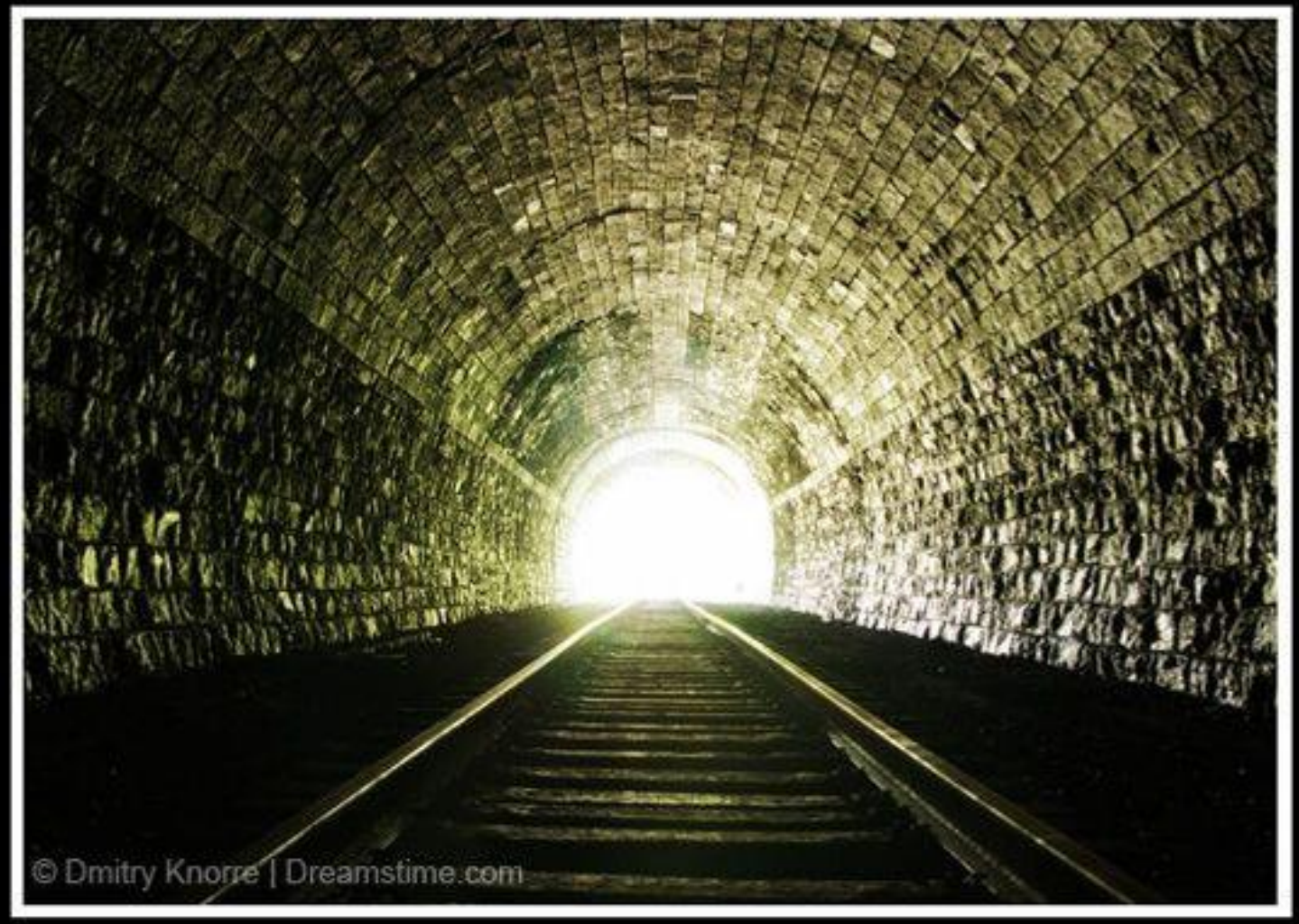
The light at the end of the tunnel



The light at the end of the tunnel

may be an oncoming train

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