Balancing Leveling and Cobbled URs

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Problem Statement

"*The problem for the linguist, as well as for the child learning the language, is to determine from the data [. . .] the underlying system of rules*" (Chomsky 1965:4)

- Linguistic theory is concerned with adult knowledge of language and how it is acquired.

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- We have some working learning algorithms in syntax and phonology.
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  - Tesar and Prince (2007), Jarosz (2006), Heinz (2010), Hayes and Wilson (2008).

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  - Yoshinaka and Clark (2010), Clark, Eyraud and Habrard (2008)
  - Tesar and Prince (2007), Jarosz (2006), Heinz (2010), Hayes and Wilson (2008).
- We can improve our algorithms with historical data (Niyogi 2006, Albright 2002).
  - Systems that persist are presumably learnable.
  - Systems that change may be outside of learners' formal capacity (among other possibilities).

Single Surface Base Hypothesis

- Albright (2002; 2008b; 2010 *inter alia*) proposes the single surface base hypothesis.
1. Paradigms are derived from a single cell.
2. The cell is selected early in phonological learning, and retained.
3. The maximally informative (least neutralized) cell is chosen.

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- Supported by evidence from language change.

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buráf	burav-í
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ganáʃ	ganaʃ-í
ʃúrf	ʃurf-í
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kaʃél	kaʃil-í

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- Any unpredictable alternation from nom.pl is prone to change .

Evidence for the theory

- Latin *honor* analogy (Kiparsky 1971, Kenstowicz 1996, Albright 2002; 2005)

Old Latin		Classical Latin
honoːs	>	honor
honoːris	>	honoːris

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- Classical Latin [r] was not the result of sound change.
- One surface allomorph "took over" remainder of paradigm.
- Also successfully applied to:
  - Yiddish paradigm levelling (Albright 2004; 2008b; 2010)
  - Korean alternation propagation (Albright 2008a, Albright and Kang 2008)
  - Lakhota alternation propagation (Albright 2002; 2008c)

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Empirical Problem

- The schematic example wasn't fake. It is Russian.

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- Changing direction on a per-paradigm basis won't work . . .

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Cobbled URs

- Many stems undergo both devoicing and reduction.
- This requires a **cobbled UR** (Kenstowicz and Kisseberth 1977).
  - Consult different cells for contrastive segments.
 - → UR is different from all cells.

Form	Cell	Neutralization
pirók	nom.sg	devoicing
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- Elegant cobbled UR analysis:

$$/pir\ o\ g/$$

$$[pir\ ó\ k] \qquad\qquad [pira\ g\ \text{-}í]$$
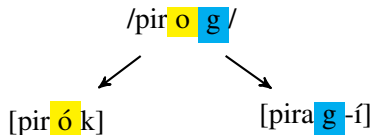
Stating the problem

- We must resolve an apparent contradiction:
- Evidence that learners consult multiple cells (cobbled URs).
- Evidence that learners consult a single cell (single base).

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3 Decisive cell re-interpreted from Albright's work.
    - Other cells are not derived from this cell. They are derived from a UR.
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    - The decisive cell is selected as Albright has proposed.
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- Up next, walk through 1 using Russian as an example.

OT learning

- Goal is to identify grammars from data.
    - A grammar is a ranking of constraints (markedness and faithfulness).
    - Data is a corpus of "paradigm labeled" (glossed and segmented) surface forms.

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    - A grammar is a ranking of constraints (markedness and faithfulness).
    - Data is a corpus of "paradigm labeled" (glossed and segmented) surface forms.
- Constraint ranking is written $C_1 \gg C_2$
- This abbreviates an Elementary Ranking Condition (ERC, Prince 2002):

	C_1	C_2
winner vs loser	W	L

- $C_1 \gg C_2$ because C_2 favors a loser and C_1 favors a winner.
- C_1 clearly must have precedence, or a loser will win.
- There must be at least one W that can outrank all L's in an ERC (Brasoveanu and Prince 2011)

Inference from data

- The goal is to extract ERCs from the data.
- Our data consists of surface forms, broken into allomorphs of morphemes.
- The data provides two flavors of ERC:
1 If an SR violates markedness m, it must be dominated.
    - Surface forms $\rightarrow$ markedness = L (dominated markedness).
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- Learner will consider every faithfulness setting suggested by alternations (Tesar and Prince 2007).
- Discard settings that are inconsistent with the baseline (Brasoveanu and Prince 2011).

Russian Problem

- Goal: take the following data

nom	gen	Gloss
vrát͡ʃ	vrat͡ʃ-á	'doctor'
vrák	vrag-á	'enemy'
stól	stal-á	'table'
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- And induce the following analysis:

/pir o g /   Reduction, devoicing

[pir ó k]   [pira g -á]

Step 1: Initial Rankings

- Available constraints:

Alternation	Markedness	Faithfulness
voicing	*D#, *VTV	Id-voi
height	*o , *á	Id-lo

- Step 1: make sure surface forms are legal.
    - Assume UR = SR (so at least faithfulness assigns W).
    - Use *contenders(UR)* to find all relevant candidates (Riggle 2004).

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a. ☞	vrat͡ʃ-á						
b.	vrad͡ʒ-á	L		W			

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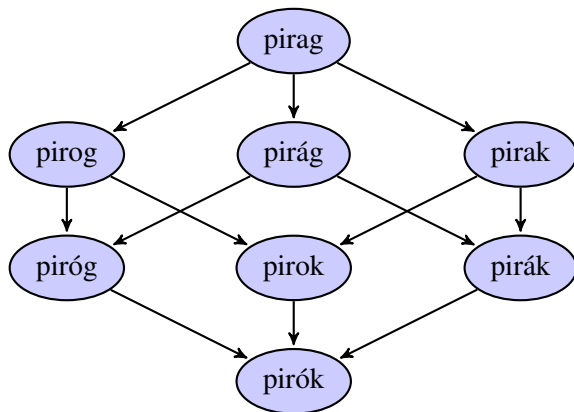 | Alternation | Markedness | Faithfulness |
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b. vrad͡ʒ-á		L		W			
c. vrat͡ʃ-ó						L	W

13

Problem
○○○○○○○
Proposal Pt I
○○○○●○○○○○○○
Proposal Pt 2
○○
Yiddish Levelling
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Odawa
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Conclusion
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- ID-LO ≫ *á ... "no raising"
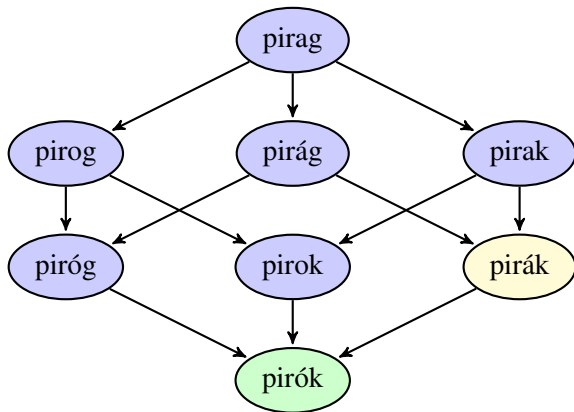- ID-VOI ≫ *VTV ... "no inter-V voicing"

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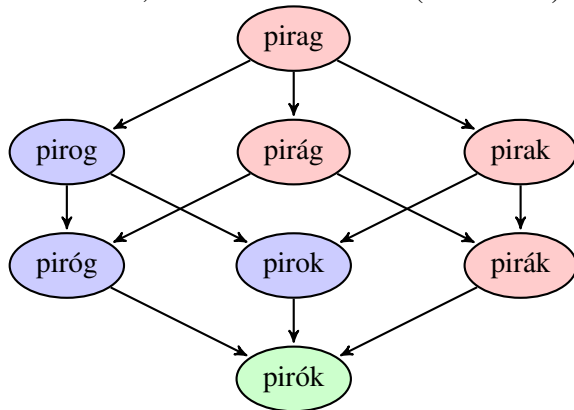- But could the [a] ~ [ó] alternation come from underlying [á]?

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Testing /pirák/ → [pirók]

- Given the phonotactic rankings, underlying /á/ cannot be a source for [ó].

pirák	*VTV	*D#	ID-VOI	*o	*á	ID-LO
a. ☺ pirók						*
b. pirák					W	L
c. *inter-v voi	L		W			
d. *raising					L	W

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$/g/ \rightarrow [k]$

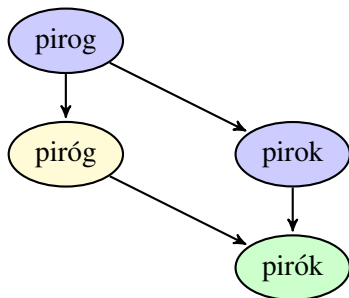- In fact, no UR with /a/ works (Tesar 2013).

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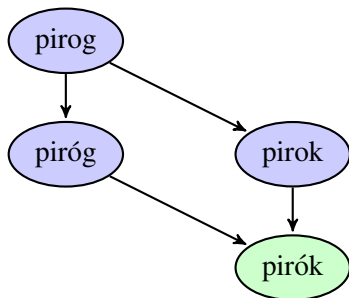
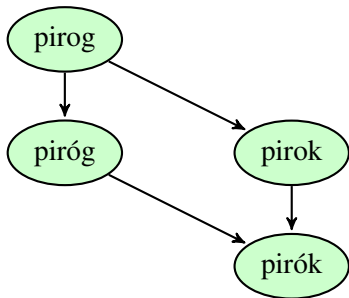- In fact, no UR with /a/ works (Tesar 2013).

- But could [k] be derived from /g/?

Testing /piróg/ → [pirók]

- The phonotactic rankings do not rule out devoicing.

	piróg	*VTV	*D#	ID-VOI	*o	*á	ID-LO
a. ☞	pirók						
b.	piróg		W	L			
c.	*inter-v voi	L		W			
d.	*raising					L	W

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- The [ó] in *pirók* must be underlyingly mid.
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$\quad$ piróg

$\quad$ pirok

$\quad$ pirók

18

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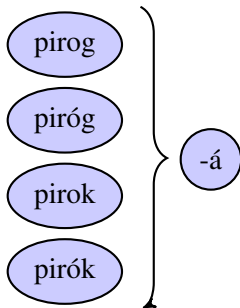- We now need to check with *pirag-á* .

pirog

piróg
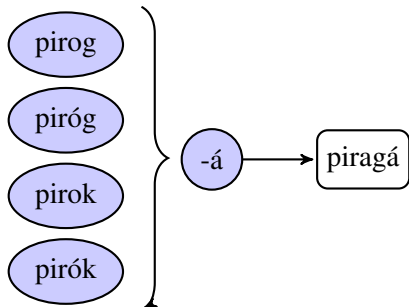
pirok   -á

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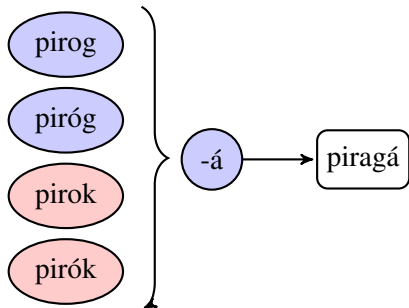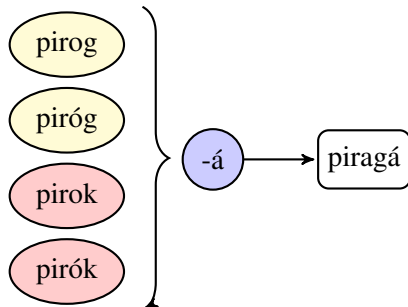
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/pirog-á/ → [piragá]

pirog-á	*VTV	*D#	ID-VOI	*o	*á	ID-LO
a. ☞ piragá						
b. pirogá				W		L
c. devoice		W	L			
d. *inter-v voi	L		W			
e. *raising					L	W

- There is a consistent ranking and UR set for *pirók*, *piragá*
- *D# ≫ ID-VOI ≫ *VTV (devoice, not inter-V voicing)
- *o ≫ ID-LOW ≫ *á (reduce, not raise)
- Underlying *piróg*, *pirog*

Russian Wrap-up

- The goal has been met:

$$/pir\ \text{o}\ \text{g}/ \quad \text{Reduction, devoicing}$$

[pir ó k]   [pira g -á]
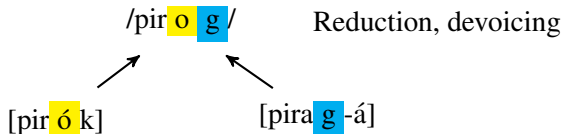
- The phonotactics left room for rankings that drive alternations.
- Consulting each form set contrastive features in the UR.

Key Ideas

- For Russian, only the ability to uncover cobbled URs was needed.
  - Fragility of OT, decisive form were not needed.
  - But they matter for cases of levelling.

- In my model, the paradigm is not derived from the decisive cell.
  - It is a filter for the UR space.
  - Whatever happens, URs must be mappable to the decisive cell.
  - Implemented as testing UR $\rightarrow$ SR maps on decisive form first.

- If OT can't handle the system, the UR will reflect the decisive cell.

Local Summary

- In sum, my theory:
    - Seeks contrastive segments in multiple forms of the paradigm.
    - Limits URs to just those that can map to the decisive form.
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- Up next: an examination of one of the cases adduced in support of the single surface base hypothesis.

Yiddish: Albrightian Levelling

Precursor to Levelling

- Middle High German innovated schwa apocope (King 1976, Albright 2008b)
  - Opacating earlier open σ lengthening, word-final devoicing

'praise'	'praise-nom.pl'	
/lob/	/lob-ə/	UR
lop	—	Devoicing
—	loːbə	Open σ Lengthening
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[lop]	[loːb]	

- The next generation had no evidence to motivate /-ə/.
    - This is a hopeless phonology problem.
    - Even if you consult both paradigm members to make a cobbled UR, the alternations don't make sense

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Fallout from MHG

- Response to unsolvable problem: levelling
  - (Sapir 1915, King 1976, Albright 2002; 2008b; 2010)

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saɡ-st	>	*s aː ɡ-st	>	zɔk-st	'say-2.sg'
s aː ɡ-(ə)	>	*saːɡ	>	zɔɡ	'say.1.sg'

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saːg-(ə)	>	*saːg	>	zɔg	'say.1.sg'

- Plural and 1.sg are the "decisive cells" for our model.
    - Albright's work shows they were least neutralized cells.

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Actuating Levelling

- Phonotactic rankings from MHG after apocope (for more, see Albright 2008b)
    - Id-long ≫ *V:C(C)]$_\sigma$ (V: in lo:b is legal)
    - Id-voi ≫ *D# (b# in lo:b is legal)

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- First test possible URs for decisive cell [lo:b] (pl):
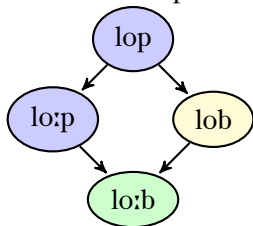
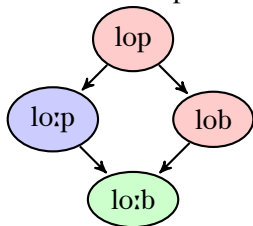| lob	ID-VOI	*D#	ID-LONG	*V:C(C)]$_\sigma$
a. ☺ lo:b		*	*!	*
b. ☞ lob		*		

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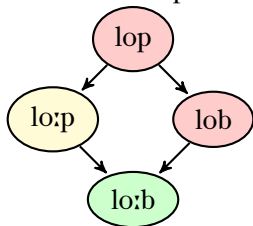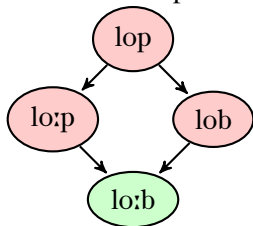| lo:p	ID-VOI	*D#	ID-LONG	*V:C(C)]$_\sigma$
a. ☺ lo:b	*!	*		*
b. ☞ lo:p				*

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Actuating Levelling

- Phonotactic rankings from MHG after apocope (for more, see Albright 2008b)
    - Id-long $\gg$ *Vː C(C)]$_\sigma$ (Vː in loːb is legal)
    - Id-voi $\gg$ *D# (b# in loːb is legal)
- First test possible URs for decisive cell [loːb] (pl):

Actuating Levelling II

- The only viable UR /loːb/ can't map to singular [lop] given rankings:

loːb	ID-VOI	*D#	ID-LONG	*VːC(C)]$_\sigma$
a. ☹ lop	*(!)		*(!)	
b. ☞ loːb		*		*

- There are no alternatives. The singular will surface as [loːb].

Actuating Levelling II

- The only viable UR /loːb/ can't map to singular [lop] given rankings:

loːb	ID-VOI	*D#	ID-LONG	*VːC(C)]$_\sigma$
a. ☹ lop	*(!)		*(!)	
b. ☞ loːb		*		*

- There are no alternatives. The singular will surface as [loːb].
- The change need not happen overnight. MHG forms could be stored as irregulars and only eventually succumb to the pressures of the grammar-UR combination.

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Diagnosis

- The opacity of MHG made former allophones contrastive.
- OT is too fragile to find the "right" analysis.
- When the model encountered the phones in the decisive cell, they became part of the UR.
- The long vowels and voicing then surfaced everywhere in the paradigm.
- This is not a new perspective for the Yiddish facts.
  - Kiparsky (1968), King (1969; 1976), Albright (2008b; 2010) recognized that opacity was a potential trigger for change.

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Local Summary

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- Using OT, a break down was inevitable.
- Levelling is a result imposed by the model during a break down.

Local Summary

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- Using OT, a break down was inevitable.
- Levelling is a result imposed by the model during a break down.
- Up next, evidence that even during a breakdown, cobbled URs are calculated.
- That is: levelling that goes beyond the single surface base hypothesis

Odawa: Cobbled Levelling

Setting the Stage

- Focus on Odawa after ca 1938.

Old Odawa	17th - 19th centuries
	(Baraga 1878, Blackbird 1887)
↓	
Increased Reduction	1912
	(Sapir, in Rhodes 2008)
↓	
Transitional Odawa	1938
	(Bloomfield 1957)
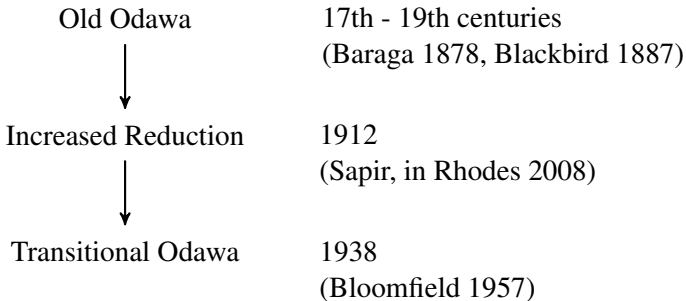
- "The vowels are ... *never* silent" (Baraga 1878:4, emph. orig.).

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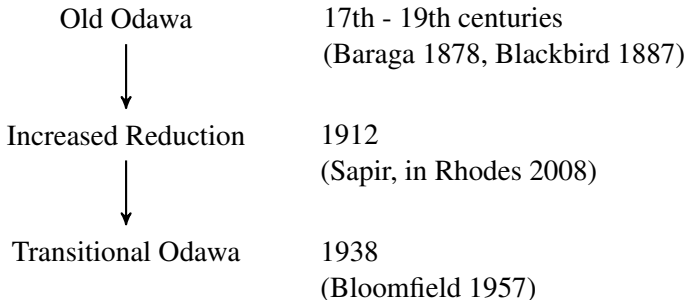
- "The vowels are ... *never* silent" (Baraga 1878:4, emph. orig.).
- "The reduced vowels are rapidly spoken and often whispered or entirely omitted" (Bloomfield 1957:5).

Rhythmic Syncope

- Core generalization: dramatically reduce unstressed vowels
  (Bloomfield 1957, Kaye 1973, Piggott 1983).

- $(\sigma \, \acute{\sigma}) \quad \rightarrow \quad (\_ \, \acute{\sigma})$
  (nɪkʌ́) \qquad (n̩kʌ́) 'goose'

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  (nɪkʌ́)   (n̩kʌ́) 'goose'

- Though it is severe reduction at this phase, will treat it as categorical deletion.

  - Assumed that learners did so too.

Intermediate Level Needed

'book'	'my book'	
/mʌzɪnʌʔɪgʌn/	/nɪ-mʌzɪnʌʔɪgʌn/	UR
(mʌzí)(nʌʔí)(gʌ́n)	(nɪmʌ́)(zmʌ́)(ʔɪgʌ́n)	Stress
(m_zí)(n_ʔí)(gʌ́n)	(n_mʌ́)(z_nʌ́)(ʔ_gʌ́n)	Syncope
[mzínʔígʌ́n]	[nmʌ́znʌ́ʔgʌ́n]	SR

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	'book'	'my book'	
	/mʌzɪnʌʔɪgʌn/	/nɪ-mʌzɪnʌʔɪgʌn/	UR
	(mʌzí)(nʌʔí)(gʌ́n)	(nɪmʌ́)(zmʌ́)(ʔɪgʌ́n)	Stress
	(m‿zí)(n‿ʔí)(gʌ́n)	(n‿mʌ́)(z‿nʌ́)(ʔ‿gʌ́n)	Syncope
	[mzínʔígʌ́n]	[nmʌ́znʌ́ʔgʌ́n]	SR

- Vowel deletion depends on feet.
- But deletion destroys the feet.
- An intermediate representation guides unstressed vowel avoidance.

Classic OT Fails

- Classic OT lacks intermediate representations, so stress-before-deletion is impossible (Kager 1997).
- An OT learner cannot acquire the system.

Classic OT Fails

- Classic OT lacks intermediate representations, so stress-before-deletion is impossible (Kager 1997).
- An OT learner cannot acquire the system.
- Classic OT simultaneously applies footing and syncope.
  - Unstressed vowel avoidance spurs FTBIN violations.
  - But there are many ways to foot a word into degenerate feet.

mʌzɪmʌʔɪgʌn	*WEAKV	FTBIN	MAX-V
a. ☞ (mzín)(ʔí)(gán)		***	**
b. (mʌzí)(nʌʔí)(gán)	**!	*	
c. (mʌ́)(zí)(nʌ́)(ʔí)(gán)		****!*	
d. ☹ (mʌ́z)(nʌ́ʔ)(gán)		***	**

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Levelling

- The response to this problem: levelling (Rhodes 1985a; 1985b).
- Noun and verb paradigms were rebuilt off of unprefixed forms.

T. Odawa		New Odawa	
n̥-bíz̥géːʃín	>	ndʌ- bzʊgeːʃm	I stumble
b̥zʊ́géʃín	>	bzʊgeːʃm	He stumbles
n̥-mʌ́k̥zín	>	ndʌ- mkɪzɪn	'my shoe'
m̥kízín	>	mkɪzɪn	'shoe'

35

. . . And Cobbled

- And yet, prefixed forms still could contribute segments:

T. Odawa		New Odawa	
n̠dóː-d͡ʒéːp í z̠	>	ndʌ-d͡ʒeːp ɪ z̠	I am lively
d͡ʒéːp̠zí-d	>	d͡ʒeːp̠zɪ-d	If he is lively

. . . And Cobbled

- And yet, prefixed forms still could contribute segments:

T. Odawa		New Odawa	
n̲-dóː-d͡ʒéːp í z̲	>	ndʌ-d͡ʒeːp ɪ z̲	I am lively
d͡ʒéːp̲-zí-d	>	d͡ʒeːp̲-zɪ-d	If he is lively

- About 400 more examples, including:

ndʌ-biːndgeːb ɪ z	biːndgeːbzʊ-d	zip inside
ndʌ-bkʊd ʌ b	bkʊdbɪ-d	perch
ndʌ-nd͡ʒ ɪn ʌ z	nd͡ʒɪnzʊ-d	dispute

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A closer look

- Prefixed forms contributed to penultimate syllable when followed by short, open syllable.

	d͡ʒ	eː	p	**ɪ**	z	**ɪ**			New Odawa UR
	d͡ʒ	eː	p		z	**ɪ**	d	T. Odawa SR
ndoː	d͡ʒ	eː	p	**ɪ**	z			T. Odawa SR

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	d͡ʒ	eː	p		z	ɪ	d	T. Odawa SR
ndoː	d͡ʒ	eː	p	ɪ	z			T. Odawa SR

- To generate the SRs from such a UR, two processes are needed:

'I am lively'	'If he is lively'	
/ndʌ-d͡ʒeːpɪzɪ/	/d͡ʒeːpɪzɪ-d/	UR
ndʌd͡ʒeːpɪz‿	—	Apocope
—	d͡ʒeːp‿zɪd	2-sided open σ syncope
[ndʌd͡ʒeːpɪz]	[d͡ʒeːpzɪd]	SR

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	d͡ʒ	eː	p	**ɪ**	z	**ɪ**		New Odawa UR
	d͡ʒ	eː	p		z	**ɪ**	d	T. Odawa SR
ndoː	d͡ʒ	eː	p	**ɪ**	z			T. Odawa SR

- To generate the SRs from such a UR, two processes are needed:

'I am lively'	'If he is lively'	
/ndʌ-d͡ʒeːpɪzɪ/	/d͡ʒeːpɪzɪ-d/	UR
ndʌd͡ʒeːpɪz‿	—	Apocope
—	d͡ʒeːp‿zɪd	2-sided open σ syncope
[ndʌd͡ʒeːpɪz]	[d͡ʒeːpzɪd]	SR

- Both are independently needed in New Odawa

  - /ndʌ-waːbaːnzʊ/ → [ndʌ-waːbaːnz‿] 'I am white'
  - /aːnʌk-ʌg/ → [aːn‿kʌg] 'brown thrashers'

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Cobbled Lexicon

- Assume apocope and new syncope.
- Assume unprefixed forms are decisive cell.
- The following UR is certainly available:

	d͡ʒ	eː	p	**ɪ**	z	**ɪ**		New Odawa UR
	d͡ʒ	eː	p		z	**ɪ**	d	T. Odawa SR
ndoː	d͡ʒ	eː	p	**ɪ**	z			T. Odawa SR

- Including the penult vowel doesn't hurt generation of decisive cell.
  - ✓ /d͡ʒeːp**ɪ**zɪ-d/ → d͡ʒeːpzɪ-d
- And the penult vowel helps generation of prefixed forms.
  - ✓ /ndʌ-d͡ʒeːp**ɪ**zɪ/ → ndʌ-d͡ʒeːp**ɪ**z
- Cobbled UR is good.

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	d͡ʒ	eː	p		z	ɪ	d	T. Odawa SR
ndoː	d͡ʒ	eː	p	ɪ	z			T. Odawa SR

- Including the penult vowel doesn't hurt generation of decisive cell.

    ✓ /d͡ʒeːp ɪ zɪ-d/ → d͡ʒeːpzɪ-d

- And the penult vowel helps generation of prefixed forms.

    ✓ /ndʌ-d͡ʒeːp ɪ zɪ/ → ndʌ-d͡ʒeːp ɪ z

- Cobbled UR is good.
- *Learners took vowels from Transitional prefixed forms when they didn't hurt generation of unprefixed forms.*

Concrete Lexicon

- In all other environments, vowels from prefixed forms hurt generation of unprefixed forms.

	m	Λ	k	ɪ	z	ɪ	n	UR
	m		k	ɪ	z	ɪ	n	SR 1
n-	m	Λ	k		z	ɪ	n	SR 2

- The cobbled UR:

    X /mΛkɪzɪn/ → mΛk_zɪn

- The identity UR:

    ✓ /mkɪzɪn/ ⇒ mkɪzɪn

- Identity UR is good.

Summary of Odawa

- Decisive cell was unprefixed.
- Learners had a terrible grammar.
  - All it could do was apocope and phonotactic syncope.
- To always generate unprefixed forms (decisive cell), they had to change the lexicon.
  - Threw out vowels present only in prefixed forms.
  - Hence the massive leveling of alternations.
  - Yet the learners didn't give up, and cobbled as much as they could.

Broad Conclusion

- History can be capricious, but there is enough reason that post-dicting it is a valuable testing ground:

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"*Language change is for the linguist [. . .], what earthquakes and volcanic eruptions are for the geologist, or supernovae for the astronomer. They add welcome new perspective in a field where the object of study is static [. . .]. Just as the careful analysis of earthquakes may reveal something about the earth's interior, so careful analysis of linguistic changes may reveal otherwise inaccessible aspects of linguistic structure.*" (Kiparsky 1970:314)

Narrow Conclusion

- The problem: how to reconcile evidence for single surface basism with need for cobbled URs.
- Both traditional phonology and Albright are correct.
    - Reconstrue the single surface base hypothesis as a criterion of adequacy on UR selection.
    - Make constructive use of OT's inability to handle opacity.
    - The correct deployment of these methods yields a workable solution.

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  - Make constructive use of OT's inability to handle opacity.
  - The correct deployment of these methods yields a workable solution.

- Cobbled URs are only possible when a complete phonological analysis is available (see also Bermúdez-Otero in prep; 2014)

References I

Albright, A. (2002). The Identification of Bases in Morphological Paradigms. Ph. D. thesis, University of California, Los Angeles.

Albright, A. (2004). Sub-optimal paradigms in Yiddish. In V. Chand, A. Kelleher, A. Rodríguez, and B. Schmeiser (Eds.), WCCFL 23, pp. 1–14. Cascadilla Press.

Albright, A. (2005). The morphological basis of paradigm leveling. In L. Downing, T. Hall, and R. Raffelsiefen (Eds.), Paradigms in Phonological Theory. Oxford University Press.

Albright, A. (2008a). Explaining universal tendencies and language particulars in analogical change. In J. Good (Ed.), Language Universals and Language Change. Oxford University Press.

Albright, A. (2008b). Inflectional paradigms have bases too: Evidence from Yiddish. In A. Bachrach and A. Nevins (Eds.), The Bases of Inflectional Identity. Oxford University Press.

Albright, A. (2008c). A restricted model of UR discovery: Evidence from Lakhota. MIT manuscript.

References II

Albright, A. (2010). Base-driven leveling in Yiddish verb paradigms. Natural Language and Linguistic Theory 28, 475–537.

Albright, A. and Y. Kang (2008). Predicting innovative variants in Korean verb paradigms. In Proceedings of CIL18: The 18th International Congress of Linguists.

Baraga, F. (1850 [1878]). A Theoretical and Practical Grammar of the Otchipwe Language (Second ed.). Beauchemin and Valois.

Bermúdez-Otero, R. (2014). French adjectival liaison: Evidence for underlying representations. Handout Given at Oxford University.

Bermúdez-Otero, R. (In prep). Stratal phonology: Arguments for cyclic containment, morphological implications. University of Manchester ms.

Blackbird, A. J. (1887). History of the Ottawa and Chippewa Indians of Michigan; A Grammar of their Language and Personal and Family History of the Author. Ypsilantian Job Printing House.

Bloomfield, L. (1957). Eastern Ojibwa: Grammatical Sketch, Texts and Word List. Ann Arbor: University of Michigan Press.

References III

Bowers, D. (2012). Phonological restructuring in Odawa. Master's thesis, University of California, Los Angeles.

Bowers, D. (2013). New Odawa prefix grammar. In M. Macaulay and R. Valentine (Eds.), To appear in Algonquian Conference 44. SUNY Press.

Brasoveanu, A. and A. Prince (2011). Ranking and necessity: The Fusional Reduction algorithm. Natural Language and Linguistic Theory 29, 3–70.

Bright, W. (1970). Phonological rules in literary and colloquial Kannada. Journal of the American Oriental Society 90(1), 140–144.

Chomsky, N. (1965). Aspects of the Theory of Syntax. MIT Press.

Clark, A., R. Eyraud, and A. Habrard (2008). A polynomial algorithm for the inference of context free languages. In Grammatical Inference: Algorithms and Applications. Springer.

Goddard, I. (1979). Comparative Algonquian. In L. Campbell and M. Mithun (Eds.), The Languages of Native America, pp. 70–132. University of Texas Press.

Goddard, I. (1982). The historical phonology of Munsee. International Journal of American Linguistics 48(1), 16–48.

References IV

Gress-Wright, J. (2010). Opacity and Transparency in Phonological Change. Ph. D. thesis, University of Pennsylvania.

Häberl, C. G. (2009). The Neo-Mandaic Dialect of Khorramshahr. Harrassowitz Verlag.

Hayes, B. and C. Wilson (2008). A maximum entropy model of phonotactics and phonotactic learning. Linguistic Inquiry 39(3), 379–440.

Heinz, J. (2010). Learning long-distance phonotactics. Linguistic Inquiry 41, 623–661.

Hockett, C. (1948). Potawatomi I: Phonemics, morphophonemics and morphological survey. International Journal of American Linguistics 14(1), 1–10.

Jackson, K. (1953). Language and History in Early Britain: A Chronological Survey of the Brittonic Languages First to Twelfth Century A.D. Edinburgh University Press.

Jacobs, H. (2004). Rhythmic vowel deletion in OT: Syncope in Latin. Probus 16, 63–90.

Jarosz, G. (2006). Rich Lexicons and Restrictive Grammars: Maximum Likelihood Learning in Optimality Theory. Ph. D. thesis, Johns Hopkins.

References V

Kager, R. (1997). Rhythmic vowel deletion in Optimality Theory. In I. Roca (Ed.), Derivations and Constraints in Phonology, pp. 463–499. Oxford University Press.

Kaye, J. (1973). Odawa stress and related phenomena. In Odawa Language Project: Second Report. University of Toronto.

Kenstowicz, M. (1996). Base identity and uniform exponence: Alternatives to cyclicity. In J. Durand and B. Laks (Eds.), Current Trends in Phonology: Models and Methods, pp. 363–393. University of Salford Publications.

Kenstowicz, M. and C. Kisseberth (1977). Topics in Phonological Theory. University of Illinois.

King, R. (1969). Historical Linguistics and Generative Grammar. Prentice-Hall.

King, R. (1976). The History of Final Devoicing in Yiddish. Indiana University Linguistics Club.

Kiparsky, P. (1968). Linguistic universals and linguistic change. In E. Bach and R. Harms (Eds.), Universals in Linguistic Theory. Holt, Rinehart and Winston.

Kiparsky, P. (1970). Historical linguistics. In J. Lyons (Ed.), New Horizons in Linguistics, pp. 302–316. Penguin Books.

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References VI

Kiparsky, P. (1971). Historical linguistics. In W. O. Dingwall (Ed.), A Survey of Linguistic Science, pp. 576–649. University of Maryland Press.

Kiparsky, V. (1979). Russian Historical Grammar. Ardis.

Lunt, H. (1980). On "akanje" and linguistic theory. Harvard Ukrainian Studies 3/4, 595–608.

Malone, J. (1997). Modern and classical Mandaic phonology. In A. S. Kaye (Ed.), Phonologies of Asia and Africa, Volume 1, Chapter 10, pp. 141–159. Eisenbrauns.

McCarthy, J. (2008). The serial interaction of stress and syncope. Natural Language and Linguistic Theory 26, 499–546.

Niyogi, P. (2006). The Computational Nature of Language Learning and Evolution. MIT Press.

Payne, D. (1990). Accent in Aguaruna. In D. Payne (Ed.), Amazonian Linguistics: Studies in Lowland South America, pp. 161–184. University of Texas Press.

Piggott, G. L. (1983). Extrametricality and Ojibwa stress. In McGill Working Papers in Linguistics, Volume 1, pp. 80–118. McGill University.

References VII

Pope, M. (1952). From Latin to Modern French with Especial Consideration of
   Anglo-Norman Phonology and Morphology (2 ed.). University of Manchester
   Press.

Prince, A. (2002, February). Entailed ranking arguments. Technical report, Rutgers
   University Department of Linguistics and Center for Cognitive Science.

Rhodes, R. (1985a). Eastern Ojibwa-Chippewa-Ottawa Dictionary. Mouton.

Rhodes, R. (1985b). Lexicography and Ojibwa Vowel Deletion. The Canadian
   Journal of Linguistics 30(4), 453–471.

Rhodes, R. (2008, October). Appendix to Algonquian trade languages. Presented at
   40th Algonquian Conference.

Rickard, P. (1989). A History of the French Language (2 ed.). Unwin Hyman.

Riggle, J. (2004). Generation, Recognition, and Learning in Finite State Optimality
   Theory. Ph. D. thesis, University of California, Los Angeles.

Sapir, E. (1915). Notes on Judeo-German phonology. The Jewish Quarterly
   Review 6, 231–266.

Tesar, B. (2013). Output-Driven Phonology: Theory and Learning. Cambridge
   University Press.

References VIII

Tesar, B. and A. Prince (2003 [2007]). Using phonotactics to learn phonological alternations. In J. Cihlar, A. Franklin, D. Kaiser, and I. Kimbara (Eds.), Papers from the 39th Annual Meeting of the Chicago Linguistic Society, Number 2, pp. 209–237.

Wipio Deicat, G. (1996). Diccionario Aguaruna-Castellano Castellano-Aguaruna, Volume 39 of Serie Lingüística Peruana. Lima, Peru: Instituto Lingüístico de Verano.

Yoshinaka, R. and A. Clark (2010). Polynomial time learning of some multiple context-free languages using a miminimal adequate teacher. In Proceedings of the 15th Conference on Formal Grammar.

More Yiddish?

- *Can you give more detail about Yiddish?*
- Alternations that ceased due to levelling:

Process	Maintained (v = 1.sg, n = pl)	Replaced (other cells)
Umlaut	traːg	trek-st
Preterite presents	veɪs	vɪs-ən
Wechselflexion	gɪb	geb-ən
Word-final devoicing	loːb	lop
Open-syllable lengthening	saːg	sag-st
[d]-Deletion	gəfin	gəfind-ən
[ə]-Epenthesis	ʃturəm	ʃturm-ən

What About German?

- *If Yiddish lost devoicing when it was opacated, why does German still have it?*
- German writers stopped spelling devoicing after opacity arose (Gress-Wright 2010).
    - German *might* have paralleled Western Yiddish.
    - Modern devoicing may be an innovation.

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    - German *might* have paralleled Western Yiddish.
    - Modern devoicing may be an innovation.

- Eastern Yiddish made devoicing be transparent.
    - King (1976) attributes this to Polish influence.
    - German *might* have taken the Eastern Yiddish route.

Decisive Cells Improve Efficiency

- *Why should there be a decisive cell if all cells are consulted?*
  - The decisive cell by-and-large shows fewest neutralizations.
    - Can be computed via surface-surface maps (Albright 2002).
    - Fewer neutralizations $\rightarrow$ more markedness violations. Perhaps decisive cell can be computed by comparing markedness profiles.
  - Un-neutralized values $\rightarrow$ surface values must be underlying, rather than derived.
  - This cell generally narrows down possible URs the most.
  - "Likely to be down-hill from this form"

Can you explain the prefixes?

- *How did the New Odawa prefixes arise?*
- New prefixes arose via reanalysis of Transitional Odawa vowel-initial words:

- 'He hangs'   'I hang'
  /ʌgoːd͡ʒɪn/   /nɪ-ʌgoːd͡ʒɪn/   UR
  —   nɪ[d]ʌgoːd͡ʒɪn   Hiatus Resolution
  (ʌgóː)(d͡ʒín)   (nɪdʌ́)(góː)(d͡ʒín)   Stress
  (‿góː)(d͡ʒín)   (n‿dʌ́)(góː)(d͡ʒín)   Syncope
  [góːd͡ʒín]   [ndʌ́góːd͡ʒín]   SR

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- A plausible analysis (repeatable for [ɪ, ʊ], see Bowers 2012; 2013):

- | | goːd͡ʒɪn | 'He hangs' |
  | ndʌ | goːd͡ʒɪn | 'I hang' |

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More Restructured Syncope

- *Where else was rhythmic syncope a flash in the pan?*
- Old Russian and other Slavic languages (V. Kiparsky 1979)
- Old Irish, Britonnic (Jackson 1953).
- Gallo-Romance (Pope 1952, Rickard 1989, Jacobs 2004).
- Mandaic (Malone 1997 Haberl 2009).
- Potawatomi (Hockett 1948:5).
- Unami (Goddard 1979; 1982).
- Kannada (?) (Bright 1970)
- Aguaruna (Payne 1990, Deicat 1996, McCarthy 2008, Bowers In Press).