Cyclic Morphosyntax ...

- Syntax builds words and sentences cyclically = in **discrete chunks** (Ross 1967, Chomsky 1973, *inter alia*)
- **Discrete chunks** sent to **interfaces** with sound (phonology) and meaning (semantics)
- Question: How do the **interfaces** (specifically phonology) maintain these **discrete chunks**?
  - How are discrete chunks from syntax reflected in phonology?
Cyclic Morphosyntax ...

Numeration

  Syntax1

    PF1 Syntax2 LF1

    PF2 Syntax3 LF2

    PF3 LF3

Multiple spellout of **discrete chunks** to **interfaces**

... Meets Parallel Phonology

- Claim 1: Phonology reflects discrete chunks as recursive prosodic structure
- Claim 2: Phonology evaluates recursive structure in one whole chunk
  - Rather than evaluating each discrete chunk in turn
... Meets Parallel Phonology

Cyclic Morphosyntax

\[ \text{AP}_{\text{Cycle Two}} \]
\[ \text{A} \quad \text{BP} \]
\[ \text{B}_{\text{Phase Head}} \quad \text{CP}_{\text{Cycle One}} \]
\[ \text{C} \quad \text{DP} \]
\[ \text{D} \]

Parallel Phonology

\[ \text{Pwd2} \]
\[ \text{a} \quad \text{b} \quad \text{PWD1} \]
\[ \text{c} \quad \text{d} \]
Competing Models: Serial vs. Parallel Phonology
Phonology: Parallel or Serial?

• Longstanding disagreement over whether phonological derivation is **parallel** or **serial** (Kiparsky 1973, 1982, Mascaró 1976, Prince & Smolensky 1993/2004, McCarthy 2008, *inter alia*)

• **Parallel Derivation:**
  - Initial input → Final output

• **Serial Derivation:**
  - Initial input → Intermediate Steps → Final output
  - Intermediate steps = output of previous step, input of next step
  - E.g., Stratal OT (Kiparsky 2000, Bermudez-Otero 2011)
Cyclic Morphosyntax → Phonology

- Two possible models of sending discrete chunks from morphosyntax to phonology
  - **Model One: Serial Phonology** (e.g., Marvin 2002, Newell 2008, Samuels 2010)
    - Phonology operates on each chunk sent by syntax in turn
  - **Model Two: Parallel Phonology** (e.g., Cheng & Downing 2012)
    - Once all chunks from syntax are sent, phonology operates on all of them at once
    - Multiple chunks = recursive prosody
Comparison of Two Models

Cyclic Morphosyntax $\rightarrow$ **Serial Phonology**
1. Syntax sends Cycle 1 = $\text{PWd}_1$
2. **Phonology evaluates $\text{PWd}_1$**
3. Syntax sends Cycle 2 = $\text{PWd}_2$
4. **Phonology evaluates $\text{PWd}_2$**

Cyclic Morphosyntax $\rightarrow$ **Parallel Phonology**
1. Syntax sends Cycle 1 = $\text{PWd}_1$
2. Syntax sends Cycle 2 = $\text{PWd}_2$
3. **Phonology evaluates $\text{PWd}_1 \& \text{PWd}_2$**
Evidence for Parallel Phonology: Chukchansi Yokuts Templates

Part 1: (L'H) Iambs
Chukchansi = Parallel Phonology

• Stress & fixed templates in Chukchansi Yokuts favor second model
  - Cyclic Morphosyntax → Parallel Phonology
• **Serial phonology** predicts wrong form for (L'H) template (= internal PWd)
  - Non-final stress at all stages → no (L'H) PWd
• **Parallel phonology** predicts correct form for template
  - Non-final stress applies once → internal PWd can be (L'H)
Chukchansi Stress: Iambs ...

- Chukchansi Stress = Iambs + Non-finality
  (Guekquezian to appear)
- Stress = penultimate + heavy pre-penultimate
- Can be modeled by **Left-to-Right Iambs**
- Heavy Penults – Iambs: (‘H)σ, (L’H)σ
  ('pa:).ya] ‘child’-ACC
  ['bok’].to?] ‘had found’
  [(he.’je:).ma] ‘long ago’
  [(ʧi.’ja:).lat] ‘just made cut’
  [(ʔa.’le:).(dʒa. ‘law).ʃit] ‘just made oneself crazy’
... with Trochaic Reversal

- No word-final stress → stress on light penults
  - Trochaic reversal
    (Prince and Smolensky 1993/2004, McCarthy and Prince 1993b)

- Light Penults – Final ('La) Trochee
  
  [[('pi].f]t)]                  ‘just lit’
  [[('jun).('ju.nut)]         ‘just shook’
  [[('ťfe:].('xa.?an)]        ‘dog-ACC’
  [[(li.'him).('wi.će?)]     ‘will run with each other’
  [[('le:].('le?).(‘hi.jaw)]  ‘at school’
Iambs, not Trochees

- With trochaic reversal, trochaic stress may seem better fit for Chukchansi
- However, iambs = better model than trochees
- Evidence:
  - Vowel epenthesis
  - Lexical root inventory
  - Templatic morphology
lambs, not Trochees

- Vowel epenthesis: /VCCCV/ → [V.CiC.CV]
  - Epenthetic vowel positioned to create good iambs
  - /lihm+taʔ/ ‘run’-REM.PAST → (li.'him).taʔ – IAMB
  - Not *('lih)('mi.taʔ) – *TROCHEE

- Lexical Root Inventory: Skew away from roots parsed into two initial Light syllables
  - **LL Roots:** fewer observed than expected
  - **HL, LH Roots:** more observed than expected
  - **LL = Poor Iamb** but Good Trochee
Templates in Chukchansi

- Templatic morphology: more evidence for **iambs**
- Templatic forms have **recursive prosodic structure** (Guekguezian 2015)
- Roots with one underlying vowel get fixed (**L'H**) template
  - No matter what their UR
- Templates triggered by several suffixes
  (e.g., **CAUSATIVE** /-la-/, /-e-/)
- If no triggering suffix → no fixed template
- Atemplatic shapes = predictable phonotactics
## Templatic vs. Atemplatic Forms

<table>
<thead>
<tr>
<th>Root UR</th>
<th>Templatic Form: (L'H)</th>
<th>Atemplatic Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>/wan/ ‘give’</td>
<td>(wa.'na:)-la-t</td>
<td>('wa.n-it)</td>
</tr>
<tr>
<td>/ʧiʃ/ ‘cut’</td>
<td>(ʧi.'ja:)-la-t</td>
<td>('ʧi.j-it)</td>
</tr>
<tr>
<td>/ma:x/ ‘collect’</td>
<td>(ma.'xa:)-la-t</td>
<td>('ma:).x-it</td>
</tr>
<tr>
<td>/ʃawg/ ‘buy’</td>
<td>(ʃa.'wa:).g-e-t</td>
<td>('ʃaw).g-it</td>
</tr>
<tr>
<td>/be:wn/ ‘sew’</td>
<td>(be.'we:).n-e-t</td>
<td>('bew).n-it</td>
</tr>
</tbody>
</table>
Evidence for Parallel Phonology: Chukchansi Yokuts Templates

Part 2: Cyclic Morphosyntax = PWd
Recursion
Templates = Cyclic Morphosyntax

• Templates triggers send roots to phonology early
  = syntactically cyclic
• Syntactically cyclic = phase heads
  (Chomsky 2000, 2001)
• Relevant phase head = active little $v$
• Active little $v$ sends complement (= verb root in VP) to phonology
Templates = Cyclic Morphosyntax

Cycle One:
VP spelled out by $v_0$

Cycle Two:
InflP spelled out

Diagram:
- InflP\textsuperscript{Cycle Two}
- Infl\textsubscript{0}
- vP
- $v_0$ Phase Head
- VP\textsuperscript{Cycle One}
- $V_0$
Template Triggers: Active Little \( v \)

- Active little \( v \) has semantics of **agenthood, initiation, dynamicity**

- Active little \( v \) triggers:
  - Causative \(-\text{la-}/, \text{-e-}/\)
  - Inchoative \(-\text{a-}/\)
  - Durative \(-\text{ʔa-}/\)
  - Distributive \(-\text{a-}/, \text{-e-}/\)
  - Agentive Nominal \((v + n)\) \(-\text{ʧ’-}/\)
  - Adjunctive Nominal \((v + n)\) \(-\text{ʔhij-}/\)
Syntax Matching Phonology

- General **correspondence** between syntactic “words” (X₀) and phonological “words” (PWd)
- Modeled by **Match** constraints (Selkirk 2009, 2011)
  - X₀ ≈ PWd
- **Head movement** forms single X₀ out of multiple X₀s (Travis 1984)
  - Lower X₀ adjoins to higher X₀
  - Multiple adjoined X₀s matched to single PWd
Atemplatic Verb

• Chukchansi: Root head-moves to Infl₀, spelled out together with Suffix2 in Cycle One
• Root + Suffix2 = Single PWd
Cyclic Syntax = Recursive Phonology

• Proposal: Complex $X_o$ spans syntactic cycles = matched to recursive PWd
• Due to copy theory of movement (Chomsky 1993)
  - Highest copy in cycle spelled out (Nunes 2004)
• Chukchansi: verb root spelled out twice
  - Lower copy: Cycle One (VP)
  - Higher head-moved copy: Cycle Two (InflP)
Cyclic Syntax = Recursive Phonology

- Claim: $X_0$ argument of Match constraint = defined by **spellout domains**
- **Two** copies of root in **two** different $X_0$s = PWds
- Chukchansi: only **one** exponent of root inserted
- One exponent in two PWds = **PWd recursion**
Cyclic Syntax = Recursive Phonology

- Copies of root spelled out in Cycles One & Two
- Exponent of root in $\text{PWd}_{\text{min}}$ & $\text{PWd}_{\text{max}}$
Evidence for Parallel Phonology: Chukchansi Yokuts Templates

Part 3: Non-Final Stress → Parallelism
Templates = Minimality + Prosody

- Templates: one-vowel roots → LH when they form PWd_{min}
- Template = **minimality** effect: disyllabic PWds
- One-vowel roots augmented to disyllables
- Epenthetic material → forms **optimal** disyllable
- Optimal disyllable in Chukchansi: (L'H) Iamb
  - Also reflected in stress, epenthesis, lexical root inventory
Problem: Non-final Stress

- Template = internal PWd (PWD_{min}) with emergent (L’H) shape
- BUT: disyllabic words cannot have final stress
  - [(‘Lσ)]_{PWD}, not *[L’H)]_{PWD}
  - [(‘pi.ʃit)]_{PWD} vs. *[pi.’ʃit)]_{PWD}

- Problem:
  - Non-final stress **allowed** in PWD_{min}
  - Non-final stress **avoided** in PWD_{max}
Solution: Recursion-Sensitivity

- Phonological processes can be sensitive to level of recursive prosody (maximal vs. non-maximal)
  - Including OT constraints (Itô & Mester 2012, Elfner 2015)
- **Non-final stress** only applies to $\text{PWD}_{\text{max}}$
  - $\text{NONFINALITY}(\text{PWD}_{\text{Max}})$: assign a violation mark for a stressed syllable at the end of a maximal PWd (see Prince & Smolensky (1993/2004) for $\text{NONFINALITY}(\text{PWD})$)
Parallel vs. Serial

- No $\text{PWd}_{\text{max}}$-final stress: works for parallel derivation, not serial derivation

- **Parallel:** both PWds evaluated simultaneously
  - $/\text{Root}+\text{Suffixes}/ \rightarrow \left[\left[\text{Root}\right]_{\text{PWd}_{\text{min}}}+\text{Suffixes}\right]_{\text{PWd}_{\text{max}}}$
  - Non-final stress avoided in Root PWd ($\text{PWd}_{\text{min}}$)

- **Serial:** Each PWd evaluated once sent by syntax
  - $/\text{Root}/ \rightarrow \left[\text{Root}\right]_{\text{PWd}_{\text{max}}} + /\text{Suffixes}/ \rightarrow \left[\left[\text{Root}\right]_{\text{PWd}_{\text{min}}}+\text{Suffixes}\right]_{\text{PWd}_{\text{max}}}$
  - Non-final stress applies in Root PWd ($\text{PWd}_{\text{max}}$ in first cycle)
Parallel vs. Serial

- Example: cyclic input /wan+la\textsubscript{CYCLIC}+it/
- **Parallel**: /wan+la+it/ $\rightarrow$ 
  $$ ([[\text{\textipa{wa.'na:}}]\text{PWdmin lat}]_{PWdmax}$$
- **Serial**: /wan/ $\rightarrow$ [(\textipa{wa.na})\text{PWdmax} + /la+it/ $\rightarrow$
  $$ [[[\text{\textipa{wa.na}}]\text{PWdmin lat}]_{PWdmax}$$
- **Serial stipulation**: final stress allowed at first cycle
  - /wan/ $\rightarrow$ [\textipa{wa.'na:}]_{PWdmax}
Problem with Serial Account

- Serial account must **divide** stress rules
- Non-final stress cannot apply **at first cycle**
  - Must only apply at second, final cycle
- Other stress rules apply **at all cycles**
  - Iambic parsing, disyllabic minimality
- In OT terms: NONFINALITY(PWd_{Max}) has different ranking at different cycles
  - **Sacrifices unity of grammar**
Parallel Derivation: Templatic Verb

• Templatic Verb: \([[(L'H)]_{PWd_{min}} \sigma \ldots ]_{PWd_{max}}\)
• /wan-la_{CYCLIC-it}/ → \[\[(wa.'na:)]_{PWd_{min} \text{lat}}]_{PWd_{max}}\)

<table>
<thead>
<tr>
<th>/wan-la_{CYCLIC-it}/</th>
<th>DISYLL</th>
<th>NONFINALITY (PWd_{Max})</th>
<th>IAMMB</th>
</tr>
</thead>
<tbody>
<tr>
<td>[[(wa.'na:)]<em>{PWd</em>{min} \text{lat}}]<em>{PWd</em>{max}})</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[[(wa. na)]<em>{PWd</em>{min} \text{lat}}]<em>{PWd</em>{max}})</td>
<td></td>
<td></td>
<td>1 W</td>
</tr>
<tr>
<td>[[(wan)]<em>{PWd</em>{min} \text{lat}}]<em>{PWd</em>{max}})</td>
<td></td>
<td></td>
<td>1 W</td>
</tr>
</tbody>
</table>
Parallel Analysis: Atemplatic Verb

- Atemplatic Verb [('Lo)]_{PWdmax}
- /wan-it/ \rightarrow [('wa.n-it)]_{PWdmax}

<table>
<thead>
<tr>
<th>/wan-it/</th>
<th>DISYLL</th>
<th>NONFINALITY (PWd_{Max})</th>
<th>IAMB</th>
</tr>
</thead>
<tbody>
<tr>
<td>✏️ [('wa.n-it)]_{PWdmax}</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>[(wa.'n-it)]_{PWdmax}</td>
<td></td>
<td>1 W</td>
<td>L</td>
</tr>
</tbody>
</table>
Serial Analysis: Problem

- Templatic Verb: \*[[('LL)]_{PWdmin} \cdots]_{PWdmax}
- /wan/ → [('wa.na)]_{PWdmax} + /-la_{CYCLIC}-it/ → \\
  \*[[('wa.na)]_{PWdmin} lat]_{PWdmax}

<table>
<thead>
<tr>
<th>/wan/</th>
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<td>☞ [('wa.na)]_{PWdmax}</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>☹ [('wa.na:)]{PWdmax}</td>
<td></td>
<td></td>
<td>L</td>
</tr>
<tr>
<td>[(‘wan)]_{PWdmax}</td>
<td></td>
<td>1 W</td>
<td></td>
</tr>
</tbody>
</table>
Summary
Cyclic Morphosyntax & Parallel Phonology

• Claim 1: Word with Cyclic Morphosyntax = **Recursive PWds**
  - Each discrete chunk from syntax = PWd

• Claim 2: Recursive PWds evaluated in **parallel**, not serially
References
References

- Guekguezian, P. to appear. The great Chukchansi Yokuts iambic conspiracy. in *Supplemental Proceedings of Phonology 2014*. LSA.
References

References

Acknowledgments
Crucial Thanks

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• To the audiences that have shaped this line of work, including PhonLunch and Syntax+ at USC, AMP 2014 and 2015, and NELS 45.
Further Details
Phonotactics and Atemplatic Forms

- Shape of atemplatic forms: depends on whether following suffix is Consonant- or Vowel-initial
- Can trigger **vowel shortening** or **vowel epenthesis**

<table>
<thead>
<tr>
<th>Root UR</th>
<th>C-initial /-ta?/</th>
<th>V-initial /-it/</th>
</tr>
</thead>
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<tr>
<td>/wan/ ‘give’</td>
<td>(ˈwan).-ta?</td>
<td>(ˈwa.n-it)</td>
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<tr>
<td>/ʧiʃ/ ‘cut’</td>
<td>(ˈʧiʃ).-ta?</td>
<td>(ˈʧiʃ-it)</td>
</tr>
<tr>
<td>/ma:x/ ‘collect’</td>
<td>(ˈmax).-ta?</td>
<td>(ˈma:).x-it</td>
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<td>/ʃawg/ ‘buy’</td>
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<td>(ˈbe:).(ˈwin).-ta?</td>
<td>(ˈbew).n-it</td>
</tr>
</tbody>
</table>
Transitive Verbs = Atemplastic

• Problem: transitive verbs have active little \( v \), but no template
• Proposal: transitive little \( v \) = subject to Domain Suspension (Bobaljik & Wurmbrand 2013) = doesn’t act like phase
  - Transitive little \( v \) forms unit with root at PF & LF
    • Unit = phonological form and semantic meaning not compositional (see Marantz 2001)
  - \( \{v + \sqrt{v}\} = \) unit at interfaces → \( v \)’s phasehood suspended
## Transitive Verbs = Atemplatic

- **PF Evidence**: different URs of nominalized \((n + \sqrt{\ })\) and verbalized \((v + \sqrt{\ })\) roots
- **LF Evidence**: non-compositional meaning of lexical root and categorizers

<table>
<thead>
<tr>
<th>Nominalized Root ((n+\sqrt{\ }))</th>
<th>Verbalized Root ((v+\sqrt{\ }))</th>
<th>Unit @</th>
</tr>
</thead>
<tbody>
<tr>
<td>/so:nop/ ‘snot’</td>
<td>/sonp’/ ‘be snotty’</td>
<td>PF</td>
</tr>
<tr>
<td>/gadya/ ‘hungry’</td>
<td>/gada:y/ ‘be hungry’</td>
<td>PF</td>
</tr>
<tr>
<td>/je?:al/ ‘rain’ (n.)</td>
<td>/je?e:l/ ‘rain’ (v.)</td>
<td>PF</td>
</tr>
<tr>
<td>/hoy’no/ ‘plane’</td>
<td>/hoy’n/ ‘fly’</td>
<td>PF, LF</td>
</tr>
<tr>
<td>/dehel’/ ‘scissors’</td>
<td>/dihl’/ ‘cut with scissors’</td>
<td>PF, LF</td>
</tr>
<tr>
<td>/balk’/ ‘stomach’</td>
<td>/balk’/ ‘become full’</td>
<td>LF</td>
</tr>
</tbody>
</table>