Outline of talk

- Kashaya stress patterns
  - interactions with morphological structure
- evidence for global interaction
  - problems with ordered operations
- fully global OT
  - problems with morphology and opacity
- Stratal OT combined with Candidate Chains
  - promising, but still not a perfect solution

Pomoan family

- morphological bracketing plays an important role later; roots in bold
- data from Oswalt (1961, 1964) and dictionary notes

```
[ [ cad-uced ] un ]
( ca dú· ) ( ce dun )
'while looking'

[ [ ti-cc-iced ] u ]
( tic ) ( ci c‘e· ) du
'jerk one's foot back'

[ [ mo-mul-ic'-ed ] u ]
( mo mú· ) ( li c‘e· ) du
'run in circles'

[ [ kel-mul-ad-uced ] u ]
( kél ) ( mu lá· ) ( du ce· ) du
'keep peering around'
```
Syllable extrametricality

- occurs only in disyllabic or prefixed roots (Buckley 1994)
- blocked by minimality for monosyllabic roots

```
[ [ qahmat-ibic ] biw ]
⟨qah⟩ ( ma tí · ) ( bic’ ) ( biw )
‘must have been mad’

[ [ qaʃc’at-aced ] u ]
⟨qaʃ⟩ ( c’a ŋ · ) ( du ce · ) du
‘used to cry and cry’

[ [ qaʃc’at ] kʰε ] t’i:n
⟨qaʃ⟩ ( c’a ŋ’ ) ( kʰε t’i:n )
‘shouldn’t cry’

[ [ pi-hset-ibic-ed ] u ]
⟨pih⟩ ( se t’i · ) ( bi ce · ) du
‘(hair) kept springing up’
```

Foot extrametricality

- applies to initial Cv· foot
- long vowel can be derived by elision

```
[ [ wa-ad ] ʔrba-em ]
⟨wa ⟩ ( dúʔ ) ( bem )
‘could walk away’

[ [ di-c’-id ] ba ]
⟨di ⟩ ( c’ in’ ) ba
‘after having said’

[ [ cu-se-to-ʔma ]
⟨cu ⟩ ( se t’oʔ ) na
‘at our uncle’s house’

[ ma·kina ]
⟨ma ⟩ ( ki ná )
‘car’ < Sp. máquina
```

Plus syllable extrametricality

- “initial” Cv· relative to syllable extrametricality, if present
- therefore cumulative when root is disyllabic or prefixed

```
[ [ du-ʔya-q-ad-qa ] ba ]
⟨duʔ⟩ ⟨ya ⟩ ( qán’ ) ( qa ba )
‘after thinking about it

[ [ ba-ne-aduc-qa ] li ]
⟨ba ⟩ ⟨ne ⟩ ( dúcʰ ) ( qa · ) li
‘when (they) sent it off in the distance’

[ [ šula-m ] ʔba ]
⟨šu ⟩ ⟨la ⟩ ( máʔ ) ba
‘would get sick’

[ [ qa-de-ibic-qa-wac ] in ]
⟨qa ⟩ ⟨de ⟩ ( bicʰ ) ( qa wa · ) ( c’in )
‘when they tried prying’
```

Foot Flipping

- initial Cv· Cv · Cv Cv·
- results in a “perfect iamb”, which is also extrametrical

```
[ [ t’e-t-ibic ] ba ]
⟨t’e ti ⟩ ( bic’ ) ba
‘flies along’

[ [ ca-aduc-qa ] u ]
⟨ca du ⟩ ( ce dú )
‘run down intermittently’

[ [ mo-ala-wad-adad ] u ]
⟨mo la ⟩ ( wa dá’ ) ( da du )
‘he used to tell (this story)’
```
Plus syllable extrametricality

- cumulative, just like plain foot extrametricality
- as a result, accent can fall as far in as the 5th syllable

[ [ muna ] # c-id ] u?ba
\langle m\rangle \langle n\rangle \langle \text{c-i} \rangle \langle d\rangle \langle u \rangle \langle b\rangle

\text{‘would be shy’}

[ [ bide-aloq-ic ] ] ti
\langle b\rangle \langle d\rangle \langle a \rangle \langle \text{lo} \rangle \langle q\rangle \langle o \rangle \langle \text{i} \rangle \langle c\rangle \langle i \rangle \langle t\rangle

\text{‘in order to carry them back up here’}

[ [ loq'o ] # c-aduwad ] u
\langle l\rangle \langle o \rangle \langle q\rangle \langle o \rangle \langle \text{c-a} \rangle \langle d\rangle \langle u\rangle \langle \text{wad} \rangle \langle u \rangle \langle b\rangle

\text{‘make noise by moving around’}

[ [ si-de-aiic ] ] in
\langle s\rangle \langle i \rangle \langle \text{d-c} \rangle \langle i \rangle \langle i \rangle \langle i \rangle \langle i \rangle \langle i \rangle \langle \text{c} \rangle \langle \text{in} \rangle

\text{‘while they were sailing along’}

Level ordering

- fundamental structure of a Kashaya verb

[ [ [ t'e ] # root ibic ] # stem ] word

- “Level 1” = Stem Level suffixes = derivational
  - a verb can contain many such suffixes, but sometimes none
    - directionals, inceptives
    - reflexive, reciprocal
    - causative
    - duratives, distributive

- “Level 2” = Word Level suffixes = inflectional
  - every verb requires one slot to be filled, chosen from several categories
    - absolutive
    - evidentials
    - imperatives
    - modals
    - switch reference
    - certain other suffixes can precede or follow this slot

No word-level lengthening

- Stem Level suffixes undergo Lengthening and Flipping
- Word Level suffixes do not undergo either process

[ [ mo-mac-ed ] ] ela
\langle m\rangle \langle o \rangle \langle m\rangle \langle a \rangle \langle c\rangle \langle e \rangle \langle d\rangle \langle a \rangle \langle l\rangle

\text{‘I keep running in there’}

[ [ tala-mec ] ] t'i-pila
\langle t\rangle \langle a\rangle \langle l\rangle \langle a \rangle \langle m\rangle \langle e \rangle \langle c \rangle \langle t\rangle \langle i \rangle \langle p\rangle \langle i \rangle \langle a \rangle \langle l\rangle

\text{‘if (you) don’t climb down’}

[ [ hot-pala ] ] s'uw-em
\langle h\rangle \langle o\rangle \langle t\rangle \langle p\rangle \langle a\rangle \langle l\rangle \langle a \rangle \langle s\rangle \langle u \rangle \langle w\rangle \langle e \rangle \langle m\rangle

\text{‘it would warm (us) up’}

[ [ s'i-yic ] ] ?cid-t'i-mi-ya-em
\langle s\rangle \langle i \rangle \langle y\rangle \langle i \rangle \langle y\rangle \langle i \rangle \langle c\rangle \langle i \rangle \langle t\rangle \langle i \rangle \langle m\rangle \langle i \rangle \langle y\rangle \langle a \rangle \langle e \rangle \langle a \rangle \langle y\rangle \langle e \rangle \langle a \rangle \langle e \rangle

\text{‘they never used to do (that)’}

No word-level lengthening

- this is true even in the main-stress syllable
- syllable extrametricality of course affects the location of feet

[ [ s'i ] ] p'i-la
\langle s\rangle \langle i \rangle \langle p\rangle \langle i \rangle \langle l\rangle \langle a \rangle

\text{‘if it happens’}

[ [ cad ] ] ela
\langle c\rangle \langle a \rangle \langle d\rangle \langle e \rangle \langle l\rangle \langle a \rangle

\text{‘I see (it)’}

[ [ bawil ] ] ela
\langle b\rangle \langle a \rangle \langle w\rangle \langle i \rangle \langle l\rangle \langle a \rangle \langle e \rangle

\text{‘I am putting (it) in’}

[ [ ca-hke ] ] wi-ya-e
\langle c\rangle \langle a \rangle \langle h\rangle \langle k\rangle \langle e \rangle \langle w\rangle \langle i \rangle \langle y\rangle \langle a \rangle \langle e \rangle \langle a \rangle \langle e \rangle

\text{‘it blocked me from sitting’}
No word-level Flipping

- Foot Flipping occurs only if the entire Cv-Cv is located in the Stem
- otherwise the Cv- remains a nonbranching (and extrametrical) foot

\[
\begin{align*}
\text{[ [ q’a- ] mela ]} & \quad \text{[ [ q’a- ] mela ]} \\
\text{[ [ q’a ] ( me lá )] } & \quad \text{[ [ q’a ] ( me lá )] }
\end{align*}
\]

'I left'

\[
\begin{align*}
\text{[ [ sima-q ] eti ]} & \quad \text{[ [ sima-q ] eti ]} \\
\text{[ [ si ] } & \quad \text{[ [ si ] }
\end{align*}
\]

although he’s asleep

\[
\begin{align*}
\text{[ [ qa-t’o ] wi-ya-e ]} & \quad \text{[ [ qa-t’o ] wi-ya-e ]} \\
\text{[ [ qa ] } & \quad \text{[ [ qa ] }
\end{align*}
\]

rubbed off (my skin)

\[
\begin{align*}
\text{[ [ so-t’o ] t’i-p’ila ]} & \quad \text{[ [ so-t’o ] t’i-p’ila ]} \\
\text{[ [ so ] } & \quad \text{[ [ so ] }
\end{align*}
\]

‘if (you) don’t peel it’

\[
\begin{align*}
\text{[ [ qa- ] ba ]} & \quad \text{[ [ qa- ] ba ]} \\
\text{[ [ qa ] ( cin’) ]} & \quad \text{[ [ qa ] ( cin’) ]}
\end{align*}
\]

‘after leaving’

\[
\begin{align*}
\text{[ [ sima-q-ad ] t’-e ]} & \quad \text{[ [ sima-q-ad ] t’-e ]} \\
\text{[ [ sima ] } & \quad \text{[ [ sima ] }
\end{align*}
\]

‘can’t sleep’

\[
\begin{align*}
\text{[ [ qa-t’o ] cid-uced ] t’u ]} & \quad \text{[ [ qa-t’o ] cid-uced ] t’u ]} \\
\text{[ [ qa-t’o ] } & \quad \text{[ [ qa-t’o ] }
\end{align*}
\]

‘don’t peel (it)!’

No Flipping before CVC

- since Flipping applies to Cv-Cv, it is blocked in Cv-CvC
- this is true even fully within the Stem Level

\[
\begin{align*}
\text{[ [ q’a-cid ] ba ]} & \quad \text{[ [ q’a-cid ] u ]} \\
\text{[ [ q’a ] ( cin’) ]} & \quad \text{[ [ q’a ] ( cin’) ]}
\end{align*}
\]

‘after leaving’

\[
\begin{align*}
\text{[ [ sima-q-ad ] t’-e ]} & \quad \text{[ [ sima-q-ad ] t’-e ]} \\
\text{[ [ sima ] } & \quad \text{[ [ sima ] }
\end{align*}
\]

‘can’t sleep’

\[
\begin{align*}
\text{[ [ qa-t’o ] cid-uced ] t’u ]} & \quad \text{[ [ qa-t’o ] cid-uced ] t’u ]} \\
\text{[ [ qa-t’o ] } & \quad \text{[ [ qa-t’o ] }
\end{align*}
\]

‘don’t peel (it)!’

Ordering analysis of Lengthening

- apply Lengthening to the Stem
  - only Stem level suffixes are present at this point

\[
\begin{align*}
\text{[ [ ho ]-ala ]} & \quad \text{[ [ ho ]-ala ]} \\
\text{[ ( ho ] } & \quad \text{[ ( ho ] }
\end{align*}
\]

( ho t’a ) la

- then add the Word level suffixes without Lengthening
  - new suffixes do not undergo the process

\[
\begin{align*}
\text{[ [ ( ho ] t’a- ) ] s’uw-em ]} & \quad \text{[ [ ( ho ] t’a- ) ] s’uw-em ]} \\
\text{[ ( ho ] } & \quad \text{[ ( ho ] }
\end{align*}
\]

( ho t’a ) ( la s’u ) ( wem )

- this approach can be implemented in Lexical Phonology (Buckley 1994)
  - also in any derivational theory that permits an intermediate representation of
    the Stem to which phonological processes apply
Final extrasyllabicity

• extrasyllabic final C in Stem to permit Lengthening there
  [mo-\text{mul-ic}'-ed]
  (mo \text{ mú}'\text{e}')d
• necessary since often ends up as an open syllable due to Word suffix
  [\text{mo-\text{mul-ic}'-ed}]u
  (mo \text{ mú}'\text{e}')du \quad \text{‘run in circles’}
• if the syllable ends up closed, it will shorten again independently
  [\text{mo-\text{mul-ic}'-ed}]
  (mo \text{ mú}'\text{e}')ba
  \quad \text{‘after running in circles’}
• so here, look-ahead is not crucial; but Flipping is more complicated...

Look-ahead for Flipping

• when we see just the Stem with extrasyllabicity, Flipping should apply
  [q'a\text{-cid}]
  \langle q'a\text{ ci} \rangle d
• but we can’t predict whether we’ll eventually have CvC or Cv
  [\text{q'a\text{-cid}}]b
  \langle q'a\text{ ci} \rangle d
  \langle q'a\text{ ci} \rangle (dù)
  \quad \text{‘after leaving’} \quad \text{‘keep leaving’}
• and we can’t just undo it by shortening, unlike with Iambic Lengthening
  [\text{q'a\text{-cid}}]b
  \langle q'a\text{ ci} \rangle d
  \rightarrow \langle q'a\text{ ci}\text{'n}\rangle b
  \rightarrow \ast \langle q'a\text{ cin}' \rangle (bâ) \sim \ast (q'a\text{ cin}') b

Avoiding look-ahead

• Buckley (1994) splits the effect of Foot Flipping into two steps
  – first set the stage for Flipping
  – implemented later only if syllable structure permits
  – converted here to a two-level analysis
• Stem Level: adjoin the Cv to Cv\text{'}; creating anti-iamb Cv\cdot Cv
  [q'a\text{-cid}]

  \text{Foot Extrametricality} \quad \langle q'a \rangle \text{ ci } d

  \text{CV Adjunction} \quad \langle q'a \cdot ci \rangle d

• Word Level: closed syllable destroys Cv\cdot Cv, else Flipping occurs
  [\text{q'a\text{-cid}}]b
  \langle q'a\cdot ci \rangle d b
  \langle q'a\cdot ci \rangle (cin') b

Lexical Phonology summary

• advantages
  – architecture captures Stem / Word distinction
  – Iambic Lengthening, CV Adjunction simply turn off
  – the general problem of opacity has an easy solution in ordered rules
• disadvantages
  – Flipping is split into two processes
    • temporary anti-iamb violates general pattern of language
    • makes no connection with Lengthening
    • yet both are fundamentally about changes in vowel length
  – classic Optimality Theory avoids the look-ahead problem
    – evaluates the output directly, with surface syllabification present
    – but requires some other means of identifying the lengthening suffixes
    • some domain equivalent to the Stem
    • or a long list of relevant morphemes
Constraint Domains

- Buckley (1996, 1997) proposes Constraint Domains
  - index constraints to particular substrings of the output
  - roughly the same as the morphological bracketing, but not nested
- ranking ensures that Word suffixes are faithful to underlying length
  - IDENT-LENGTH: the length of a segment is identical in input and output
  - *(CV)CV or other FTFORM constraints that force Flipping to occur
  - IDENT-LENGTH_{WORD} >> *(CV)CV >> IDENT-LENGTH_{STEM}

Flipping with Stem vs. Word suffixes

- Here Flipping causes two IDENT violations, unlike Buckley (1997)
- The difference is not crucial

Similar for Iambic Lengthening

- SWP = STRESS-TO-WEIGHT PRINCIPLE: a stressed syllable is heavy
- causes Iambic Lengthening
- it may be possible to unify the constraints for Lengthening and Foot Flipping
- cf. also PERFECT-IAMB or UNEVEN-IAMB: a foot has the shape CV-CV
- I haven't worked out those details
- Buckley (1997) used gradient foot alignment for Foot Flipping
  - favored expanding a foot rightward
  - this type is now generally deprecated in favor of categorical constraints
  - Kager (2001), McCarthy (2003), Buckley (2009)

No look-ahead required

- Forms (d) and (e) would be distinguished by a phonotactic constraint *v-C
- the main point is that they both lose
Constraint Domains summary

- **advantages**
  - IDENT-L connects Lengthening and Flipping
  - one indexed constraint for the Word level accounts for both
  - no need for look-ahead
  - the full output is evaluated at once
- **disadvantages**
  - stipulates Stem / Word distinction
  - laid on top of output, rather than part of architecture
  - has no inherent account for opacity
  - would require extra mechanisms just like Classic OT
    - e.g., Phrasal footing can be different from Word, without Flipping
    - hat tip to Paul Kiparsky
  - yet the entire sequence /co si/ is in two Stem domains
  - so changes to vowel length there ought to be permitted

Stratal Optimality Theory

- **fixed stages in derivation** (Kiparsky, Bermúdez-Otero)
  - Stem, Word, Phrase
  - output of level \( n \) is input to level \( n+1 \)
  - limited handling of opacity across strata
- **assume each stage is internally global like Classic OT**
  - candidates evaluated against constraint ranking

<table>
<thead>
<tr>
<th>Stem Level</th>
<th>morphology</th>
<th>output of Eval</th>
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<td>hot( ^{\cdot} )ala</td>
<td>(ho ( ^{\cdot} )á) la</td>
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Stratal OT and globality

- stratum-internal globality won’t help with the look-ahead problem
  - in this regard, it’s exactly like Lexical Phonology
- still need some equivalent to CV Adjunction in the Stem level
  - but what kind of constraints will generate this result?
  - why no Lengthening at the Word level if Flipping occurs there?

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<td>or</td>
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Global evaluation of Stratal OT

- proposal: maintain the Stratal OT levels of representation
  - Stem \( \Rightarrow \) Word \( \Rightarrow \) Phrase
- but evaluate all representations globally
  - somewhat similar idea in Baker (2009)
- borrow the notion of Chains from OT-CC
  - Eval compares CHAINS of candidates (McCarthy 2007)
    - a set of representations moving from input to output
    - but here, a fixed number of steps in chain, defined by strata
    - certain affinities to Constraint Domain approach
- unlike OT-CC, which is GRADUAL
  - one step in the chain for every faithfulness violation
  - more like traditional derivational phonology
    - except that each step must be HARMONICALLY IMPROVING
  - won’t get into details of that theory here
    - it was designed to handle opacity
    - moves away from global evaluation and won’t help the Kashaya problem
    - also does not address level-ordering issues
Stratal Chains

- same structural relations among Stem, Word, Phrase levels
  - but choice of output $n$ is potentially affected by output $n+1$
- chain consists of Input ($\approx$UR) plus three stratal outputs
  - first item in chain, the Input, might be “fully faithful parse” of UR
    - with syllabic and possibly moraic structure added; not foot structure
  - morphology is not present from the beginning
    - unlike OT-CC and Classic OT
- $<\text{Input}, \text{Stem-Output}, \text{Word-Output}, \text{Phrase-Output}>$
- I’ll mostly set aside the Phrase-Output here
  - but it’s actually central for other facts about Kashaya stress, which is assigned to the phonological phrase and can span words (Buckley & Gluckman 2012)
  - in particular, a degenerate foot is probably not created until the Phrase level (lower ranking of FT-BIN there)
  - the effect of Foot Extrametricality is felt in the Phrase as well

Kashaya derivations

- vowel length in the Stem depends on the suffix added in the Word level

| Input root | $q'a'$ | $q'a'$ |
| word | faithful parse | word | faithfull parse |
| Stem Level | morphology | $q'a'$-cid | $q'a'$-cid |
| output of Eval | (q'a ci-) d | (q'a ci) d |
| Word Level | morphology | (q'a ci)d-u | (q'a ci)d-ba |
| output of Eval | (q'a ci-) (dú) | (q'a ci) (cín') ba |

- global evaluation of the chains can achieve this effect
  - $<q'a'$, (q'aci) d, (q'aci)(dú) >$
  - $<q'a'$, (q'a)ci d, (q'a)(cín')ba >$

SL and WL for /$q'a'$-cid-u/

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WL of stem output /q’a·cid/

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Global evaluation of /q’a·-cid-u/

- violations for each step in the chain are considered as a group, but presented heuristically
- candidate a.i. without Flipping fails because it violates the relevant constraint without being forced to by a higher constraint
- candidate a.ii. is homophonous with the winner but only by chance; it is rejected due to Word-level Flipping

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<tr>
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<th>*V·C</th>
<th>IDENT-L_W</th>
<th>*(CV·)CV</th>
<th>IDENT-L_S</th>
</tr>
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<tbody>
<tr>
<td>a.i.</td>
<td>(q’a·) ci d</td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>a.ii.</td>
<td>(q’a·) (ci dú)</td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>b.i.</td>
<td>(q’a ci·) (díu)</td>
<td></td>
<td>**</td>
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</table>

SL and WL for /q’a·-cid-ba/

**Stem Level**

<table>
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<th>*(CV·)CV</th>
<th>IDENT-L_S</th>
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<tr>
<td>a.</td>
<td>(q’a·) ci d</td>
<td></td>
<td>*!</td>
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<td>b.</td>
<td>(q’a ci·) d</td>
<td></td>
<td>**</td>
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</tbody>
</table>

**Word Level**

<table>
<thead>
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<th>IDENT-L_W</th>
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<td>*(CV·)CV</td>
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<td>a.ii.</td>
<td>(q’a ci·) (díu)</td>
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<td>**</td>
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</tr>
<tr>
<td>b.i.</td>
<td>(q’a ci·) (díu)</td>
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</tr>
</tbody>
</table>
Global evaluation of /q’a·-cid-ba/ 

- crucial example of the Word level affecting the Stem level
- candidate b.i. has Flipping and leaves an ill-formed syllable
- candidate b.ii. has Flipping with Word-level shortening

<table>
<thead>
<tr>
<th></th>
<th>*(VC)</th>
<th>IDENT-Lw</th>
<th>*(CV·)CV</th>
<th>IDENT-Ls</th>
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<td>(q’a) ci d</td>
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</tr>
<tr>
<td></td>
<td>(q’a) (cin’) ba</td>
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<tr>
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<td></td>
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</tr>
<tr>
<td></td>
<td>(q’a ci`n’) ba</td>
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<td>b.ii.</td>
<td></td>
<td></td>
<td>#!</td>
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</tr>
<tr>
<td></td>
<td>(q’a cin’) ba</td>
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</tbody>
</table>

Yahwíy! 
(Thank you.)

Conclusion

- global evaluation of stratal chains
  - captures the Stem / Word dichotomy like Stratal OT
  - captures the central role of IDENT-LENGTH like Constraint Domains
- generates a superset of the grammars that regular Stratal OT does
  - necessary power for Kashaya
  - more cases?
- could it help with level-internal opacity?
  - claimed to be a problem for Stratal OT (McCarthy 2007)

References