HEAD-BASED BRACKETING PARADOXES IN ARmenian compounds

Hossef Dolatian

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• **Title:** Head-based bracketing paradoxes in Armenian compounds
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Phorum: Where’s the phonology?
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• **Phorum**: Where’s the phonology?
  1. **Phonology** = what principles control the alternation of morphemes?
     → ... in Armenian compounds
Title: Head-based bracketing paradoxes in Armenian compounds

1. Linguistic Content: Armenian compounds
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Phorum: Where’s the phonology?

1. **Phonology** = *what principles control the alternation of morphemes?*
   → ... in Armenian compounds
2. **Bracketing Paradox:** contradictions between phonology and morphology
3. **Heads:** contradictions arise from heads in morphology vs. heads in phonology
4. Cyclicity teases apart the different contradictions
● PREVIEW

● PARADOXES
  ● Classifying theories
  ● Constituencies in paradoxes

● ARMENIAN DATA
  ● Constituencies in Armenian
  ● Bracketing paradox in Armenian

● ANALYZING THE PARADOX

● VARIATION IN PROSODY

● WRAP-UP
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- **Armenian data**
  - Constituencies in Armenian
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- **Analyzing the paradox**

- **Variation in prosody**

- **Wrap-up**
## Syllable-counting plurals

- Plural allomorphy in simplex words

<table>
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<tr>
<th>σ</th>
<th>σ-er</th>
<th>( σσ^+ )</th>
<th>( σσ^+-ner )</th>
</tr>
</thead>
<tbody>
<tr>
<td>pág</td>
<td>pag-ér</td>
<td>‘yards’</td>
<td></td>
</tr>
<tr>
<td>panág</td>
<td>panag-nér</td>
<td>‘armies’</td>
<td></td>
</tr>
<tr>
<td>akarág</td>
<td>akarag-nér</td>
<td>farms</td>
<td></td>
</tr>
</tbody>
</table>
Syllable-counting plurals

- Plural allomorphy in simplex words

\[
\begin{array}{c|cc}
\sigma & \sigma-er & \sigma\sigma^+ \quad \sigma\sigma^+-ner \\
pág & pag-éř & \text{‘yards’} & \text{panág} & \text{panag-nér} & \text{‘armies’} & \text{akarág} & \text{akarag-nér} & \text{farms}
\end{array}
\]

- Stress does not matter – everything has final stress
Syllable-counting plurals

- Plural allomorphy in simplex words
  \[
  \begin{array}{lll}
  \sigma & \sigma\text{-er} & \sigma\sigma^+ & \sigma\sigma^+\text{-ner} \\
  \text{pág} & \text{pag-ér} & \text{panáq} & \text{panag-nér} \\
  \text{‘yards’} & \text{‘armies’} & \text{‘armies’} & \text{farms}
  \end{array}
  \]

- Stress does not matter – everything has final stress

- Mnemonic: short-allomorph → smaller syllables

  \[
  \begin{align*}
  \text{PL} \rightarrow -\text{er} & \quad / \#\sigma \_ & \quad \text{pag} & \quad \text{pag-er} & \quad \text{‘yards’} \\
  \text{PL} \rightarrow -\text{ner} & \quad /\text{elsewhere} & \quad \text{panag} & \quad \text{panag-ner} & \quad \text{‘armies’}
  \end{align*}
  \]
**Compound plurals**

- Compounds: concatenate 2 stems with \(-a-\)
  
  \[\text{t}f\acute{a}r + \text{s}írd \quad \text{‘evil + heart’} \quad \text{antsr}é\acute{v} + \text{t}f\acute{u}r \quad \text{‘rain + water’}\]
  
  \[\text{t}f\acute{a}r-a-sírd \quad \text{‘evil-hearted’} \quad \text{antsr}é\acute{v}-a-\text{t}f\acute{u}r \quad \text{‘rain-water’}\]

- Final stress on compound ~ 1 PWord

- Plural?
Compound plurals

- Compounds: concatenate 2 stems with -a-

  \[\text{tfár} + \text{sírd} \quad \text{‘evil + heart’} \quad \text{antsrév} + \text{tfúr} \quad \text{‘rain + water’}\]

  \[\text{tfar-a-sírd} \quad \text{‘evil-hearted’} \quad \text{antsrev-a-tfúr} \quad \text{‘rain-water’}\]

- Final stress on compound \(\sim 1\) PWord

- Plural?
  - STEM2 is monosyllabic but compound is polysyllabic...
• Compounds: concatenate 2 stems with -a-

\[ \tilde{t}f\acute{a}r + s\acute{i}rd \quad \text{‘evil + heart’} \quad \text{antsrёv} + \tilde{t}f\acute{u}r \quad \text{‘rain + water’} \]

\[ \tilde{t}f\acute{a}r-a-s\acute{i}rd \quad \text{‘evil-hearted’} \quad \text{antsrev-a-} \tilde{t}f\acute{u}r \quad \text{‘rain-water’} \]

• Final stress on compound \( \sim 1 \) PWord

• Plural?
  
  - STEM2 is monosyllabic but compound is polysyllabic...

  - Count entire compound

\[ \tilde{t}f\acute{a}r-a-si\acute{r}d \quad \text{‘evil-hearted’} \]

\[ \tilde{t}f\acute{a}r-a-si\acute{r}d-ner \quad \text{‘evil-hearted ppl’} \]
COMPOUND PLURALS

- Compounds: concatenate 2 stems with -a-
  \[ \text{\texttt{\textit{\textbackslash tfar} + \textit{\textbackslash sird}}} \quad \text{‘evil + heart’} \quad \text{\texttt{\textit{\textbackslash an\textbackslash tsr} + \textit{\textbackslash Tfur}}} \quad \text{‘rain + water’} \]
  \[ \text{\texttt{\textit{\textbackslash tfar-a-sird}}} \quad \text{‘evil-hearted’} \quad \text{\texttt{\textit{\textbackslash an\textbackslash tsrev-a-t\textbackslash Tfur}}} \quad \text{‘rain-water’} \]

- Final stress on compound ~ 1 PWord

- Plural?
  - \text{\texttt{\textit{\textbackslash tfar-a-sird}}} is monosyllabic but compound is polysyllabic...

- Count entire compound
  \[ \text{\texttt{\textit{\textbackslash tfar-a-sird}}} \quad \text{‘evil-hearted’} \quad \text{\texttt{\textit{\textbackslash an\textbackslash tsrev-a-t\textbackslash Tfur}}} \quad \text{‘rain-water’} \]

- Only count \text{\texttt{\textit{\textbackslash tfar-a-sird}}}
  \[ \text{\texttt{\textit{\textbackslash tfar-a-sird-ner}}} \quad \text{‘evil-hearted ppl’} \quad \text{\texttt{\textit{\textbackslash an\textbackslash tsrev-a-t\textbackslash Tfur-er}}} \quad \text{‘rain-waters’} \]
ARMENIAN PARADOX

- Bracketing paradox: two contradictory constituencies
  - **MORPHO**: Plural has semantic scope over compound
  - **PHONO**: Plural should count the *entire* compound
**ARMENIAN PARADOX**

- Bracketing paradox: two contradictory constituencies
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  - **PHONO**: Plural should count the *entire* compound

**Transparent Plural**

\[ \text{transparent plural: } \tilde{t}f\text{ar-a-sird-ner} \]

‘evil-hearted ppl’

- **MORPHO**
  - STEM1: \( \tilde{t}f\text{ar} \)
  - STEM2: \( -a- \)
  - STEM3: \( \text{sird} \)
  - PL: \( -\text{ner} \)

- **PHONO**
  - \( \sigma's \)
  - STEM: \( \tilde{t}f\text{ar-a-sird-ner} \)
  - PL: \( -\text{ner} \)
ARMENIAN PARADOX

- Bracketing paradox: two contradictory constituencies
  - Morpho: Plural has semantic scope over compound
  - Phono: Plural should count the *entire* compound

**Transparent Plural**

$t\text{far-a-sird-ner}$

‘evil-hearted ppl’

**Paradoxical Plural**

$\text{antsrev-a-tfur-er}$

‘rain-waters’

\[\text{Morpho}\]

\[\text{Phono}\]
Questions

- Data:

  Transparent plural  Paradoxical plural
  \( t\text{far-a-sird-ner} \)  \( \text{antsrev-a-t\text{fur-er}} \)
  ‘evil-hearted people’  ‘rain-waters’

- Question: Why get transparent plurals vs. paradoxical plurals?
- A lot of tools for paradoxes...
Questions

- Data:

  \[\text{Transparent plural} \quad \text{Paradoxical plural}\]
  \[
  \text{\(\tilde{\text{t\text{\'far-a-sird-ner}}\)}\quad \text{\(\text{\(\tilde{\text{antsrev-a-t\text{\'fur-er}}\)}\)}
  
  'evil-hearted people' \quad 'rain-waters'
  
- Question: Why get transparent plurals vs. paradoxical plurals?
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<td>Head Operations</td>
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→ distinguishes cyclic vs non-cyclic theories
→ works with cyclic, but not with counter-cyclic
→ Head-operations + prosodic constituents!
  ! distinguishes process-based vs. allomorphy based paradoxes
Questions

- Data:
  
  Transparent plural  |  Paradoxical plural
  \( \text{tsar-a-sird-ner} \)  |  \( \text{antsrev-a-tsfur-er} \)
  ‘evil-hearted people’  |  ‘rain-waters’

- Question: Why get transparent plurals vs. paradoxical plurals?
- A lot of tools for paradoxes...

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What is a Paradox

- What is a Bracketing Paradox?
  - Phono & Morpo need different constituencies
- Classic example: un-happi-er

```
Morpho

COMP

A

NEG A COMP

un happy -er

Phono

un happy -er
```
**Types of theories**

- Lots of theories since Pesetsky (1985)
- Usual classification is based on "which came first?"

<table>
<thead>
<tr>
<th>Phono 1\textsuperscript{st}</th>
<th>Morpho 1\textsuperscript{st}</th>
<th>Both</th>
</tr>
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<tbody>
<tr>
<td>Affix Raising</td>
<td>Morpho. Rebracketing</td>
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<td></td>
<td></td>
<td>Autosegmental planes</td>
</tr>
</tbody>
</table>

- Most popular nowadays are:
  - Rebracketing (Sproat, 1985)
  - Morphological Merger (Marantz, 1988)
  - Prosodic Phonology (Nespor and Vogel, 1986)
  - Late Adjunction (new but trending) (Newell, 2005)

→ Before we look at Armenian, let’s reclassify
Cyclic classification of theories

- Reclassify theories based on cyclic spell-out
Cyclic classification of theories

- Reclassify theories based on cyclic spell-out
  
  = Do we spell-out morphemes *in the same order* that morphemes are interpreted
Cyclic classification of theories

- Reclassify theories based on cyclic spell-out
  - Do we spell-out morphemes *in the same order* that morphemes are interpreted
- Most theories are counter-cyclic, some are cyclic

<table>
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<tbody>
<tr>
<td>Morphological Rebracketing</td>
<td>Prosodic Phonology</td>
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<tr>
<td>Morphological Merger</td>
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<td>Late Adjunction ...</td>
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What’s a cyclic theory

- Cyclic = we spell-out morphemes *in the same order* that morphemes are interpreted
- For *un-happier*, Prosodic Phonology is cyclic
What’s a cyclic theory

- Cyclic = we spell-out morphemes *in the same order* that morphemes are interpreted
- For *un-happier*, Prosodic Phonology is cyclic

![Diagram]

- Morpho: `COMP`\(\xrightarrow{\text{A}}\) `NEG`\(\xrightarrow{\text{happy}}\) `A`\(\xrightarrow{\text{-er}}\) `háppy`
- Phono (Prosody): `PW`\(\xrightarrow{\Sigma}\) `háppy`
What’s a cyclic theory

- Cyclic = we spell-out morphemes *in the same order* that morphemes are interpreted
- For *un-happier*, Prosodic Phonology is cyclic

```
MORPHO                     PHONO (Prosody)

COMP

A

NEG A COMP

un happy -er

PW' PW

ùn- háppy

Σ
```
What's a cyclic theory

- Cyclic = we spell-out morphemes *in the same order* that morphemes are interpreted
- For *un-happier*, Prosodic Phonology is cyclic

![Diagram](attachment:image.png)

- *-er* added after *-un* (= Morpho)
What’s a non-cyclic theory

- Counter-Cyclic = we spell-out morphemes not in a same order that morphemes are interpreted

- For \textit{un-happier}, Morphological Rebracketing is counter-cyclic

Original MORPHO

```
COMP
  /\   /
 A   A
  /\   /
NEG A COMP
  |  |  |
 un happy -er
```
What’s a non-cyclic theory

- Counter-Cyclic = we spell-out morphemes **not in a same order** that morphemes are interpreted
- For *un-happier*, Morphological Rebracketing is counter-cyclic

Original MORPHO       Modified MORPHO

```
COMP
  A
    NEG un  A happy  COMP -er
```

```
COMP
  A
    NEG un  A happy  COMP -er
```
What’s a non-cyclic theory

- Counter-Cyclic = we spell-out morphemes **not in a same order** that morphemes are interpreted
- For *un-happier*, Morphological Rebracketing is counter-cyclic

![Diagram showing original and modified morphologies](image-url)
What’s a non-cyclic theory

- Counter-Cyclic = we spell-out morphemes **not in a same order** that morphemes are interpreted
- For *un-happier*, Morphological Rebracketing is counter-cyclic

![Diagram of Original Morpho, Modified Morpho, and Phono](#)
What’s a non-cyclic theory

- Counter-Cyclic = we spell-out morphemes not in a same order that morphemes are interpreted
- For un-happier, Morphological Rebracketing is counter-cyclic

Original MORPHO

Modified MORPHO

Phono
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Types of paradoxes

- Cross-linguistically, paradoxes differ in source of PHONO constituency

1. Allomorphy-Based PHONO: un-happier

```
MORPHO                       Allomorphy-Based PHONO

COMP
  A
  NEG  A  COMP
    un  happy  -er

Comp
  Allo
    un  happy  -er
```
Types of paradoxes

- Cross-linguistically, paradoxes differ in source of PHONO constituency

1. Allomorphy-Based PHONO: \textit{un-happier}
2. Process-Based PHONO: \textit{un-grammatical-ity}

![Diagram of morphological and process-based phonology]

- Morpho
- Process-Based PHONO

- N
- A
- A
- un-grammatical
- -ity
- un-grammatical
- -ity
Tendencies in paradoxes

- Usually in morphology-phonology paradoxes...
- Allomorphy ~ Process ~ Prosody
**Tendencies in paradoxes**

- Usually in morphology-phonology paradoxes...
- Allomorphy $\sim$ Process $\sim$ Prosody
- For *un-happier*: *un-* is Level 2 & PWord-external

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<tr>
<td>A</td>
<td>WLevel</td>
<td>PW’</td>
</tr>
<tr>
<td>NEG A</td>
<td>SLevel</td>
<td>PW</td>
</tr>
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<td>un happy -er</td>
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<td>ùn- háppy-er</td>
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- **Process-Based Allomorphy-Based**

![Diagram showing the structure of morphological and phonological processes.](image)
Tendencies in paradoxes

- Usually in morphology-phonology paradoxes...
- Allomorphy ~ Process ~ Prosody
- For *un-happier*: *un-* is Level 2 & PWord-external
- For *un-grammatical-ity*: *-ity* is attached Adjs with *-al*, while *un-* attaches to any Adj

→ Most theories predict that all the P-based representations match
Most paradoxes:

\[ \text{Morpho} \neq ( \text{Process} \sim \text{Allomorphy} \sim \text{Prosody} ) \]

Most theories predict or can handle

\[ \text{Morpho} \neq ( \text{Process} \sim \text{Allomorphy} \sim \text{Prosody} ) \]
What if

- Most paradoxes:
  \[ \text{Morpho} \neq ( \text{Process} \sim \text{Allomorphy} \sim \text{Prosody} ) \]

- Most theories predict or can handle
  \[ \text{Morpho} \neq ( \text{Process} \sim \text{Allomorphy} \sim \text{Prosody} ) \]

- But in Armenian compounds:
  \[ ( \text{Morpho} \sim \text{Process} ) \neq ( \text{Allomorphy} \sim \text{Prosody} ) \]
What if

- Most paradoxes:
  $$\text{Morpho} \neq (\text{Process} \sim \text{Allomorphy} \sim \text{Prosody})$$
- Most theories predict or can handle
  $$\text{Morpho} \neq (\text{Process} \sim \text{Allomorphy} \sim \text{Prosody})$$
- But in Armenian compounds:
  $$(\text{Morpho} \sim \text{Process}) \neq (\text{Allomorphy} \sim \text{Prosody})$$
- Most theories are ill-equipped for Armenian, only some survive
  - Counter-cyclic theories fail, only cyclic ones survive
  - Need both Head Operations (Hoeksema, 1984) + Prosodic Phonology

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What's in a Word

- Armenian is an Indo-European isolate
- Agglutinative & suffixing
- Final stress

kórdz  ‘work’
kordz-avór  ‘worker’
kordz-avor-nér  ‘workers’
What’s in a word

- Armenian is an Indo-European isolate
- Agglutinative & suffixing
- Final stress

- Compounds use a linking vowel -a-
- Can get suffixed
- Final stress

kórdz ‘work’  háts + kórdz ‘bread + work’
kordz-avór ‘worker’ hats-a-kórdz ‘baker’
kòrdz-avor-nér ‘workers’ hats-a-kòrdz-utjún ‘bakery’

→ Simplex words & Compounds form a single PWord
Do compounds show same processes as simple words?

Yup... Armenian phonology is stratal. Derivational suffixes trigger stem-level phonology. Inflectional suffixes trigger word-level phonology.

E.g., destressed high vowel reduction is stem-level:

- azn´iv 'sincere' > tS´ur 'water'
- azn@v-utj´un 'sincerity' > tS@r-aj´in 'aquatic'
- azniv-´e 'from sincere (one)' > tSur-´ov 'with water'

Reduction applies in compounds too!

- azn´iv + s´ird 'sincere + heart' > tS´ur + k´i > dz 'water + line'
- azn@v-a-s´ird 'sincere-hearted' > tS@r-a-k´i > dz 'waterline'

Compounding is stem-level and triggers the same set of rules as Der. suffixes. All other SLevel rules also apply in Der & Compounding, not Infl.
Do compounds show same processes as simple words?

Yup... Armenian phonology is stratal

- Derivational suffixes trigger stem-level phonology
- Inflectional suffixes trigger word-level phonology

E.g., destressed high vowel reduction is stem-level:
- `azniv` 'sincere' > `tSır` 'water'
- `Derazn@v-utjńun` 'sincerity' > `tS@r-ajın` 'aquatic'
- `Infazniv-ıe` 'from sincere (one)' > `tSur-ıov` 'with water'

Reduction applies in compounds too!
- `azniv + sird` 'sincere + heart' > `tSır + kί >dz` 'water + line'
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Compounding is stem-level and triggers same set of rules as Der. suffixes.

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\[\text{azn\`iv} \quad \text{‘sincere’} \quad \tilde{\text{t\text{"u}r}} \quad \text{‘water’}\]
Processes in Armenian

- Do compounds show same processes as simple words?
- Yup... Armenian phonology is stratal
  - Derivational suffixes trigger stem-level phonology
  - Inflectional suffixes trigger word-level phonology
- E.g., destressed high vowel reduction is stem-level

\[
\begin{align*}
\text{aznîv} & \quad \text{‘sincere’} & \quad \hat{t}\text{fúr} & \quad \text{‘water’} \\
\text{Der} & \quad \text{aznəv-utjún} & \quad \text{‘sincerity’} & \quad \hat{t}\text{fər-ajín} & \quad \text{‘aquatic’}
\end{align*}
\]
Processes in Armenian

- Do compounds show same processes as simple words?
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\[
\begin{array}{ccc}
\text{aznǐv} & \text{‘sincere’} & \hat{t}\text{fúr} & \text{‘water’} \\
\text{Der} & \text{aznəv-utjúń} & \text{‘sincerity’} & \hat{t}\text{fər-ajín} & \text{‘aquatic’} \\
\text{Inf} & \text{azniv-é} & \text{‘from sincere (one)’} & \hat{t}\text{fur-óv} & \text{‘with water’} \\
\end{array}
\]
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<tr>
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<th>Derivational</th>
<th>Inflectional</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>azniv</code></td>
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<td><code>azniv-é</code></td>
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</tr>
<tr>
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<td><code>tfər-ajîn</code></td>
<td><code>tfur-ôv</code></td>
</tr>
<tr>
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<td>‘aquatic’</td>
<td>‘with water’</td>
</tr>
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</table>

Reduction applies in compounds too!

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<th>Inflectional</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>azniv + sírd</code></td>
<td><code>azniv</code></td>
<td><code>sîrd</code></td>
<td><code>tfûr</code></td>
</tr>
<tr>
<td>‘sincere + heart’</td>
<td>‘sincere-hearted’</td>
<td>‘water + line’</td>
<td></td>
</tr>
<tr>
<td><code>aznəv-a-sírd</code></td>
<td><code>aznəv</code></td>
<td><code>sírd</code></td>
<td><code>tfər-a-kîdž</code></td>
</tr>
<tr>
<td>‘sincere-hearted’</td>
<td>‘waterline’</td>
<td></td>
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Yup... Armenian phonology is stratal

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E.g., destressed high vowel reduction is stem-level

\[
\begin{align*}
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\text{Inf} \quad \text{aznỳv-é} & \quad \text{‘from sincere (one)’} & \quad \text{tʃỳr-óv} & \quad \text{‘with water’}
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Reduction applies in compounds too!

\[
\begin{align*}
\text{aznǐv} + \text{sìrd} & \quad \text{‘sincere + heart’} & \quad \text{tʃỳr} + \text{kìdz} & \quad \text{‘water + line’} \\
\text{aznỳv-a-sìrd} & \quad \text{‘sincere-hearted’} & \quad \text{tʃỳr-a-kìdz} & \quad \text{‘waterline’}
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\]

→ Compounding is stem-level and triggers same set of rules as Der. suffixes

* All other SLevel rules also apply in Der & Compounding, not Infl
So far, compounds show no paradoxes
Allomorphy in Armenian

- So far, compounds show no paradoxes – but they do in plurals.
Allomorphy in Armenian

- So far, compounds show no paradoxes – but they do in plurals.
- Simplex words: PL is -er if monosyllabic, -ner if polysyllabic

\[
\begin{array}{cccc}
\sigma & \sigma\sigma & \sigma\sigma\sigma + \\
\text{pág} & \text{panág} & \text{akarág} & \text{‘farm’} \\
\text{pag-ér} & \text{panag-nér} & \text{‘armies’} & \text{akarag-nér} & \text{‘farms’}
\end{array}
\]

* Allomorphy is simple syllable-counting, not about stress or feet
Paradoxical plurals

- Compounds are polysyllabic so they should always take -ner.
- It shouldn’t matter if STEM2 is a single σ or not.
Paradoxical Plurals

- Compounds are polysyllabic so they should always take -ner.
- It shouldn’t matter if STEM2 is a single σ or not.
- **Transparent** Plurals: PL counts entire polysyllabic compound

  \[
  \text{azniv} + \text{sird} \quad \text{‘sincere + heart’} \\
  \text{aznəv-a-sírd} \quad \text{‘sincere-hearted’} \\
  \underline{\text{aznəv-a-sird-ner}} \quad \text{‘sincere-hearted ones’}
  \]

* Underline domain of syllable counting
Paradoxical plurals

- Compounds are polysyllabic so they should **always** take -*ner*
- It shouldn’t matter if STEM2 is a single σ or not.
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  \]

* Underline domain of syllable counting

- **Paradoxical** Plurals: PL counts monosyllabic STEM2
  
  \[
  \text{tfýr} + \text{kídz} \quad \text{‘water + line’} \\
  \text{tfýr-a-kídz} \quad \text{‘waterline’} \\
  \text{tfýr-a-kídz-ér} \quad \text{‘waterlines’}
  \]
Paradoxical plurals

- Compounds are polysyllabic so they should always take -ner
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  \]

* Underline domain of syllable counting

- **Paradoxical** Plurals: PL counts monosyllabic STEM2

  \[
  \text{tfúr} + \text{kipə} \quad \text{‘water + line’} \\
  \text{tfəɾ-a-kidz} \quad \text{‘waterline’} \\
  \text{tfəɾ-a-kidz}-ér \quad \text{‘waterlines’}
  \]

- Both have stem-level reduction between STEM1,2, not before PL suffix
Constituencies in Armenian

- Transparent plural: All constituencies match
  
  $azniv + sird$ ‘sincere + heart’
  
  $aznəv-a-sírd$ ‘sincere-hearted’
  
  $aznəv-a-sırd-ńér$ ‘sincere-hearted ones’

- Morpho ~ Process ~ Allomorphy
Constituencies in Armenian

- Transparent plural: All constituencies match
  
  \( \text{azniv} + \text{sird} \)  \(\) ‘sincere + heart’
  
  \(\text{aznəv-a-sǐrd} \) ‘sincere-hearted’
  
  \(\text{aznəv-a-sǐrd-ner} \) ‘sincere-hearted ones’

- Morpho ~ Process ~ Allomorphy

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<td></td>
</tr>
<tr>
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<td>SLevel</td>
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<tr>
<td>STEM1</td>
<td>STEM2</td>
<td>PL</td>
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<tr>
<td>azniv</td>
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<tr>
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<td>-ner</td>
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</table>
Constituencies in Armenian

- Paradoxical plural: Only some match
  \[ \text{tfúr} + \text{kidz} \quad \text{‘water + line’} \]
  \[ \text{tfér-a-kídž} \quad \text{‘waterline’} \]
  \[ \text{tfér-a-kidž-ér} \quad \text{‘waterlines’} \]

- (Morpho ~ Process) ≠ Allomorphy
**Constituencies in Armenian**

- Paradoxical plural: Only some match
  
  \[
  \tilde{t}fu\text{r} + \tilde{k}\text{idz} \quad \text{‘water + line’}
  \]
  
  \[
  \tilde{t}\text{f}\text{o}\text{r}-a-\tilde{k}\text{idz} \quad \text{‘waterline’}
  \]
  
  \[
  \tilde{t}\text{f}\text{o}\text{r}-a-\tilde{k}\text{idz-}\text{er} \quad \text{‘waterlines’}
  \]

- (Morpho ~ Process) \(\neq\) Allomorphy

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<th><strong>PL</strong></th>
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<tr>
<td>(\tilde{t}\text{f}\text{u}\text{r})</td>
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  - Bracketing paradox in Armenian

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- Variation in Prosody

- Wrap-up
Endocentricity

- Paradox exists, but what’s the pattern?

1 Allen (1979)’s ‘IS A’ relation; well-known generalization in Armenian (Vaux, 1998).
Endocentricity

- Paradox exists, but what’s the pattern?
- Paradox is essentially about semantic endocentricity\(^1\)

Is the compound endocentric?

\[ ? \]

Is it hyponymic?

\[ ? \]

Is compound a type of STEM2?

\[ \checkmark \quad \times \]

Paradoxical \quad Transparent

\( \text{waterline} \quad \text{IS A} \quad \text{line} \quad \text{sincere-hearted} \quad \text{IS not A} \quad \text{heart} \)

\( \text{tʃəra-a-kidz-er} \quad \text{kidz-er} \quad \text{aznəv-a-sird-ner} \quad \text{sird-er} \)

\(^1\)Allen (1979)’s ‘IS A’ relation; well-known generalization in Armenian (Vaux, 1998).
How robust is the paradox? How robust is endocentricity? Very!\(^2\)

\(^2\)(Donabédian, 2004)
How robust is the paradox? How robust is endocentricity? Very!\textsuperscript{2}

Hyponymic $\rightarrow$ endocentric $\rightarrow$ paradoxical

**Nominal**

\[
\begin{align*}
X + N &= N & \text{\textasciitilde30\% lexicon} \\
\hat{t}ʃur + \hat{kidz} & \quad \text{‘water + line’} \\
X + \underline{N}-er & \quad \hat{ʃər}-a-\underline{kidz}-er & \quad \text{‘waterline(s)’}
\end{align*}
\]

\textsuperscript{2}(Donabédian, 2004)
Compound classifications

- How robust is the paradox? How robust is endocentricity? Very!\(^2\)
- Hyponymic → endocentric → paradoxical

**Nominal**

X + N = N  \(\hat{t}fur + kidz\)  ‘water + line’
X + N-er \(\hat{t}f\text{ər-a-kidz-er}\)  ‘waterline(s)’

**Non-hyponymic → exocentric → transparent**

**Possessive**

X + N = A  \(azniv + sird\)  ‘sincere + heart’
X + N-er \(azn\text{əv-a-sird-ner}\)  ‘sincere-hearted (people)’

**Deverbal**

X + V\(_{\text{root}}\) = N/A  \(antsrev + per-el\)  ‘rain + to bring’
X + V-ner \(antsrev-a-per-ner\)  ‘rain-bearing’

- Doesn’t matter what’s Stem1’s POS, semantics, morphological structure (appendix)

\(^2\)(Donabédian, 2004)
Head-marking in compounds

- Compound PL is head-marking: counting syllables in the semantic head

---

3Irregular inflection is usually optional for most irregular words
HEAD-MARKING IN COMPOUNDS

- Compound PL is head-marking: counting syllables in the semantic head
- Prediction: irregular plurals are inherited too!\(^3\)

\(^3\)Irregular inflection is usually optional for most irregular words
Compound PL is head-marking: counting syllables in the semantic head

Prediction: irregular plurals are inherited too!

\[
\begin{align*}
\text{mart} & \quad \text{‘man’} \\
\text{ajdz} + \text{mart} & \quad \text{‘goat + man’} \\
\text{ajdz-a-mart} & \quad \text{‘satyr’} \\
\text{mart-ig} & \quad \text{‘men’} \\
\text{ajdz-a-mart-ig} & \quad \text{‘satyrs’} \\
\text{ajdz-a-mart-er} & \quad \text{‘satyrs’}
\end{align*}
\]

Cross-linguistically, Head-marking is all-or-nothing (Stump, 1995)

\[\text{Irregular inflection is usually optional for most irregular words}\]
**Head-marking in compounds**

- Compound PL is head-marking: counting syllables in the semantic head
- Prediction: irregular plurals are inherited too!³

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  \]

- Cross-linguistically, Head-marking is all-or-nothing (Stump, 1995)
  - All irregular morphology is inherited in endocentric compounds

  \[
  \begin{align*}
  \text{‘mother’} \\
  \text{majr} \\
  \text{PL} \quad \text{majr-er} \\
  \text{Reg GEN} \quad \text{majr-i} \\
  \text{Irreg GEN} \quad \text{mor}
  \end{align*}
  \]

³Irregular inflection is usually optional for most irregular words
Head-marking in compounds

- Compound PL is head-marking: counting syllables in the semantic head
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\[
\begin{align*}
\text{mart} & \quad \text{‘man’} & \quad \text{ajdz + mart} & \quad \text{‘goat + man’} \\
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\[
\begin{align*}
\text{‘mother’} & \quad \text{‘seal + mother’} \\
& \quad \text{‘god-mother’} \\
\text{majr} & \quad \text{gệnk-a-majr} \\
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\]

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\text{Irreg GEN} & \quad \text{mor} & \quad \text{gənk-a-mor}
\end{align*}
\]

---

3Irregular inflection is usually optional for most irregular words
Head-marking in compounds

- Compound PL is head-marking: counting syllables in the semantic head
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  \[ \text{mart} \quad \text{‘man’} \quad \text{adj} + \text{mart} \quad \text{‘goat + man’} \]
  \[ \text{adj-a-mart} \quad \text{‘satyr’} \]
  \[ \text{mart-ig} \quad \text{‘men’} \quad \text{adj-a-mart-ig} \quad \text{‘satyrs’} \]
  \[ \text{adj-a-mart-er} \quad \text{‘satyrs’} \]

- Cross-linguistically, Head-marking is all-or-nothing (Stump, 1995)
  - All irregular morphology is inherited in endocentric compounds

  \[ \text{‘mother’} \quad \text{‘seal + mother’} \quad \text{‘country + mother’} \]
  \[ \text{‘god-mother’} \quad \text{‘capital’} \]
  \[ \text{majr} \quad \text{gənk-a-majr} \quad \text{kayak-a-majr} \]
  \[ \text{PL} \quad \text{majr-er} \quad \text{gənk-a-majr-er} \quad \text{kayak-a-majr-ner} \]
  \[ \text{Reg GEN} \quad \text{majr-i} \quad \text{gənk-a-majr-i} \quad \text{kayak-a-majr-i} \]
  \[ \text{Irreg GEN} \quad \text{mor} \quad \text{gənk-a-mor} \]

→ Semantic head is also Morphological head

³Irregular inflection is usually optional for most irregular words
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<td><strong>ANALYZING THE PARADOX</strong></td>
</tr>
<tr>
<td><strong>VARIATION IN PROSODY</strong></td>
</tr>
<tr>
<td><strong>WRAP-UP</strong></td>
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</tbody>
</table>
Long-story short: Pl counts syllables in STEM2 if it’s the semantic head

- $\text{azniv} + \text{sird}$ ‘sincere + heart’
- $\text{aznəv-a-sírd}$ ‘sincere-hearted’
- $\text{aznəv-a-sírd-nér}$

- $\text{tʃúr} + \text{kídz}$ ‘water + line’
- $\text{tʃər-a-kídz}$ ‘waterline’
- $\text{tʃər-a-kídz-ér}$

How do we analyze the paradox?
Interim summary

- Long-story short: PL counts syllables in STEM2 if it’s the semantic head
  
  \[ \text{azniv} + \text{sird} \quad \text{‘sincere + heart’} \quad \text{\(\tilde{t}f\urd\)r} + \text{\(\tilde{k}\idi\)z} \quad \text{‘water + line’} \]
  
  \[ \text{azn\@v-a-s\@rd} \quad \text{‘sincere-hearted’} \quad \text{\(\tilde{t}\sigmar-a-k\idi\)dz} \quad \text{‘waterline’} \]
  
  \[ \text{azn\@v-a-s\@rd-n\@r} \quad \text{\(\tilde{t}\sigmar-a-k\idi\)dz-\@r} \]

- How do we analyze the paradox?

- **Reminder**: some approaches are counter-cyclic if spell-out doesn’t match underlying morphology

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<thead>
<tr>
<th><strong>Counter-cyclic</strong></th>
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- For Armenian...
Interim summary

- Long-story short: PL counts syllables in STEM2 if it’s the semantic head
  
  \[
  \text{azniv + sird} \quad \text{‘sincere + heart’} \quad \text{tfür + kídž} \quad \text{‘water + line’} \\
  \text{aznəv-a-sírd} \quad \text{‘sincere-hearted’} \quad \text{tfər-a-kídž} \quad \text{‘waterline’} \\
  \text{aznəv-a-sírd-nér} \\
  \]

- How do we analyze the paradox?

- Reminder: some approaches are counter-cyclic if spell-out doesn’t match underlying morphology

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- For Armenian...
  
  😊 Counter-cyclic theory like Merger/Rebracketing can do the paradox, but not stratal phonology
Interim summary

- Long-story short: PL counts syllables in STEM2 if it’s the semantic head
  
  \[ \text{azniv} + \text{sird} \]  ‘sincere + heart’ \[ \text{tʃúr} + \text{kidž} \]  ‘water + line’
  
  \[ \text{aznəv-a-sírd} \]  ‘sincere-hearted’ \[ \text{tʃeɾ-a-kidž} \]  ‘waterline’
  
  \[ \text{aznəv-a-sírd-nër} \]  ‘sincere-hearted’ \[ \text{tʃeɾ-a-kidž-ér} \]  ‘waterline’

- How do we analyze the paradox?

- **Reminder**: some approaches are counter-cyclic if spell-out doesn’t match underlying morphology

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- For Armenian...
  - Counter-cyclic theory like Merger/Rebracketing can do the paradox, but not stratal phonology
  - Cyclic ones like Head-Operations can do both
Morphological Rebracketing: PL is rebracketed with the head
Morphological Rebracketing: PL is rebracketed with the head
For exocentric, nothing special happens

Input

Countercyclic doesn’t work

‘sincere-hearted (PL)

MW

MS

PL

/azniv/ /sird/
Morphological Rebracketing: PL is rebracketed with the head
For exocentric, nothing special happens

\[
\begin{align*}
\text{\textbf{MW}}_{\text{PL}} & \\
\text{MS}_a & \\
\text{MS}_a & \quad \text{MS}_n & \quad \text{PL} \\
/\text{azniv}/ & \quad /\text{sird}/ \\
\end{align*}
\]

\begin{tabular}{ll}
Input & ‘sincere-hearted (PL) \\
Cycle 1 & Spell-out stems \(\text{azniv} + \text{sird}\) \\
& SLevel: stress & reduce \(\text{aznív} + \text{sírd}\)
\end{tabular}
Morphological Rebracketing: PL is rebracketed with the head

For exocentric, nothing special happens

\[ \text{‘sincere-hearted (PL)} \]

\[ \text{MW}_{\text{PL}} \]

\[ \text{MS}_a \]

\[ \text{MS}_a \quad \text{MS}_n \quad \text{PL} \]

\[ /azniv/ \quad /sird/ \]

**Input**

**Cycle 1**  Spell-out stems  \[ azniv + sird \]

SLevel: stress & reduce  \[ azniv + sird \]

**Cycle 2**  Combine stems  \[ azniv-a-sird \]

SLevel: stress & reduce  \[ azn\text{v-a-sird} \]
COUNTER-CYCLIC DOESN’T WORK

- Morphological Rebracketing: PL is rebracketed with the head
- For exocentric, nothing special happens

‘sincere-hearted (PL)

MW

Input
Cycle 1 Spell-out stems
SLevel: stress & reduce
Cycle 2 Combine stems
SLevel: stress & reduce
Cycle 3 Spell-out PL
WLevel: stress

/azniv/ /sird/

azniv + sird
aznív + sírd
azněv-a-sírd
azněv-a-sírd-ner
azněv-a-sírd-nér
Counter-cyclic doesn’t work

- Counter-cyclic can do exocentric, but for endocentric ‘waterlines’...
Counter-cyclic doesn’t work

- Counter-cyclic can do exocentric, but for endocentric ‘waterlines’...
- Pl is rebracketed with STEM2

Input | Rebracketed
--- | ---
MW_{PL} | MW_{PL}
MS_n | MS_n
MS_n | MS_n
PL | PL

/ˈtʃɜr/ | /ˈkɪdʒ/ | /ˈtʃɜr/ | /ˈkɪdʒ/

‘water’ ‘line’ ‘water’ ‘line’
Counter-cyclic doesn’t work

- Counter-cyclic can do exocentric, but for endocentric ‘waterlines’...

😊 PL is rebracketed with STEM2

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<tr>
<td></td>
<td>MW&lt;sub&gt;PL&lt;/sub&gt;</td>
</tr>
<tr>
<td></td>
<td>MS&lt;sub&gt;n&lt;/sub&gt;</td>
</tr>
<tr>
<td></td>
<td>MS&lt;sub&gt;n&lt;/sub&gt;</td>
</tr>
<tr>
<td>MS&lt;sub&gt;n&lt;/sub&gt;</td>
<td>/tfur/</td>
</tr>
<tr>
<td>MS&lt;sub&gt;n&lt;/sub&gt;</td>
<td>/tfur/</td>
</tr>
</tbody>
</table>

‘water’ ‘line’ ‘water’ ‘line’

- Entire compound is now MWord instead of MStem

😊 can’t apply reduction on STEM1
Counter-cyclic doesn’t work

- Counter-cyclic can do exocentric, but for endocentric...
  → can’t apply reduction on STEM1
Counter-cyclic doesn’t work

- Counter-cyclic can do exocentric, but for endocentric...
  → can’t apply reduction on STEM1

Input
Cycle 1  Spell-out stems  \( \tilde{t}f\acute{u}r + k\tilde{i}d\tilde{z} \)
  SLevel: stress & reduce  \( \tilde{t}f\acute{u}r + k\tilde{i}d\tilde{z} \)
COUNTER-CYCLIC DOESN’T WORK

- Counter-cyclic can do exocentric, but for endocentric...
  → can’t apply reduction on STEM1

Input
Cycle 1  Spell-out stems  \( \hat{t}f\text{ur} + \hat{k}\text{idz} \)
SLevel: stress & reduce  \( \hat{t}\text{fúr} + \hat{k}\text{idz} \)
Cycle 2  Spell-out Pl  \( \hat{t}\text{fúr} + \hat{k}\text{idz-er} \)
WLevel: stress  \( \hat{t}\text{fúr} + \hat{k}\text{idz-ér} \)
Counter-cyclic doesn’t work

- Counter-cyclic can do exocentric, but for endocentric...
- can’t apply reduction on STEM1

\[\begin{array}{c}
\text{Input} \\
\text{Cycle 1} & \text{Spell-out stems} & \text{Spell-out PL} \\
& \text{SLevel: stress & reduce} & \text{WLevel: stress} \\
& \text{Combine stems} &
\end{array}\]

\[\begin{array}{c}
\text{MS}_n & \text{MS}_n & \text{PL} \\
\text{MW}_{PL} & \text{MW}_{PL} \\
/\text{tfur}/ & /\text{kidz}/ \\
\end{array}\]
Counter-cyclic doesn’t work

- Counter-cyclic can do exocentric, but for endocentric...
  → can’t apply reduction on STEM1

Input

Cycle 1
- Spell-out stems: $tʃur + kidz$
- SLevel: stress & reduce: $tʃúr + kídz$

Cycle 2
- Spell-out PL: $tʃúr + kídz$-er
- WLevel: stress: $tʃúr + kídz$-ér

Cycle 3
- Combine stems: $tʃur$-a-$kídz$-ér
- WLevel: stress: *$tʃur$-a-$kídz$-ér
- *expect...: $tʃør$-a-$kídz$-ér
Counter-cyclic analyses correlate with phonological non-coherence

\[ \text{happy} \rightarrow \text{háppy-er} \]

\[ \text{un-happy} \rightarrow \text{ùn-háppy-er} \]

Intuitively, counter-cyclic analysis can’t work because they predict that

\[ \text{Process} \sim \text{Allomorphy} \]

In Armenian compounds, crucially \( \text{Process} \neq \text{Allomorphy} \)

\[ \rightarrow \text{Need cyclic approaches!} \]

\[ \text{Morpho Process Allomorphy} \]

\[ \text{pl} \rightarrow \text{pl-er} \]

\[ \text{Compound Stem2} \rightarrow \text{ki>dz} \]

\[ \text{Stem1} \rightarrow \text{tSur} \]

\[ \text{WLevel} \rightarrow \text{SLevel} \rightarrow \text{SLevel} \rightarrow \text{Allo-er} \]

\[ \text{ki>dz} \rightarrow \text{tS@r-a-} \]
Counter-cyclicity and non-coherence

- Counter-cyclic analyses correlate with phonological non-coherence
  - happy  háppy-er
  - un-happy  ùn-háppy-er
Counter-cyclicity and non-coherence

- Counter-cyclic analyses correlate with phonological non-coherence
  - *happy*    *háp-y-er*
  - *un-happy* *ùn-háp-y-er*
- Intuitively, counter-cyclic analysis can’t work because they predict that Process $\sim$ Allomorphy
Counter-cyclicity and non-coherence

- Counter-cyclic analyses correlate with phonological non-coherence
  - *happy* \( \rightarrow \) *háppy-er*
  - *un-happy* \( \rightarrow \) *ùn-háppy-er*

- Intuitively, counter-cyclic analysis can’t work because they predict that Process \( \sim \) Allomorphy

- In Armenian compounds, crucially Process \( \neq \) Allomorphy
  - Need cyclic approaches!

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<tr>
<th>Morpho</th>
<th>Process</th>
<th>Allomorphy</th>
</tr>
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<tbody>
<tr>
<td>Compound</td>
<td>SLevel</td>
<td>Allo</td>
</tr>
<tr>
<td>STem1</td>
<td>STem2</td>
<td>PL</td>
</tr>
<tr>
<td>( \tilde{t}fur )</td>
<td>kidz</td>
<td>-er</td>
</tr>
<tr>
<td>SLevel</td>
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What’s a head-operation

- Head-operation: rule/morpheme looks for the semantic head
- PL is a head-operation
  - $PL(X + h) = X + PL(h)$
  - $PL \rightarrow -er / \left[ \sigma \right]_h$
  - $PL \rightarrow -ner / \text{elsewhere}$

- Semantic Head $h$:
  - If simplex/exocentric, then $h=\text{WORD}$
  - if endocentric, then $h=\text{STEM2}$
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  - if endocentric, then $h=$STEM2

- Head-Operations are cyclic + work perfectly with stratal process
  - Exo ‘sincere-hearted’
  - Endo ‘waterlines’
What’s a head-operation

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Exo
- ‘sincere-hearted’
- ‘waterlines’

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<td>tʃur  kɪdʒ</td>
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  - if endocentric, then h=STEM2

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<td>Combine stems</td>
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<td>tfur  kidz</td>
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<td></td>
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  - $\text{PL}(X + h) = X + \text{PL}(h)$
  - $\text{PL} \rightarrow -er$ if simplex/exocentric, then $h=$ *word*
  - $\text{PL} \rightarrow -ner$ elsewhere if endocentric, then $h=$ *stem2*

- Semantic Head $h$:
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<th>Add PL</th>
<th>WLevel: stress</th>
<th>[azniv-a-sírd]$_h$-ner</th>
<th>tfúr-a-[kidz]$_h$-er</th>
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<td>tfúr-a-kidz-ér</td>
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Lots of theories for paradoxes but...
**Interim theory**

- Lots of theories for paradoxes but...
  - Armenian doesn’t work with counter-cyclic theories
  - Armenian uses cyclic head-operations

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Interim Theory

- Lots of theories for paradoxes but...
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<td></td>
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- Twist: variation data also shows use for *prosodic constituents*
Bisyllabic compounds

- Old data...

  - *azniv + sird* \(\text{‘sincere + heart’}\)
  - *\(\text{t}f\text{ur} + \text{ki}d\text{z}\)* \(\text{‘water + line’}\)

  - *azn\(\text{v}-\text{a}-\text{sird}\)-ner* \(\text{‘sincere-hearted’}\)
  - *\(\text{t}f\text{or}-\text{a}-\text{ki}d\text{z}\)-er* \(\text{‘waterlines’}\)

Twist:

- **Endo**
  - *kar + daS-el* \(\text{‘stone + to carve’}\)
    - *kar-daS* \(\text{‘stone carver’}\)
    - *kar-daS-ner* \(\text{‘stonecarvers’}\)

- **Exo**
  - *xa\(\text{t}S + \text{kar}\)* \(\text{‘cross + stone’}\)
    - *xa\(\text{t}S-kar\)* \(\text{‘cross-stone’}\)
    - *xa\(\text{t}S-kar-ner\)* \(\text{‘cross-stones’}\)
Bisyllabic compounds

- Old data...
  
  \[
  \text{azniv} + \text{sird} \quad \text{‘sincere + heart’} \\
  \text{aznəv-a-sird-ner} \quad \text{‘sincere-hearted’}
  \]
  
  \[
  \text{tfur} + \text{kidz} \quad \text{‘water + line’} \\
  \text{tfər-a-kidz-er} \quad \text{‘waterlines’}
  \]

- Twist:
  
  - All you saw were 3+-syllabic compounds
Bisyllabic compounds

- Old data...
  
  \[
  \text{azniv} + \text{sird} \quad \text{‘sincere} + \text{heart’} \quad \text{\(\tilde{t}fur\)} + \text{\(\tilde{ki}dz\)} \quad \text{‘water} + \text{line’}
  \]
  
  \[
  \text{azn\(\text{\v{a}}\)-a-sird-ner} \quad \text{‘sincere-hearted’} \quad \text{\(\tilde{t}\text{\(\text{\v{a}}\)r-a-\(\tilde{ki}dz\)}\)-er} \quad \text{‘waterlines’}
  \]

- Twist:
  
  - All you saw were 3+-syllabic compounds
  - Bisyllabic endo compounds show variation

Exo

\[
\text{kar} + \text{daf-el} \quad \text{‘stone} + \text{to carve’}
\]

\[
\text{kar-daf} \quad \text{‘stone carver’}
\]
Bisyllabic compounds

- Old data...
  - *azniv + sird* ‘sincere + heart’  *tfur + kidž* ‘water + line’
  - *aznəv-a-sird-ner* ‘sincere-hearted’  *tfər-a-kidž-er* ‘waterlines’

- Twist:
  - All you saw were 3+-syllabic compounds
  - Bisyllabic *endo* compounds show *variation*

  **Exo**
  - *kar + daf-el* ‘stone + to carve’
  - *kar-daf* ‘stone carver’

  *kar-daf-ner*
Bisyllabic compounds

- Old data...
  - \( \text{azniv} + \text{sird} \) ‘sincere + heart’ \( \text{tfur} + \text{kidz} \) ‘water + line’
  - \( \text{aznēv-a-sird-ner} \) ‘sincere-hearted’ \( \text{tfēr-a-kidz-er} \) ‘waterlines’

- Twist:
  - All you saw were 3+-syllabic compounds
  - Bisyllabic endo compounds show variation

Exo                \hspace{0.5cm} ENDO
\( \text{kar} + \text{daf-el} \)  ‘stone + to carve’  \( \text{xatj} + \text{kar} \)  ‘cross + stone’
\( \text{kar-daf} \)  ‘stone carver’  \( \text{xatj-kar} \)  ‘cross-stone’
\( \underline{\text{kar-daf-ner}} \)
Bisyllabic compounds

- Old data...
  - *azniv + sird* ‘sincere + heart’  *tʃur + kidz* ‘water + line’
  - *aznv-a-sird-ner* ‘sincere-hearted’  *tʃər-a-kidz-er* ‘waterlines’

- Twist:
  - All you saw were 3+-syllabic compounds
  - Bisyllabic endo compounds show variation

  **Exo**
  - *kar + daf-el* ‘stone + to carve’
  - *kar-daf* ‘stone carver’

  **Endo**
  - *xatʃ + kar* ‘cross + stone’
  - *xatʃ-kar* ‘cross-stone’
  - *xatʃ-kar-er*
Bisyllabic compounds

- Old data...
  
  \[
  \begin{align*}
  \text{azniv} + \text{sird} & \quad \text{‘sincere + heart’} \\
  \text{tfur} + \text{kidz} & \quad \text{‘water + line’} \\
  \text{aznəv-a-sird-ner} & \quad \text{‘sincere-hearted’} \\
  \text{tfər-a-kidz-er} & \quad \text{‘waterlines’}
  \end{align*}
  \]

- Twist:
  
  - All you saw were 3+-syllabic compounds
  - Bisyllabic endo compounds show variation

  \[
  \begin{align*}
  \text{Exo} & \\
  \text{kar} + \text{daf-el} & \quad \text{‘stone + to carve’} \\
  \text{kar-daf} & \quad \text{‘stone carver’}
  \end{align*}
  \]

  \[
  \begin{align*}
  \text{Endo} & \\
  \text{yatʃ} + \text{kar} & \quad \text{‘cross + stone’} \\
  \text{yatʃ-ker} & \quad \text{‘cross-stone’} \\
  \text{yatʃ-ker-er} & \\
  \text{yatʃ-ker-ner} &
  \end{align*}
  \]

  → Bisyllabic endo compounds optionally get transparent plurals
Prosodic Heads

- Bisyllabic endo compounds optionally get transparent plurals
- Analysis: Prosodic Heads $p$
Bisyllabic endo compounds optionally get transparent plurals

Analysis: Prosodic Heads $p$

1) Map $p$ 

$[\ldots]_h \rightarrow (...)_p$
Prosodic Heads

- Bisyllabic endo compounds *optionally* get transparent plurals
- Analysis: Prosodic Heads $p$
  1) Map $p$  
     $[...]_h \rightarrow (...)_p$
  2) Optional restructuring  
     $\#\sigma (\sigma)_p \rightarrow (\sigma \sigma)_p$
Prosodic Heads

- Bisyllabic endo compounds *optionally* get transparent plurals
- Analysis: Prosodic Heads \( p \)

1) Map \( p \)  
\[
[...]^h \rightarrow (...)_p
\]

2) Optional restructuring  
\[
\#\sigma \ (\sigma)_p \rightarrow (\sigma \sigma)_p
\]

3) Count \( \sigma \)'s in \( p \)  
PL \( \rightarrow -er/ (\sigma)_{p,h} \_ \)
PL \( \rightarrow -ner/ \) elsewhere

Exo 'sincere-hearted' 'stone-carver'

\( \hat{t}far + sird + PL \) \( kar + da\hat{f}e + PL \)
Bisyllabic endo compounds *optionally* get transparent plurals

**Analysis: Prosodic Heads** $p$

1) Map $p$
$$[...]{h} \rightarrow (...)_{p}$$

2) Optional restructuring
$$\#\sigma (\sigma)_{p} \rightarrow (\sigma\sigma)_{p}$$

3) Count $\sigma$’s in $p$
$$\text{PL} \rightarrow -er / (\sigma)_{p,h}$$
$$\text{PL} \rightarrow -ner / \text{elsewhere}$$

<table>
<thead>
<tr>
<th>Exo</th>
<th>‘sincere-hearted’</th>
<th>‘stone-carver’</th>
</tr>
</thead>
<tbody>
<tr>
<td>$t\ddot{a}r + s\ddot{i}d + \text{PL}$</td>
<td>$k\ddot{a}r + d\ddot{a}s - + \text{PL}$</td>
<td></td>
</tr>
</tbody>
</table>

**Cycle 1** Spell-out & SLevel
- $az\acute{n} \acute{\i}v + s\ddot{i}r\ddot{d}$
- $k\acute{\i}r + d\ddot{a}s$
Prosodic Heads

- Bisyllabic endo compounds *optionally* get transparent plurals

- Analysis: Prosodic Heads $p$

  1) Map $p$  
  \[ [...]_h \rightarrow (...)_p \]

  2) Optional restructuring  
  \[ \#\sigma (\sigma)_p \rightarrow (\sigma \sigma)_p \]

  3) Count $\sigma$’s in $p$  
  PL \rightarrow -er / (\sigma)_{p,h}\
  PL \rightarrow -ner / elsewhere

<table>
<thead>
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<th>‘stone-carver’</th>
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</thead>
<tbody>
<tr>
<td>Cycle 1</td>
<td>Spell-out &amp; SLevel</td>
<td>$tfar + sird + PL$</td>
</tr>
<tr>
<td>Cycle 2</td>
<td>Combine &amp; SLevel</td>
<td>$azniv + sird$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$aznov-a-sird$</td>
</tr>
</tbody>
</table>
Prosodic Heads

- Bisyllabic endo compounds *optionally* get transparent plurals

Analysis: Prosodic Heads $p$

1) Map $p$

\[ [...]_h \rightarrow (...)_p \]

2) Optional restructuring

\[ \#\sigma (\sigma)_p \rightarrow (\sigma \sigma)_p \]

3) Count $\sigma$’s in $p$

- PL \rightarrow -er / (\sigma)_p,h
- PL \rightarrow -ner / elsewhere

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<th>‘stone-carver’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spell-out &amp; SLevel</td>
<td>$t\tilde{f}ar + \text{sírd} + PL$</td>
<td>$\text{kar} + \text{daf}- + PL$</td>
</tr>
<tr>
<td>Combine &amp; SLevel</td>
<td>$\text{anzəv-a-sírd}$</td>
<td>$\text{kar-dáf}$</td>
</tr>
<tr>
<td>$h?$</td>
<td>$[\text{anzəv-a-sírd}]_h$</td>
<td>$[\text{kar-dáf}]_h$</td>
</tr>
</tbody>
</table>
**Prosodic Heads**

- Bisyllabic endo compounds *optionally* get transparent plurals
- Analysis: Prosodic Heads $p$

1) Map $p$ 
   
2) Optional restructuring 
   $\#\sigma (\sigma)_p \rightarrow (\sigma \sigma)_p$

3) Count $\sigma$'s in $p$ 
   $\text{PL} \rightarrow \text{-er} / (\sigma)_p,h$;
   $\text{PL} \rightarrow \text{-ner} / \text{elsewhere}$

<table>
<thead>
<tr>
<th>Exo</th>
<th>'sincere-hearted'</th>
<th>'stone-carver'</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\text{tfar + sird + PL}$</td>
<td>$\text{kar + dáf + PL}$</td>
<td></td>
</tr>
<tr>
<td>$\text{aznív + sírd}$</td>
<td>$\text{kár + dáf}$</td>
<td></td>
</tr>
<tr>
<td>$\text{aznəv-a-sírd}$</td>
<td>$\text{kar-dáf}$</td>
<td></td>
</tr>
<tr>
<td>$[\text{anzəv-a-sírd}]_h$</td>
<td>$[\text{kar-dáf}]_h$</td>
<td></td>
</tr>
<tr>
<td>$(\text{aznəv-a-sírd})_p$</td>
<td>$(\text{kar-dáf})_p$</td>
<td></td>
</tr>
</tbody>
</table>

Cycle 1: Spell-out & SLevel

Cycle 2: Combine & SLevel

$h$?

$p$?

size?
## Prosodic Heads

- Bisyllabic endo compounds *optionally* get transparent plurals
- Analysis: Prosodic Heads $p$
  1) Map $p$  
     $$\ldots|h\rightarrow(\ldots)_p$$
  2) Optional restructuring  
     $$\#\sigma(\sigma)_p\rightarrow(\sigma\sigma)_p$$
  3) Count $\sigma$’s in $p$  
     PL  
     $$\rightarrow-er/(\sigma)_p,h_\_$$
     PL  
     $$\rightarrow-ner/\text{elsewhere}$$

<table>
<thead>
<tr>
<th>Exo</th>
<th>‘sincere-hearted’</th>
<th>‘stone-carver’</th>
</tr>
</thead>
<tbody>
<tr>
<td>$t\text{far} + \text{sírd} + \text{PL}$</td>
<td>$k\text{ár} + d\text{áf}$</td>
<td></td>
</tr>
<tr>
<td>$azn\text{ív} + \text{sírd}$</td>
<td>$k\text{ár-dáf}$</td>
<td></td>
</tr>
<tr>
<td>$azn\text{év-a-sírd}$</td>
<td>$[k\text{ar-dáf}]_h$</td>
<td></td>
</tr>
<tr>
<td>$[anz\text{év-a-sírd}]_h$</td>
<td>$(k\text{ar-dáf})_p$</td>
<td></td>
</tr>
<tr>
<td>$azn\text{év-a-sírd}_p$</td>
<td>$(k\text{ar-dáf})_p$</td>
<td></td>
</tr>
<tr>
<td>‘sincere-heartedly’ ‘stone-carver’</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Cycle 1  
  Spell-out & SLevel
- Cycle 2  
  Combine & SLevel
- Cycle 3  
  Add PL
Prosodic Heads

- Bisyllabic endo compounds optionally get transparent plurals
- Analysis: Prosodic Heads $p$
  1) Map $h$ to $p$  
     $[\ldots]_h \rightarrow (\ldots)_p$
  2) Optional restructuring  
     $\#\sigma (\sigma)_p \rightarrow (\sigma\sigma)_p$
  3) Count $\sigma$’s in $p$  
     PL $\rightarrow -er / (\sigma)_p,h$
     PL $\rightarrow -ner / elsewhere$

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<tr>
<th>ENDO</th>
<th>‘waterlines’</th>
<th>‘cross-stones’</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\widehat{t}fur + kid\widehat{z} + PL$</td>
<td>$\widehat{xat}\widehat{f} + kar + PL$</td>
<td></td>
</tr>
</tbody>
</table>
Prosodic Heads

- Bisyllabic endo compounds \textit{optionally} get transparent plurals

Analysis: Prosodic Heads $p$

1) Map $h$ to $p$  
   \[ \ldots_h \to (\ldots)_p \]

2) Optional restructuring  
   \[ \#\sigma (\sigma)_p \to (\sigma \sigma)_p \]

3) Count $\sigma$’s in $p$  
   PL  
   \[\to -er / (\sigma)_{p,h} \_\]

   PL  
   \[\to -ner / \text{elsewhere} \]

Endo

\begin{tabular}{l l l l}
\hline
\textbf{ENDO} & ‘waterlines’ & ‘cross-stones’ \\
\hline
\end{tabular}

\begin{tabular}{l l l l}
\hline
\textless tfur + kidz \textgreater + PL & \textless xatf \textgreater + kar + PL \\
\hline
\end{tabular}

Cycle 1  Spell-out & SLevel  
\begin{tabular}{l l}
\hline
\textless tfúr + kidz \textgreater & \textless xátf \textgreater + kár \\
\hline
\end{tabular}
Prosodic Heads

- Bisyllabic endo compounds *optionally* get transparent plurals
- Analysis: Prosodic Heads $p$
  1) Map $h$ to $p$ $[...]_h \rightarrow (...)_p$
  2) Optional restructuring $\#\sigma (\sigma)_p \rightarrow (\sigma \sigma)_p$
  3) Count $\sigma$’s in $p$ PL $\rightarrow -er / (\sigma)_p,h _$

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<td></td>
<td>$\tilde{t}\text{s}ur + \text{kidz} + PL$</td>
<td>$x\tilde{a}t\text{f} + \text{kar} + PL$</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Cycle 1</th>
<th>Spell-out &amp; SLevel</th>
<th>$\tilde{t}\text{s}úr + \text{kidz}$</th>
<th>$x\tilde{a}t\text{f} + k\tilde{a}r$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle 2</td>
<td>Combine &amp; SLevel</td>
<td>$\tilde{t}\text{s}\text{-}r-a\text{-}\text{kidz}$</td>
<td>$x\tilde{a}t\text{f}\text{-}k\tilde{a}r$</td>
</tr>
<tr>
<td></td>
<td>$h?$</td>
<td>$\tilde{t}\text{s}\text{-}r-a-[\text{kidz}]_h$</td>
<td>$x\tilde{a}t\text{f}\text{-}[\text{kar}]_h$</td>
</tr>
<tr>
<td></td>
<td>$p?$</td>
<td>$\tilde{t}\text{s}\text{-}r-a-(\text{kidz})_p$</td>
<td>$x\tilde{a}t\text{f}\text{-}(\text{kar})_p$</td>
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Prosodic Heads

- Bisyllabic endo compounds *optionally* get transparent plurals
- Analysis: Prosodic Heads $p$
  1) Map $h$ to $p$ $[...)_h \rightarrow (...)_p$
  2) Optional restructuring $\#\sigma (\sigma)_p \rightarrow (\sigma \sigma)_p$
  3) Count $\sigma$’s in $p$ $PL \rightarrow -er / (\sigma)_p,h$ _
     $PL \rightarrow -ner /$ elsewhere

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<td>$\text{tʃu}r + \text{kidz} + PL$</td>
<td>$\text{xatʃ} + \text{kar} + PL$</td>
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</table>

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<tr>
<th>Cycle</th>
<th>Spell-out &amp; SLevel</th>
<th>$\text{tʃúr} + \text{kidz}$</th>
<th>$\text{xátʃ} + \text{kár}$</th>
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<tr>
<td>Cycle 2</td>
<td>Combine &amp; SLevel</td>
<td>$\text{tʃọ-r-a-kídz}$</td>
<td>$\text{xatʃ-kár}$</td>
</tr>
<tr>
<td>h?</td>
<td>$\text{tʃọ-r-a-[kidz]}_h$</td>
<td>$\text{xatʃ-[kár]}_h$</td>
<td></td>
</tr>
<tr>
<td>p?</td>
<td>$\text{tʃọ-r-a-(kidz)}_p$</td>
<td>$\text{xatʃ-(kár)}_p$</td>
<td></td>
</tr>
<tr>
<td>size?</td>
<td></td>
<td>$\text{xatʃ-(kár)}_p, (\text{xatʃ-kár})_p$</td>
<td></td>
</tr>
</tbody>
</table>
Prosodic Heads

- Bisyllabic endo compounds *optionally* get transparent plurals
- Analysis: Prosodic Heads $p$
  1) Map $h$ to $p$
     
     $$\begin{align*}
     ([...])_h & \rightarrow ([...])_p \\
     \end{align*}$$
  2) Optional restructuring
     
     $$\begin{align*}
     \#\sigma (\sigma)_p & \rightarrow (\sigma \sigma)_p \\
     \end{align*}$$
  3) Count $\sigma$’s in $p$
     
     $$\begin{align*}
     \text{PL} & \rightarrow \text{-er} / (\sigma)_{p,h} \\
     \text{PL} & \rightarrow \text{-ner} / \text{elsewhere} \\
     \end{align*}$$

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<th>‘waterlines’</th>
<th>‘cross-stones’</th>
</tr>
</thead>
<tbody>
<tr>
<td>$t\hat{\text{fur}} + \text{kidz} + \text{PL}$</td>
<td>$x\hat{\text{atf}} + \text{kár} + \text{PL}$</td>
<td></td>
</tr>
<tr>
<td>$t\hat{\text{fúr}} + \text{kidz}$</td>
<td>$x\hat{\text{átf}} + \text{kár}$</td>
<td></td>
</tr>
<tr>
<td>$t\hat{\text{fər-ə-kídz}}$</td>
<td>$x\hat{\text{atf}}-\text{kár}$</td>
<td></td>
</tr>
<tr>
<td>$t\hat{\text{fər-ə-[kídz]}}_h$</td>
<td>$x\hat{\text{atf-}[kár]}_h$</td>
<td></td>
</tr>
<tr>
<td>$t\hat{\text{fər-ə-(kidz)}}_p$</td>
<td>$x\hat{\text{atf-(kár)}}_p$</td>
<td></td>
</tr>
<tr>
<td>$\text{size?}$</td>
<td>$x\hat{\text{atf-(kár)}}_p, (x\hat{\text{atf}}-\text{kár})_p$</td>
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</table>

Cycle 1  Spell-out & SLevel  
Cycle 2  Combine & SLevel  
  $h?$  
  $p?$  
  size?  
Cycle 3  Add PL  
  $t\hat{\text{fər-a-kidz}}$  
  $t\hat{\text{fər-a-kidz-ér}}$  
  $x\hat{\text{atf-ker-ér}}, x\hat{\text{atf-ker-ner}}$
What is $p$?

- Prosodic Head $p$:
  - 'waterline(s)'
  - 'cross-stone(s)'

\[
\begin{align*}
\text{Prosodic Stem} & \quad \text{Prosodic Head} \\
\text{Foot} & \quad (\omega \text{ or } w) \\
\end{align*}
\]

- $p$ can't be a Foot or PWord $\rightarrow$ intermediate PStem
What is $p$?

- Prosodic Head $p$:
  - ‘waterline(s)’
  - ‘cross-stone(s)’

  \[ \begin{array}{cc}
  \text{Prosodic Stem} & \text{Foot (F or } \Sigma) \\
  \text{Prosodic Word (w or w)} & \\
  \end{array} \]

- But what is $p$?
  - Prosodic Word ($\omega$ or $w$)

\[ \begin{array}{cc}
  \text{Prosodic Head} & \text{Prosodic Word (w or w)} \\
  \text{Prosodic Stem} & \text{Foot (F or } \Sigma) \\
  \end{array} \]
What is $p$?

- Prosodic Head $p$:
  - ‘waterline(s)’
  - ‘cross-stone(s)’

- But what is $p$?
  - Prosodic Word ($\omega$ or $w$)
  - Prosodic Stem ($s$)
  - Foot ($F$ or $\Sigma$)

- $p$ can’t be a Foot or PWord $\rightarrow$ intermediate PStem
<table>
<thead>
<tr>
<th><strong>Table of Contents</strong></th>
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<tbody>
<tr>
<td><strong>Preview</strong></td>
</tr>
<tr>
<td><strong>Paradoxes</strong></td>
</tr>
<tr>
<td>- Classifying theories</td>
</tr>
<tr>
<td>- Constituencies in paradoxes</td>
</tr>
<tr>
<td><strong>Armenian data</strong></td>
</tr>
<tr>
<td>- Constituencies in Armenian</td>
</tr>
<tr>
<td>- Bracketing paradox in Armenian</td>
</tr>
<tr>
<td><strong>Analyzing the paradox</strong></td>
</tr>
<tr>
<td><strong>Variation in prosody</strong></td>
</tr>
<tr>
<td><strong>Wrap-up</strong></td>
</tr>
</tbody>
</table>
In simplex words, PL is simple syllable-counting

\[ \text{pag-er} \quad \text{‘yards’} \quad \text{panag-ner} \quad \text{‘armies’} \]

In compounds, PL counts \( \sigma \)’s in either Compound or STEM2

\[
\begin{align*}
\text{azniv + sird} & \quad \text{‘sincere + heart’} \\
\text{azniv-a-sird-ner} & \quad \text{‘sincere-hearted’}
\end{align*}
\]

\[
\begin{align*}
\text{tfur + kidz} & \quad \text{‘water + line’} \\
\text{tfør-a-kidz-er} & \quad \text{‘waterlines’}
\end{align*}
\]

Bracketing paradox:

- **MORPHO**: PL scopes over Compound
- **PHONO**: But sometimes PL looks *inside* the compound into STEM2
Wrap-up

- PL is head-marking:
  - Dissects different types of (nearly) isomorphic heads

<table>
<thead>
<tr>
<th>Semantic Head</th>
<th>Morphological Head</th>
<th>Prosodic Head</th>
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<tbody>
<tr>
<td>Endocentric</td>
<td>Irregular Infl</td>
<td>Bisyllabic minimality</td>
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</tbody>
</table>

The Armenian paradox is unlike most other paradoxes...

- Allomorphy-Based
- Process-Based
- Analysis must be cyclic because of stratal phonology
- Popular counter-cyclic theories can't work

- Armenian uses a unique combination of some theories, and excludes most
  Counter-cyclic
  Cyclic
  Rebracketing
  Head-operations
  Merger
  Prosodic Phonology
  Late Adjunction
Wrap-up

- PL is head-marking:
  - Dissects different types of (nearly) isomorphic heads
  
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</table>

- The Armenian paradox is unlike most other paradoxes...
  - Allomorphy-Based PHONO ≠ Process-Based PHONO
  - Analysis must be cyclic because of stratal phonology
  - Popular counter-cyclic theories can’t work
Wrap-up

- PL is head-marking:
  - Dissects different types of (nearly) isomorphic heads
    | Semantic Head | Morphological Head | Prosodic Head |
    | Endocentric   | Irregular Infl     | Bisyllabic minimality |
- The Armenian paradox is unlike most other paradoxes...
  - Allomorphy-Based $\text{PHONO} \neq$ Process-Based $\text{PHONO}$
  - Analysis must be cyclic because of stratal phonology
  - Popular counter-cyclic theories can’t work
- Armenian uses a unique combination of some theories, and excludes most

<table>
<thead>
<tr>
<th>Counter-cyclic</th>
<th>Cyclic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rebracketing</td>
<td>Head-operations</td>
</tr>
<tr>
<td>Merger</td>
<td>Prosodic Phonology</td>
</tr>
<tr>
<td>Late Adjunction</td>
<td></td>
</tr>
<tr>
<td>$\times$</td>
<td>$\checkmark$</td>
</tr>
</tbody>
</table>
Appendix

- More info on....
  1. prosodic constituent in compounding [46]
  2. syllable-counting in plurals [53]
  3. types of compounds w.r.t. the paradox [54]
  4. variation data & productivity [63]
  5. morphological structure of compounds [68]
$p = \text{Foot?}$

- $p = \text{Foot?}$

\[ \begin{array}{c}
\text{F} & \text{F} \\
\text{xatʃ} & \text{kar} & -er \\
\text{F} & \text{xatʃ - kar} & -ner
\end{array} \]
\[ p = \text{Foot?} \]

- \( p = \text{Foot?} \)

- Nope!... Armenian has initial secondary stress
$p = \text{Foot?}$

- $p = \text{Foot?}$

\[
\begin{array}{c}
\text{w} \\
\text{F} \quad \text{F} \\
\text{xatʃ} \quad \text{kar} \quad -\text{er} \\
\end{array}
\quad
\begin{array}{c}
\text{w} \\
\text{F} \\
\text{xatʃ} - \text{kar} \quad -\text{ner} \\
\end{array}
\]

- Nope!... Armenian has initial secondary stress
- Above words *always* have two feet + $p$ is higher

Singular  Paradoxical  Transparent

\[
\begin{array}{c}
\text{w} \\
\text{?} \quad \text{?} \\
\text{F} \quad \text{F} \\
\text{xatʃ} \quad \text{kár} \\
\end{array}
\quad
\begin{array}{c}
\text{w} \\
\text{？} \\
\text{F} \quad \text{F} \\
\text{xatʃ} \quad \text{kár} \quad + -\text{er} \\
\end{array}
\quad
\begin{array}{c}
\text{w} \\
\text{p} \\
\text{F} \quad \text{F} \\
\text{xatʃ} \quad \text{kár} \quad + -\text{ner} \\
\end{array}
\]
$p = \text{Foot?}$

- Clearer in prefixed words
$p = \text{Foot?}$

- Clearer in prefixed words
- Prefix \textit{an-} marks negation + secondary stressed + always counted

<table>
<thead>
<tr>
<th>Base</th>
<th>Derivative</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG: hám ‘taste’</td>
<td>àn-hám ‘tasteless’</td>
</tr>
</tbody>
</table>
$p = \text{Foot?}$

- Clearer in prefixed words
- Prefix *an*- marks negation + secondary stressed + always counted

<table>
<thead>
<tr>
<th>Base</th>
<th>Derivative</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG: $h\acute{a}m$ ‘taste’</td>
<td>$\acute{a}n$-$h\acute{a}m$ ‘tasteless’</td>
</tr>
</tbody>
</table>

\[
\begin{array}{c}
\begin{array}{c}
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h\acute{a}m
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\begin{array{
\[ p = \text{PWord?} \]

- \( p = \) a recursive PWord?

\[
\begin{array}{c}
\text{\texttt{xàtʃ} } \quad \text{\texttt{kár} } \quad \text{\texttt{-er}} \\
\text{\texttt{xàtʃ} } \quad \text{\texttt{kár} } \quad \text{\texttt{-ner}}
\end{array}
\]
\( p = \text{PWord}\)?

- \( p = \) a recursive PWord?

Nope because stem-level processes apply across these ‘word’ boundaries
\( p = \text{PWord?} \)

- Stem-level processes apply in Der + Comp but not inflection
  
  \[
  \begin{array}{ll}
  \text{Der} & t\text{f}ur-\text{ajín} & \text{aquatic} \\
  \text{Inf} & tfūr-óv & \text{with water} \\
  \end{array}
  \]
Stem-level processes apply in Der + Comp but not inflection

Der $tS\acute{\text{or}}$-$\text{ajín}$ ‘aquatic’
Inf $tS\acute{\text{ur}}$-$\acute{o}\hspace{0.1em}v$ ‘with water’
Comp $tS\acute{\text{ur}}$ + $h\acute{\text{ór}}$ ‘water + well’
   $tS\acute{\text{or}}$-$h\acute{\text{ór}}$ ‘water-well’
   $tS\acute{\text{or}}$-$\text{hor}$-$\text{er}$ ‘water-wells’
   $tS\acute{\text{or}}$-$\text{hor}$-$\text{ner}$ ‘water-wells’
\( p = \text{PWord?} \)

- Stem-level processes apply in Der + Comp but not inflection
  - Der: \( \widehat{\text{tʃúr}} \) ‘water’
  - Inf: \( \widehat{\text{tʃur-óv}} \) ‘with water’
  - Comp: \( \widehat{\text{tʃúr + hór}} \) ‘water + well’
  - \( \widehat{\text{tʃɔr-hór}} \) ‘water-well’
  - \( \widehat{\text{tʃɔr-hor-er}} \) ‘water-wells’
  - \( \widehat{\text{tʃɔr-hor-ner}} \) ‘water-wells’

- Weird if \( p \) is a word-boundary because stem-level processes apply across it
What is $p$

$p \neq F$

$F \quad F$

$\text{xtjf} \quad \text{kar}$

$w$

$p \neq W$

$w$

$w$

$w$

$p \neq W$

$w$

$w$

$w$

$F < p < W$

$\text{xtjf} \quad \text{kar}$

$w$

$F \quad F$

$w$

$\text{xtjf} \quad \text{kar}$

$w$

$\text{xtjf} \quad \text{kar}$

$\text{xtjf} \quad \text{kar}$
Prosodic Stems

- $p = \text{Prosodic Stem } s$?
- Tradition: PWord is smallest morphologically-derived constituents
Prosodic Stems

- $p =$ Prosodic Stem $s$?
- Tradition: PWord is smallest morphologically-derived constituents
- But: some agglutinative languages show need for a smaller one
  - Intonational Phrase ($\iota$)
    - Phonological Phrase ($\phi$)
      - Prosodic Word ($\omega$ or PWord)
        - Prosodic Stem (PStem)
          - Foot ($F$ or $\Sigma$)
What is $p$?

$p \neq F$

\[
\begin{array}{c}
p \neq W \\
\text{w} \\
\text{F} \\
\text{xat}\hat{f} \quad \text{kar} \\
\text{w} \\
\text{F} \\
\text{xat}\hat{f} - \text{kar}
\end{array}
\]

$F < (p=S) < W$

\[
\begin{array}{c}
\text{w} \\
\text{s} \\
\text{F} \\
\text{xat}\hat{f} \quad \text{kar} \\
\text{w} \\
\text{s} \\
\text{F} \\
\text{xat}\hat{f} \quad \text{kar}
\end{array}
\]
## Syllable-counting

- Simple syllable-counting

<table>
<thead>
<tr>
<th>CV</th>
<th>σ</th>
<th>σ-er</th>
<th>σσ⁺</th>
<th>σσ⁺-ner</th>
</tr>
</thead>
<tbody>
<tr>
<td>CV</td>
<td>tsi</td>
<td>tsi[j]-er</td>
<td>mekena</td>
<td>mekena-ner</td>
</tr>
<tr>
<td>CVC</td>
<td>pat</td>
<td>pat-er</td>
<td>dʒagad</td>
<td>dʒagad-ner</td>
</tr>
<tr>
<td>CVCC</td>
<td>pand</td>
<td>pand-er</td>
<td>aʃxadank</td>
<td>aʃxadank-ner</td>
</tr>
<tr>
<td>CVCCC</td>
<td>bartk</td>
<td>bartk-er</td>
<td>lusantsk</td>
<td>lusantsk-ner</td>
</tr>
</tbody>
</table>

CV: monosyllabic words
CVC: disyllabic words
CVCC: trisyllabic words
CVCCC: tetrasyllabic words

- 'horses'
- 'machines'
- 'ducks'
- 'foreheads'
- 'prisons'
- 'works'
- 'debts'
- 'margins'
Nominal compound: X+N=N  

- Hyponymic → Endocentric → Paradoxical Plural

\[ \text{antsrev} + \text{tjur} \quad \text{‘rain + water’} \]
\[ \text{antsrev-a-tjur-er} \quad \text{‘rain water(s)’} \]

- Doesn’t matter what’s relationship between STEM1 & STEM2

<table>
<thead>
<tr>
<th>2 of 1</th>
<th>arev + joy</th>
<th>‘sun + ray’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>arev-a-joy-er</td>
<td>‘sun-ray(s)’</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2 made from 1</th>
<th>medaks + kork</th>
<th>‘silk + carpet’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>medaks-a-kork-er</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2 in 1</th>
<th>kedin + xorf</th>
<th>‘ground + pit’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>kedn-a-xorf-er</td>
<td>‘ditch(es)’</td>
</tr>
</tbody>
</table>
Nominal compound

- Nominal compound: $X + N = N$
  - Hyponymic → Endocentric → Paradoxical Plural
    - $antsrev + t\text{f}ur$ ‘rain + water’
    - $antsrev-a-t\text{f}ur-er$ ‘rain water(s)’

- Doesn’t matter what’s POS of STEM1

<table>
<thead>
<tr>
<th>POS</th>
<th>Example</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>$don + \text{d}z\text{ar}$</td>
<td>‘holiday + tree’</td>
</tr>
<tr>
<td></td>
<td>$don-a-\text{d}z\text{ar}-er$</td>
<td>‘Christmas tree(s)’</td>
</tr>
<tr>
<td>Adj</td>
<td>$nax + hajr$</td>
<td>‘first + father’</td>
</tr>
<tr>
<td></td>
<td>$nax-a-hajr-er$</td>
<td>‘forefather(s)’</td>
</tr>
<tr>
<td>INF</td>
<td>$kord\text{z}-el + gerb$</td>
<td>‘to work + manner’</td>
</tr>
<tr>
<td></td>
<td>$kord\text{z}-el-a-gerb-er$</td>
<td>‘strategy’</td>
</tr>
<tr>
<td>V root</td>
<td>$a\text{xad}-il + var\text{ts}$</td>
<td>‘to work + reward’</td>
</tr>
<tr>
<td></td>
<td>$a\text{xad}-a-var\text{ts}-er$</td>
<td>wage(s)</td>
</tr>
</tbody>
</table>
• Possessive compound: X+N=A

  • Non-hyponymic → Exocentric → Transparent Plural

  \[
  \text{tfar + sird} \quad '\text{evil + heart}'
  \]

  \[
  \text{tfar-a-sird-ner} \quad '\text{evil-hearted (people)}'
  \]

• Doesn’t matter what’s POS of STEM1

<table>
<thead>
<tr>
<th>POS</th>
<th>Example</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adj</td>
<td>\text{tetev + kajl}</td>
<td>‘light + footstep’</td>
</tr>
<tr>
<td></td>
<td>\text{tetev-a-kajl-ner}</td>
<td>‘light-footed (people)’</td>
</tr>
<tr>
<td>Noun</td>
<td>\text{arjun + kujn}</td>
<td>‘blood + color’</td>
</tr>
<tr>
<td></td>
<td>\text{arjun-a-kujn-ner}</td>
<td>‘blood-colored (people)’</td>
</tr>
<tr>
<td>V root</td>
<td>\text{xeyt-el + tsajn}</td>
<td>‘to strangle + voice’</td>
</tr>
<tr>
<td></td>
<td>\text{xeyt-a-tsajn-ner}</td>
<td>‘strangled-voiced (people)’</td>
</tr>
</tbody>
</table>
Verbs and deverbal compounds

Verb
√ + TH + T/Agr

Deverbal compound?
X + V_root

per -e -l
‘to bring’

Deverbal compounds ~ English synthetic compounds

- Argument structure
- BUT no overt suffix
- Bare verbal root, similar to Romance compounds

What about the bracketing paradox?
Deverbal compound

- Deverbal compound: \( X + V_{\text{root}} = \text{N/A} \)
  - Non-hyponymic → Exocentric → Transparent
- Doesn’t matter what’s POS of STEM1

<table>
<thead>
<tr>
<th>POS</th>
<th>Example</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>manug + var3-el</td>
<td>‘child + ti instruct’</td>
</tr>
<tr>
<td></td>
<td>mang-a-var3-ner</td>
<td>‘school-teacher(s)’</td>
</tr>
<tr>
<td>Adj</td>
<td>lav + des-nel</td>
<td>‘good + to see’</td>
</tr>
<tr>
<td></td>
<td>lav-a-des-ner</td>
<td>‘optimist(s)’</td>
</tr>
<tr>
<td>V root</td>
<td>hajhoj-el + sir-el</td>
<td>‘to swear + to love’</td>
</tr>
<tr>
<td></td>
<td>hajhoj-a-ser-ner</td>
<td>‘lover(s) of swearing’</td>
</tr>
</tbody>
</table>
Deverbal compound

- Deverbal compound: $X + V_{\text{root}} = \text{N/A}$
  - Non-hyponymic $\rightarrow$ Exocentric $\rightarrow$ Transparent
- Type of argument structure doesn’t matter

<table>
<thead>
<tr>
<th>Type</th>
<th>Example</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obj + Active</td>
<td>$\text{hoy} + \text{kor}_\text{dz-el}$</td>
<td>‘earth + to work’</td>
</tr>
<tr>
<td></td>
<td>$\text{hos-a-kordz-ner}$</td>
<td>‘farmer(s)’</td>
</tr>
<tr>
<td>Adv + Intrans</td>
<td>$\text{jergar} + \text{dev-el}$</td>
<td>‘long + to last’</td>
</tr>
<tr>
<td></td>
<td>$\text{jergar-a-dev-ner}$</td>
<td>‘long-lasting (things)’</td>
</tr>
<tr>
<td>Subj + Passive</td>
<td>$\text{vodn} + \text{gox-vil}$</td>
<td>‘foot + to be trodden’</td>
</tr>
<tr>
<td></td>
<td>$\text{vodn-a-gox-ner}$</td>
<td>‘foot-trodden (things)’</td>
</tr>
<tr>
<td>Instr + Passive</td>
<td>$\text{jergat} + \text{kam-vil}$</td>
<td>‘iron + to be nailed’</td>
</tr>
<tr>
<td></td>
<td>$\text{jergat-a-kam-ner}$</td>
<td>‘iron-nailed (things)’</td>
</tr>
<tr>
<td>Adv + Passive</td>
<td>$\text{tæzvar} + \text{mars-vil}$</td>
<td>‘hard + to be digested’</td>
</tr>
<tr>
<td></td>
<td>$\text{tæzvar-a-mars-ner}$</td>
<td>‘indigestible (things)’</td>
</tr>
</tbody>
</table>
The bracketing paradox isn’t a fossilized unproductive rule
Productivity of Paradox

- The bracketing paradox isn’t a fossilized unproductive rule
- Most compounds are nominal, possessive, or deverbal (90+%)
- Paradox is *productive* to new types of constructions
Productivity of Paradox

- The bracketing paradox isn’t a fossilized unproductive rule
- Most compounds are nominal, possessive, or deverbal (90+%) 
- Paradox is *productive* to new types of constructions
- **Adjectival Compounds** are a new category
  - Rare, but exist and getting slowly more popular
  - Hyponymic → endocentric → paradoxical

\[
\begin{align*}
derev + xid & \quad \text{‘leaf + dense’} \\
derev-a-xid & \quad \text{‘dense with leaves’} \\
derev-a-xid-er & \quad \text{‘dense things with leaves’}
\end{align*}
\]
Productivity of Paradox

- The bracketing paradox isn’t a fossilized unproductive rule
- Paradox is psycholinguistically real and active
Productivity of Paradox

- The bracketing paradox isn’t a fossilized unproductive rule
- Paradox is psycholinguistically real and active
- **Ambiguity:**
  - Some pairs of STEM1 + STEM2 could get either an endo vs. exo meaning
  - One meaning is established, another is novel
  - Plural matches the meaning

\[
\begin{align*}
garmir &+ tev & \text{‘red + wing’} \\
garmr-a-tev & & \text{‘red-winged’ OR ‘red wings’} \\
garmr-a-tev-ner & & \text{‘red-winged things’} \\
garmr-a-tev-er & & \text{‘red wings’}
\end{align*}
\]
Variation in compounds

- Simple story:
  - Endocentric → Paradoxical
  - Exocentric → Transparent

- Limited variation and deviations (appendix)

<table>
<thead>
<tr>
<th>Gaining paradoxical plural</th>
<th>Losing paradoxical plural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gaining new senses</td>
<td>Semantic bleaching</td>
</tr>
<tr>
<td>Gaining animacy</td>
<td>Become metaphorical</td>
</tr>
<tr>
<td>Loanword adaptation</td>
<td>Grammaticalization</td>
</tr>
<tr>
<td>New compound types</td>
<td>Lexicalization</td>
</tr>
<tr>
<td></td>
<td><strong>Prosodic structure</strong></td>
</tr>
</tbody>
</table>
Is it morphological?

- My story: plural counting depends on semantic heads
- Alternative:
  - Not semantics, just morphology
  - It’s a morphological quirk of *nominal compounds*
  - PL counts $\sigma$ of STEM2 iff nominal compound

<table>
<thead>
<tr>
<th>STEM2</th>
<th>Nominal</th>
<th>Possessive</th>
<th>Deverbal</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\hat{t}fur$</td>
<td>$sird$</td>
<td>$kordz$-el</td>
<td></td>
</tr>
<tr>
<td>‘water’</td>
<td>‘heart’</td>
<td>‘to work’</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COMP PL</th>
<th>ant$\hat{s}$rev-$a$-$\hat{t}fur$-er</th>
<th>$\hat{t}far$-$a$-$sird$-ner</th>
<th>hats-$a$-$kordz$-ner</th>
</tr>
</thead>
</table>

- Looks attractive, but won’t work
Is it morphological?

- Alternative: PL counts $\sigma$ iff nominal compound
- Doesn’t work because...

1. Not every nominal compound gets a paradoxical plural
   - Semantic bleaching: if meaning is opaque, get transparent plural
     \[
     \begin{array}{cccc}
     \text{STEM1} & \text{STEM2} & \text{COMP} & \text{PL} \\
     \text{dzəx-e-l} & xod & \text{dzəx-a-xod} & \text{dzəx-a-xod-ner} \\
     \end{array}
     \]
     ‘to smoke’ ‘grass’ ‘tobacco’
   - Find variation when compound has transparent vs. opaque metaphorical meanings

2. Adjectival compounds are hyponymic and paradoxically pluralized
   - Rare, but exist and getting slowly more popular
     \[
     \begin{array}{cccc}
     \text{STEM1} & \text{STEM2} & \text{COMP} & \text{PL} \\
     \text{derev} & xid & \text{derev-a-xid} & \text{derev-a-xid-er} \\
     \end{array}
     \]
     ‘hole’ ‘dense’ ‘dense with leaves’

3. More shifts in loanwords, lexicalization, etc.
Morphological structure

- Analysis is agnostic to any specific tree-structure for compounds
- Endo nominal *rain-water*: antsrev-a-t∫ur

```plaintext
Concatenation

Conc + labels

Complex
```

```
N

N

N

antsrev t∫ur

√

n1

n2

n3

antsrev ∅ t∫ur ∅ ∅

antisrev ∅ t∫ur ∅

antsrev ∅ t∫ur ∅
```
Morphological structure

- Analysis is agnostic to any specific tree-structure for compounds
- Exo possessive *evil-hearted*: ṭjar-a-sird

### Concatenation

```
  A
 /   \
A     N
 |     |
|      |
|      |
|      |
τjar   sird
```

### Conc + labels

```
  Conc
 /   \
 a1   n2
 |     |
|     |
|     |
√   a1   √   n2
 |     |     |
|     |     |
|     |     |
τjar   τjar   τjar
          ∅   ∅   ∅
sird     sird   sird
 ∅     ∅     ∅
```

### Complex

```
  Complex
 /   \
 a1   n2
 |     |
|     |
|     |
√   a1   √   n2
 |     |     |
|     |     |
|     |     |
τjar   τjar   τjar
          ∅   ∅   ∅
sird     sird   sird
 ∅     ∅     ∅
Morphological structure

- Analysis is agnostic to any specific tree-structure for compounds
- Exo deverbal *rain-bearing*: antsrev-a-per (*per-el* ‘to bring)
• Analysis is agnostic to any specific tree-structure for compounds
• Exo deverbal *rain-bearing*: *antsrev-a-per* (< *per-el* ‘to bring’)


