Faded Copies:
Reduplication as Sharing of Activity

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GLOW 42, Oslo
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(Slides available at https://evazimmermann.com/talks.html)
Proposal

1. Reduplication is weakening of all elements involved in the copying.

Underlying:

Output:
Proposal

1. Reduplication is weakening of all elements involved in the copying.

   Underlying:

   ![Underlying Diagram]

   Output:

   ![Output Diagram]

2. Every copy operation gradiently weakens elements.

   Underlying:

   ![Underlying Diagram]

   Output:

   ![Output Diagram]
Proposal

1. Reduplication is weakening of all elements involved in the copying.

   Underlying:

   Output:

2. Every copy operation gradiently weakens elements.

   Underlying:

   Output:

Assumptions

1. All linguistic symbols have *activity* that can *gradiently* differ.

2. Reduplication is *fission* to fill empty prosodic nodes.

3. Fission is *distribution of underlying activity*. 
1. Copying as Weakening: Empirical Picture
   1.1 Copying Enables Reduction
   1.2 More Copying Enables More Reduction

2. Copying as Weakening: Theoretical Modeling
   2.1 Background Assumptions
   2.2 Proposal: Fission is Distribution of Activity
   2.3 Example 1: Lushootseed
   2.4 Example 2: Sikaiana

3. Discussion and Conclusion
Partial reduplication: an affix ‘whose canonical shape is constant […] but whose segmental content varies in an obvious way depending on the base to which it is attached’ (McCarthy, 1993, 187)

→ a prosodically delimited copy is added to express morphological meaning

(1) Partial reduplication in Ilokano: A heavy syllable (McCarthy, 1993, 187)

<table>
<thead>
<tr>
<th>Word</th>
<th>Meaning</th>
<th>Reduplicated Word</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>kaldíŋ</td>
<td>‘goat’</td>
<td>kal~kaldíŋ</td>
<td>‘goats’</td>
</tr>
<tr>
<td>púsqa</td>
<td>‘cat’</td>
<td>pus~púsqa</td>
<td>‘cats’</td>
</tr>
<tr>
<td>róʔot</td>
<td>‘litter’</td>
<td>roː~róʔot</td>
<td>‘litter’ PL</td>
</tr>
<tr>
<td>tràk</td>
<td>‘truck’</td>
<td>traː~tràk</td>
<td>‘trucks’</td>
</tr>
</tbody>
</table>
a reduplicative morpheme also contains an **invariant part**

(phonologically predictable epenthesis or lexically stored)

(2) Fixed V-Reduplication in Lushootseed  
(Stonham, 1994, 2004)

- **gʷədíl**  ‘sit’  **gʷi~gʷədíl**  ‘sit down briefly’
- **bədáʔ**  ‘child’  **bí~bədaʔ**  ‘small child’
- **qʷləyʔ**  ‘log’  **qʷi~qʷləyʔ**  ‘stick’
- **duːkʷ**  ‘knife’  **dí~duːkʷ**  ‘small knife’

(3) Fixed C-reduplication in Nuu-chah-nulth  
(Stonham, 1994, 2004)

- **haw’a**  **haːc~haw’acsupt’arːɬ**  ‘they had an eating contest’
- **hina**  **hiːc~hinhsacpeʔi**  ‘the ones on the beach side’
- **tłə**  **tłəːc~tłəːhsə**  ‘it was standing at the edge’
(4) ‘TRADITIONAL’: Reduplicant Base
kal \sim kaldíŋ
(4) ‘TRADITIONAL’:

Reduplicant | Base

\text{kal} \sim \text{kaldíŋ}

\underline{\text{Here: (PHONOLOGICAL ACCOUNT)}}

\text{kal} \sim \text{kal} - \text{díŋ} \quad \Rightarrow \text{Copying is symmetrical}

\text{Copied} | \text{Not copied}
(4)  ‘TRADITIONAL’:

\[
\text{Reduplicant} \quad \text{Base} \\
\text{kal} \sim \text{kaldíŋ}
\]

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‘Traditional’: Reduplicant \( \sim \) Base

\( \text{kal} \sim \text{kaldíŋ} \)

**Here:** (phonological account)

\( \text{kal} \sim \text{kal} - \text{díŋ} \) ➔ Copying is symmetrical

\( \text{kal} \sim \text{kal} \text{díŋ} \) ➔ Empty prosody triggers copying
1. Copying as Weakening: Empirical Picture
1.1. Copying Enables Reduction
A. C-Reduction in the Copy Exponent: Gitksan (Brown, 2008)

- fixed segmentism reduplication with /i/ (and /a/ next to gutturals)

(5) Plural reduplication (Brown, 2008, 147+148)

- dzap → dz ip ~ dz a p ‘make, do’
- dulpx w → d il ~ d ul px w ‘to be short’
- ?isx w → ? a s ~ ? i s x w ‘stink, smell’
A. C-Reduction in the Copy Exponent: Gitksan (Brown, 2008)

- fixed segmentism reduplication with /i/ (and /a/ next to gutturals)

(5) Plural reduplication (Brown, 2008, 147+148)

\[
\begin{align*}
dzap & \quad \text{dz} \, i \, p \sim \text{dz} \, a \, p & \quad \text{‘make, do’} \\
dulpw & \quad d \, i \, l \sim d \, u \, l \, p \, x^w & \quad \text{‘to be short’} \\
?isxw & \quad ? \, a \, s \sim ? \, i \, s \, x^w & \quad \text{‘stink, smell’}
\end{align*}
\]

- deaffricativization, deglottalization (+predictable voicing), and depalatalization in the copy-exponent

(6) Plural reduplication and C-reduction (Brown, 2008, 147+148)

\[
\begin{align*}
m’ats & \quad m \, i \, s \sim m’ \, a \, ts & \quad \text{‘to hit, strike’} & \quad ts \quad \rightarrow \quad s \\
t’uts’xw & \quad d \, i \, s \sim t’u:ts’ \, x^w & \quad \text{‘be black’} & \quad X’ \quad \rightarrow \quad X \\
mafxw & \quad m \, i \, s \sim m \, a \, f \, x^w & \quad \text{‘white’} & \quad f \quad \rightarrow \quad s \\
ifsxw & \quad a \, s \sim i \, f \, xw & \quad \text{‘stink, smell’}
\end{align*}
\]
A. C-Reduction in the Copy Exponent: Gitksan

(7) Plural reduplication and C-reduction (Brown, 2008, 147+148)

\[
\begin{align*}
\text{m’ats} & \quad \text{m is} \sim \text{m’ats} \quad \text{‘to hit, strike’} \\
\text{t’u:ts’x} & \quad \text{d is} \sim \text{t’u:ts’x} \quad \text{‘be black’} \\
\text{maʃx} & \quad \text{m is} \sim \text{maʃx} \quad \text{‘white’} \\
\text{iʃxw} & \quad \text{a s} \sim \text{iʃxw} \quad \text{‘stink, smell’}
\end{align*}
\]

no such reduction outside of reduplication contexts

(8) Preservation of glottalization and affricates (Brown, 2008, 127)

\[
\begin{align*}
\text{Ʉi–ts’aqt} & \quad \text{‘the tip of it’ (+DEF-prefix)/} \\
\text{si–ts’aq’} & \quad \text{‘dig, gather clams’ (+INTR-prefix)/}
\end{align*}
\]
B. V-Reduction in the Copied Base: Lushootseed
(Broselow, 1983; Bates et al., 1994; Urbanczyk, 2001)

- alternation between fixed vowel reduplication /Ci–/ and /CV–/

(9) Diminutive Reduplication

a. Fixed V in copy-exponent

\[ \begin{align*}
\text{dú:k}^w &\quad \text{‘knife’} & \text{d í ~ d u:k}^w &\quad \text{‘small knife’} \\
\text{g}^w\text{ødil} &\quad \text{‘sit’} & \text{g í ~ g}^w\text{ødil} &\quad \text{‘sit down briefly’}
\end{align*} \] (Urbanczyk, 2001, 195-207)
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a. Fixed V in copy-exponent
   
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<thead>
<tr>
<th>Word</th>
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<th>Example</th>
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<tbody>
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<td>dú:k^w</td>
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<td>gw̱í ~ gw̱díl</td>
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b. V-Reduction without fixed V
   
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<tr>
<th>Word</th>
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</tr>
</thead>
<tbody>
<tr>
<td>júbil</td>
<td>‘die, starve’</td>
<td>jú ~ j̱bil</td>
</tr>
<tr>
<td>s–túlək^w</td>
<td>‘river’</td>
<td>s~tú ~ tə lək^w</td>
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  - d í ~ dúːkʷ ‘small knife’
- gʷ̣ədíl ‘sit’
  - gʷ̣í ~ gʷ̣ədíl ‘sit down briefly’

b. V-Reduction without fixed V

- júbil ‘die, starve’
  - jú ~ jə́bil ‘small animal dies’
- s–túləkʷ ‘river’
  - s–tú ~ tə́ləkʷ ‘creek’

b. V-Deletion without fixed V

- pástəd ‘white person’
  - pá ~ pástəd ‘white child’
- ūsil ‘dive’
  - ū ~ ūsil ‘shallow dive’
C. Reduction in Copy Exponent and Copied Base: Kwak’wala
(Boas, 1947; Kalmar, 2003; Saba Kirchner, 2010)

- suffixation of /m’u:t/ ‘refuse, useless’ accompanied by reduplication

(10) Reduction in the copied base (Saba Kirchner, 2010, 177-80)

a. səl ‘drill’ səl ∼ sə m’u:t ‘left after drilling’
   kən ‘scoop up’ kən ∼ kə m’u:t ‘left after scooping up’
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b. k’aːp ‘(mouse) gnaw’ k’aː ~ k’əp m’uːt ‘gnawings of mouse’
   tiːl ‘bait’ tiː ~ təl m’uːt ‘remains of bait’
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   b. k’aːp  ‘(mouse) gnaw’  k’aː  ~  k’əp  m’u:t  ‘gnawings of mouse’
      tɪːl ‘bait’  tɪː  ~  təl  m’u:t  ‘remains of bait’

(11) Reduction in the copy exponent (Saba Kirchner, 2010, 176-79)
   a. məndz ‘cut kindling wood’  mə  ~  mən  dzəmu:t  ‘left after cutting kindling woods’
       c’əm’  ‘melt’  c’ə  ~  c’əm’əm’u:t  ‘left after melting’
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   c’əm’ ‘melt’ c’ə ~ c’əm’əm’u:t  ‘left after melting’

b. qʷ’əːl’ ‘scorch’ qʷ’ə ~ qʷ’əːl’əm’u:t  ‘embers’
   saːqʷ’ ‘peel bark’ sə ~ saːqʷ’əm’u:t  ‘left after peeling bark’
C. Reduction in Copy Exponent and Copied Base: Kwak’wala

- reduction avoids stress clashes (*HH) and builds unmarked iambic feet LH, LL, H (H=V: or sonorant coda) (Struijke, 2000; Saba Kirchner, 2010)

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<thead>
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<th>surface</th>
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<td>a.</td>
<td>səl</td>
<td>H H H</td>
<td>LH H</td>
</tr>
<tr>
<td></td>
<td>(səl)</td>
<td>(səl)</td>
<td>(mu:t)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(sə . səl)</td>
</tr>
<tr>
<td>b.</td>
<td>k’a:p</td>
<td>H H H</td>
<td>LH H</td>
</tr>
<tr>
<td></td>
<td>(k’a:p)</td>
<td>(k’a:p)</td>
<td>(mu:t)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(k’e . k’a:p)</td>
</tr>
<tr>
<td>c.</td>
<td>məndz</td>
<td>H H LH</td>
<td>LH LH</td>
</tr>
<tr>
<td></td>
<td>(mən)</td>
<td>(mən)</td>
<td>(dzə.mu:t)</td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td>H</td>
<td>H</td>
</tr>
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<td>(mən)</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>

these repairs are bound to copy exponents and copied bases

<table>
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<th>surface</th>
<th>*repair</th>
</tr>
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<tbody>
<tr>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>(ts’ó:)</td>
<td>(l’əm)</td>
<td>(y’å:)</td>
</tr>
<tr>
<td>LH</td>
<td>LH</td>
<td>(ts’ə.l’əm)</td>
</tr>
</tbody>
</table>

(12)
(13)
Summary: Copying = Weakening

(14) a. Reduction in the copy-exponent*

\[ \Box + \text{sapo} \Downarrow \; s\emptyset \sim \text{sa po} \]

(McCarthy and Prince, 1995; Becker and Flack Potts, 2011)

   e.g. Gitksan, Shuswap, Sanskrit...

b. Reduction in the copied base

\[ \Box + \text{sapo} \Downarrow \; \text{sa} \sim s\emptyset \text{po} \]

(Shaw and Howe, 1999; Struijke, 2000)

   e.g. Tohono O’odham, Heiltsuk, Mainland Sliammon,…

c. Reduction in both copy-exponent and copied base

\[ \Box + \text{sapo} \Downarrow \; s\emptyset \sim s\emptyset \text{po} \]

(Struijke, 2000)

   e.g. Kwakwala, Hausa, Tagalog,…

*‘TETU in the reduplicant’=one main argument for correspondence-theory (McCarthy and Prince, 1995)
1.2. More Copying Enables More Reduction
Multiple Reduplication

(15) *Multiple Reduplication*

The presence of two or more reduplicative morphemes in a word.
Multiple Reduplication

(15) *Multiple Reduplication*
The presence of two or more reduplicative morphemes in a word.

(16) Reduplication in Tagalog (Mattes, 2007, 126)

a. nag-**du**~duman **siya** **bulan**~**bulan**
   *BEG.AV-IPFV~DEM.DIST 3.Sg.AF PL~month*
   ‘S/he goes there every month’

b. ini **an** **ha**~**hanap**~**hanap** -on
   *DEM.PROX PB IPFV~PL~look.for-Ug*
   ‘here (they are) continuously searching’

(17) Multiple Copying

Underlying:

```
  h  a  n  a  p
   
  h  a  n  a  p
  h  a  n  a  p
  h  a  n  a  p
```

Output: `h a h a n a p h a n a p`
A. Avoidance of Multiple Reduplication: Ahousaht Nuuchahnulth

- some meanings are expressed by reduplication alone (18-a)
- many suffixes trigger prefixing reduplication (=underlined) (18-b)

(18)  

a.  

\[
\begin{align*}
\text{ma̱htiː} & : \text{‘house’} \\
\underline{ma} \sim \underline{ma̱htiː} & : \text{‘houses’} \quad (\text{PL-ma̱htiː}) \\
\text{nuːk} & : \text{‘song’} \\
\underline{nu} : \sim \underline{nuː}k & : \text{‘songs’} \quad (\text{PL-nuːk}) \\
\text{naʔa} & : \text{‘to hear’} \\
\underline{na} \sim \underline{naʔa} & : \text{‘to understand’} \quad (\text{DER-naʔa}) \\
\end{align*}
\]

b.  

\[
\begin{align*}
\text{mi} \sim \underline{mi}k’uk?icuːʃ} & \text{‘both of you look alike’} \\
\text{RED} \sim \underline{mi}k’uk?itʃuːʃ} & \\
\text{to.resemble} \sim \text{same-to.resemble-2PL.IND} & \\
\end{align*}
\]

(Kim, 2003b, 136+138)
A. Avoidance of Multiple Reduplication: Ahousaht Nuuchahnulth
(Kim, 2003a, b, 2008)

 deux reduplication-triggering morphemes in a word only result in a single copy-exponent

(19) a. \[
\begin{array}{c}
\text{na} \sim \text{na} ?\text{ak’uk}?i\text{ʃ} \\
\text{DER-na?a-k’uk-?iʃ} \\
\text{DER-to.hear-to.resemble-3Sg.IND}
\end{array}
\]
\[\begin{array}{c}
\text{‘s/he seems to be knowledgeable’}
\end{array}\]

b. \[
\begin{array}{c}
\text{t’u} \sim \text{t’u c’i:ḥ} \\
\text{PL-t’uc(up)-i:ḥ} \\
\text{PL-sea.urchin-to.gather/fish}
\end{array}
\]
\[\begin{array}{c}
\text{‘gathering more than one sea urchin’}
\end{array}\]

(a pattern that can be found in basically all Southern Wakashan languages (Rose, 1981; Stonham, 1994, 2004)
(20) Repetitive reduplication (Donner, 2012, 23+24)

a. *Bisyllabic repetitive reduplication*

\begin{align*}
\text{sopo} & \sim \text{sopo} & \text{‘jump’} \\
\text{sepu} & \sim \text{sepu} & \text{‘dive’} \\
\text{motu} & \sim \text{motu} & \text{‘snap’}
\end{align*}
B. Truncation in Multiple Reduplication Contexts: Sikaiana (Donner, 2012)

(20) Repetitive reduplication (Donner, 2012, 23+24)

a. Bisyllabic repetitive reduplication
   
   \[
   \begin{array}{c|c|c}
   \text{sopo} & \text{sopo} \sim \text{sopo} & \text{‘jump’} \\
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   \text{motu} & \text{motu} \sim \text{motu} & \text{‘snap’} \\
   \end{array}
   \]

b. CV/C-reduplication in the plural
   
   \[
   \begin{array}{c|c|c}
   \text{sopo} & s \sim \text{so po} & \text{so} \sim \text{so po} & \text{‘jump’} \\
   \text{sepu} & s \sim \text{se pu} & \text{se} \sim \text{se pu} & \text{‘dive’} \\
   \text{moe} & m \sim \text{mo e} & \text{mo} \sim \text{mo e} & \text{‘sleep’} \\
   \end{array}
   \]
(20) Repetitive reduplication (Donner, 2012, 23+24)

a. *Bisyllabic repetitive reduplication*
   - sopo: sopo ~ sopo
   - sepu: sepu ~ sepu
   - motu: motu ~ motu

b. *CV/C-reduplication in the plural*
   - sopo: s ~ sopo so ~ so po
   - sepu: s ~ sepu se ~ se pu
   - moe: m ~ mo e mo ~ mo e

   ‘jump’, ‘dive’, ‘snap’, ‘sleep’

c. *Obligatory C-reduplication if both are combined*
   - sopo: sopo ~ s ~ so po
   - sepu: sepu ~ s ~ se pu
   - *sopo ~ so ~ so po
   - *sepu ~ so ~ se pu

   ‘jump’, ‘dive’
Summary: More Copying = More Weakening

(21)

<table>
<thead>
<tr>
<th></th>
<th>No Reduplication</th>
<th>1 x Reduplication</th>
<th>2 x Reduplication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lg 1</td>
<td></td>
<td>Reduction</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>e.g. Palauan</td>
<td></td>
</tr>
<tr>
<td>Lg 2</td>
<td>No Reduction</td>
<td>Reduction</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>e.g. Lushootseed</td>
<td></td>
</tr>
<tr>
<td>Lg 3</td>
<td></td>
<td>Reduction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No Reduction</td>
<td></td>
<td>e.g. Sikaiana</td>
</tr>
<tr>
<td>Lg 4</td>
<td></td>
<td>No Reduction</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>e.g. Papapana</td>
</tr>
</tbody>
</table>
2. Copying as Weakening: Theoretical Modeling
2.1. Background Assumptions
Copying as Weakening: Assumptions

1. Reduplication Results from Prosodic Affixation
2. Gradient Symbolic Representation
3. Harmonic Grammar
4. Containment
5. Fission is Distribution of Activity
1. Reduplication Results from Prosodic Affixation
(Marantz, 1982; Pulleyblank, 2009; Saba Kirchner, 2010, 2013a,b)

- reduplicative morphemes contain **segmentally empty prosodic nodes** that are filled with ‘copied’ elements
- copying is a general phonological repair that applies to **fill these otherwise empty nodes**
1. Reduplication Results from Prosodic Affixation
(Marantz, 1982; Pulleyblank, 2009; Saba Kirchner, 2010, 2013a,b)

- reduplicative morphemes contain *segmentally empty prosodic nodes* that are filled with ‘copied’ elements
- copying is a general phonological repair that applies to *fill these otherwise empty nodes*

  ➔ no reduplication-specific mechanism, reduplication is just ‘normal’ affixation
  ➔ explains the fixed prosodic size of copy exponents
  ➔ explains non-concatenative allomorphy between reduplication and lengthening (Saba Kirchner, 2010, 2013a,b; Zimmermann, 2013)
1. Reduplication Results from Prosodic Affixation

- copying is **fission** of segments violating (22)
  (Spaetti, 1997; Struijke, 2000; Gafos, 2003; Nelson, 2003)

(22) **INTS**: Assign -1 violation to every pair of output segments that correspond to the same input segment.

**Input**: \[\text{FISSION} \]

**Output**: 

```
Input:      s_1  i_2  l'_3
            \   \   /
           FISSIO\ /
Output:    s_1  i_2  s_1  i_2  l'_3
```
1. Reduplication Results from Prosodic Affixation

- **copying is fission of segments violating (22)**
  
  (Spaelti, 1997; Struijke, 2000; Gafos, 2003; Nelson, 2003)

(22) **INTS**: Assign -1 violation to every pair of output segments that correspond to the same input segment.

\[\text{Input:} \quad \begin{array}{c}
\text{s}_1 \\
\text{i}_2 \\
\text{l'}_3
\end{array} \quad \text{FISSION} \quad \begin{array}{c}
\text{s}_1 \\
\text{i}_2 \\
\text{s}_1 \\
\text{i}_2 \\
\text{l'}_3
\end{array} \quad \text{Output:} \]

(23)

<table>
<thead>
<tr>
<th>\text{INTS}</th>
<th>\mu&gt;V</th>
<th>\text{DEPS}</th>
<th>*V:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. Gradient Symbolic Representation (Smolensky and Goldrick, 2016; Rosen, 2016)

- symbols in a linguistic representation can have different activities
- in the following, all output activity is 1
2. Gradient Symbolic Representation (Smolensky and Goldrick, 2016; Rosen, 2016)

- symbols in a linguistic representation can have different activities
- in the following, all output activity is 1
- different activities result in gradient faithfulness violations
  - weakly active elements are easier to delete than ‘normal’ segments
  - it is costly to realize weakly active elements

(24) Gradient activity = gradient faithfulness violations

<table>
<thead>
<tr>
<th>b</th>
<th>a</th>
<th>t</th>
<th>-</th>
<th>p</th>
<th></th>
<th>*CC</th>
<th>Max</th>
<th>Dep</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>.5</td>
<td></td>
<td>-1</td>
<td>-0.5</td>
<td></td>
</tr>
</tbody>
</table>

- a.

- b.

- c.
Intermezzo: Max and Dep and GSR


b. Max: For every pair of corresponding input output elements with underlying activity I and an output activity O where I>O: Assign -(I-O) violations.
2. Gradient Symbolic Representation (=GSR)

1. Embedded in a general computational architecture for cognition
   (=Gradient Symbolic Computation Smolensky and Goldrick, 2016)

2. A unified account for different exceptional phonological behaviours:
   - liaison consonants in French (Smolensky and Goldrick, 2016)
   - semi-regularity of voicing in Japanese Rendaku (Rosen, 2016)
   - allomorphy in Modern Hebrew (Faust and Smolensky, 2017)
   - lexical accent in Lithuanian (Kushnir, 2017)
   - tone sandhi in Oku (Nformi and Worbs, 2017)
   - tone allomorphy in San Miguel el Grande Mixtec (Zimmermann, 2017a,b)
   - lexical stress in Moses Columbian Salishan (Zimmermann, to appear)
   - exceptional tone (non)spreading in San Molinos Mixtec (Zimmermann, 2018a)
   - interaction of phonological/lexical gemination/lenition in Italian (Amato, 2018)
   - compound stress in Sino-Japanese (Rosen, 2018)
   - compound tensing in Korean (Lee, 2019)
   - stress-syncope interaction in Levantine Arabic (Trommer, 2018)
   - (interacting) ghost segments in Welsh (Zimmermann, 2018c)
   - ...

...
3. Harmonic Grammar (Legendre et al., 1990; Potts et al., 2010)

- constraints are **weighted**, not ranked

(26) Toy Example: Weighted Constraints

<table>
<thead>
<tr>
<th>Input</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>Harmony Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100</td>
<td>60</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

- constraint ganging and threshold effects are predicted
  - though (26-b+c) only violate C2 and C3 with a lower weight than C1, they have a worse harmony score than (26-a) since the lower-weighted violations **gang up**

- non-realization of an element is setting its **activity to zero** (=gray)
- non-realized elements can be enough to fill prosodic nodes
  (Trommer, 2011; Trommer and Zimmermann, 2014; Zimmermann, 2017c)

(27)  \[ \mu > V: \text{Assign -1 violation for every } \mu \text{ that does not dominate a vowel.} \]

(28)  \[ \mu > V_p: \text{Assign -1 violation for every } \mu \text{ that does not dominate a phonetically interpreted vowel.} \]

(29)  \[
\begin{array}{|c|c|c|c|c|}
\hline
\mu + \text{sopo} & \mu > V & \text{INTS} & \mu > V_p & \text{MAX} \\
\hline
\text{a.} & \begin{array}{cccc}
\mu & s & o & p \\
1 & 1 & 1 & 1
\end{array} & -1 & -1 & -105 \\
\hline
\text{b.} & \begin{array}{cccc}
\mu & s & o & p \\
1 & 1 & 1 & 1
\end{array} & -2 & -1 & -20 \\
\hline
\text{b.} & \begin{array}{cccc}
\mu & s & o & p \\
1 & 1 & 1 & 1
\end{array} & -2 & -1 & -30 \\
\hline
\end{array}
\]

(to be modified soon)
2.2. Proposal: Fission is Distribution of Activity
5. Fission is Distribution of Activity

(30) GEN restriction on fission
Input element $S_1$ with activity $A$ corresponds to $x$ output elements $S_1$ with underlying activity $A/x$.

(31) \begin{align*}
\text{Underlying segments:} & \quad s \quad o \quad p \quad o \\
\text{Underlying Act.:} & \quad 1 \quad 1 \quad 1 \quad 1 \\
\text{Fission} & \\
\text{Underlying Act.:} & \quad 5 \quad 5 \quad 5 \quad 5 \quad 1 \quad 1 \\
\text{Surface segments:} & \quad s \quad o \quad s \quad o \quad p \quad o \\
\end{align*}

= elements that result from fission necessarily have an activity smaller than 1 that corresponds to input activity

= all output correspondents of $S_1$ have the same amount of activity that corresponds to input activity \(\rightarrow\) \text{copying weakens symmetrically}
5. Fission is Distribution of Activity

(32) More copying = More Weakening

- Underlying segments: $s\ o\ p\ o$
- Underlying Act.: $1\ 1\ 1\ 1$

2xFission

- Underlying Act.: $\bar{3} \ 3 \ 3 \ 3 \ 3 \ 3 \ 1 \ 1$
- Surface segments: $s\ o\ s\ o\ s\ o\ p\ o$

$\rightarrow$ copying weakens gradiently
5. Fission is Distribution of Activity

- crucial consequence for elements with the same underlying activity:
  Non-realization of a copied segment is better for \text{MAX}; they are \textit{weaker}

(33)

\begin{align*}
\text{a. Copying} & \quad \text{b. Copying+Deletion} \\
\begin{array}{c}
\text{Underlying segments:} \\
\text{Underlying Act.:}
\end{array} & \quad \begin{array}{c}
\text{Underlying Act.:} \\
\text{INSERT/DELETE ACT.:} \\
\text{Surface segments:} \\
\text{Faithfulness violations:}
\end{array} \\
\text{s o p o} & \quad \text{s o p o} \\
\text{1 1 1 1} & \quad \text{1 1 1 1} \\
\text{.5 .5 .5 .5} & \quad \text{.5 .5 .5 .5} \\
\text{+.5 +.5 +.5 +.5} & \quad \text{+.5 +.5 +.5 +.5} \\
\text{s o s o p o} & \quad \text{o s o p} \\
\text{DEP: -2} & \quad \text{DEP: -1.5} \\
\text{MAX: -1.5} & \end{align*}
### Predicted Typology: Reduction Thresholds

(34) Weaker

- Less protected by $\text{Max, Ident}$
- More penalized by $\text{Dep}$

<table>
<thead>
<tr>
<th></th>
<th>No Reduplication</th>
<th>1 x Reduplication</th>
<th>2 x Reduplication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lg 1</td>
<td>Reduction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lg 2</td>
<td>No Reduction</td>
<td>Reduction</td>
<td></td>
</tr>
<tr>
<td>Lg 3</td>
<td>No Reduction</td>
<td>No Reduction</td>
<td>Reduction</td>
</tr>
<tr>
<td>Lg 4</td>
<td>No Reduction</td>
<td>No Reduction</td>
<td></td>
</tr>
</tbody>
</table>

- e.g. Palauan
- e.g. Lushootseed
- e.g. Sikaiana
- e.g. Papapan

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**Toy Example**

(35)

<table>
<thead>
<tr>
<th></th>
<th>DeletePenult!</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NoRed-a.</strong></td>
<td></td>
<td>-1</td>
</tr>
<tr>
<td>s a p o</td>
<td></td>
<td></td>
</tr>
<tr>
<td>① ① ① ①</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NoRed-b.</strong></td>
<td></td>
<td>-1</td>
</tr>
<tr>
<td>s a p o</td>
<td></td>
<td></td>
</tr>
<tr>
<td>① ① ① ①</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1xRed-a.</strong></td>
<td></td>
<td>-1</td>
</tr>
<tr>
<td>s a∼s a p o</td>
<td></td>
<td></td>
</tr>
<tr>
<td>① ① ① ①</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+.5 +.5 +.5 +.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1xRed-b.</strong></td>
<td></td>
<td>-0.5</td>
</tr>
<tr>
<td>s a∼s a p o</td>
<td></td>
<td></td>
</tr>
<tr>
<td>① ① ① ①</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+.5 +.5 +.5 -.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2xRed-a.</strong></td>
<td></td>
<td>-1</td>
</tr>
<tr>
<td>s a∼s a∼s a p o</td>
<td></td>
<td></td>
</tr>
<tr>
<td>③ ③ ③ ③ ③ ① ①</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+.6 +.6 +.6 +.6 +.6 +.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2xRed-b.</strong></td>
<td></td>
<td>-0.3</td>
</tr>
<tr>
<td>s a∼s a∼s a∼s a p o</td>
<td></td>
<td></td>
</tr>
<tr>
<td>③ ③ ③ ③ ③ ① ①</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+.6 +.6 +.6 +.6 +.6 -.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Lg 1: Always Reduction (e.g. Palauan)

(36) \[ \text{DELETEPENULT!} \gg \text{Max} \]

<table>
<thead>
<tr>
<th></th>
<th>DELETEPENULT!</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1000</td>
<td>100</td>
</tr>
<tr>
<td>NoRed-a.</td>
<td>s a p o</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>1 1 1 1</td>
<td></td>
</tr>
<tr>
<td>NoRed-b.</td>
<td>s a p o</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>1 1 1 1</td>
<td></td>
</tr>
<tr>
<td>1xRed-a.</td>
<td>s a∼s a p o</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>.5 .5 .5 .5 1 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+.5 +.5 +.5 +.5</td>
<td></td>
</tr>
<tr>
<td>1xRed-b.</td>
<td>s a∼s a p o</td>
<td>-0.5</td>
</tr>
<tr>
<td></td>
<td>.5 .5 .5 .5 1 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+.5 +.5 +.5 -.5</td>
<td></td>
</tr>
<tr>
<td>2xRed-a.</td>
<td>s a∼s a∼s a p o</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>.3 .3 .3 .3 .3 .3 1 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+.6 +.6 +.6 +.6 +.6 +.6</td>
<td></td>
</tr>
<tr>
<td>2xRed-b.</td>
<td>s a∼s a∼s a p o</td>
<td>-0.3</td>
</tr>
<tr>
<td></td>
<td>.3 .3 .3 .3 .3 .3 1 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+.6 +.6 +.6 +.6 +.6 -.3</td>
<td></td>
</tr>
</tbody>
</table>
### Lg 2: Only Reduction if Reduplication (e.g. Lushootseed)

\[(37) \quad \text{Max} \gg \text{DeletePenult! and DeletePenult!} \gg 0.5\times\text{Max}\]

<table>
<thead>
<tr>
<th></th>
<th>DeletePenult!</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>NoRed-a.</td>
<td>-1</td>
<td>-99</td>
</tr>
<tr>
<td>NoRed-b.</td>
<td>-1</td>
<td>-100</td>
</tr>
<tr>
<td>1xRed-a.</td>
<td>-1</td>
<td>-99</td>
</tr>
<tr>
<td>1xRed-b.</td>
<td>-0.5</td>
<td>-50</td>
</tr>
<tr>
<td>2xRed-a.</td>
<td>-1</td>
<td>-99</td>
</tr>
<tr>
<td>2xRed-b.</td>
<td>-0.3</td>
<td>-33.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>s a<del>s a</del>s a~s a po o</th>
</tr>
</thead>
<tbody>
<tr>
<td>NoRed-a.</td>
<td>1 1 1 1</td>
</tr>
<tr>
<td>NoRed-b.</td>
<td>1 1 1 1</td>
</tr>
<tr>
<td>1xRed-a.</td>
<td>0.5 0.5 0.5 0.5 1 1</td>
</tr>
<tr>
<td>1xRed-b.</td>
<td>0.5 0.5 0.5 0.5 1 1</td>
</tr>
<tr>
<td>2xRed-a.</td>
<td>0.3 0.3 0.3 0.3 0.3 1 1</td>
</tr>
<tr>
<td>2xRed-b.</td>
<td>0.3 0.3 0.3 0.3 0.3 1 1</td>
</tr>
</tbody>
</table>
Lg 3: Only Reduction if Multiple Reduplication (e.g. Sikaiana)

(38) \[0.5 \times \text{Max} \gg \text{DeletePenult! and DeletePenult!} \gg 0.\bar{3} \times \text{Max}\]

<table>
<thead>
<tr>
<th>Reduction</th>
<th>Diagram</th>
<th>DeletePenult!</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>NoRed-a.</td>
<td><img src="image1" alt="Diagram" /></td>
<td>-1</td>
<td>-99</td>
</tr>
<tr>
<td>NoRed-b.</td>
<td><img src="image2" alt="Diagram" /></td>
<td>-1</td>
<td>-200</td>
</tr>
<tr>
<td>1xRed-a.</td>
<td><img src="image3" alt="Diagram" /></td>
<td>-1</td>
<td>-99</td>
</tr>
<tr>
<td>1xRed-b.</td>
<td><img src="image4" alt="Diagram" /></td>
<td>-0.5</td>
<td>-100</td>
</tr>
<tr>
<td>2xRed-a.</td>
<td><img src="image5" alt="Diagram" /></td>
<td>-1</td>
<td>-99</td>
</tr>
<tr>
<td>2xRed-b.</td>
<td><img src="image6" alt="Diagram" /></td>
<td>-0.\bar{3}</td>
<td>-66.\bar{6}</td>
</tr>
</tbody>
</table>

\[GLOW\ 42\ \text{Zimmermann: Faded Copies}\]
Lg 4: No Reduction (e.g. Papapana)

(39) \[ 0.\bar{3}\times \text{Max} \gg \text{DeletePenult!} \]

<table>
<thead>
<tr>
<th></th>
<th>DeletePenult!</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100</td>
<td>1000</td>
</tr>
<tr>
<td>NoRed-a.</td>
<td>-1</td>
<td>-100</td>
</tr>
<tr>
<td>s a p o</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NoRed-b.</td>
<td>-1</td>
<td>-1000</td>
</tr>
<tr>
<td>s a p o</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1xRed-a.</td>
<td>-1</td>
<td>-100</td>
</tr>
<tr>
<td>s a∼s a p o</td>
<td>+.5</td>
<td>+.5</td>
</tr>
<tr>
<td></td>
<td>+.5</td>
<td>+.5</td>
</tr>
<tr>
<td></td>
<td>+.5</td>
<td>+.5</td>
</tr>
<tr>
<td></td>
<td>+.5</td>
<td>+.5</td>
</tr>
<tr>
<td>1xRed-b.</td>
<td>-0.5</td>
<td>-500</td>
</tr>
<tr>
<td>s a∼s a p o</td>
<td>+.5</td>
<td>+.5</td>
</tr>
<tr>
<td></td>
<td>+.5</td>
<td>+.5</td>
</tr>
<tr>
<td></td>
<td>+.5</td>
<td>-0.5</td>
</tr>
<tr>
<td></td>
<td>+.5</td>
<td>-0.5</td>
</tr>
<tr>
<td>2xRed-a.</td>
<td>-1</td>
<td>-100</td>
</tr>
<tr>
<td>s a∼s a∼s a∼s a p o</td>
<td>+.6</td>
<td>+.6</td>
</tr>
<tr>
<td></td>
<td>+.6</td>
<td>+.6</td>
</tr>
<tr>
<td></td>
<td>+.6</td>
<td>+.6</td>
</tr>
<tr>
<td></td>
<td>+.6</td>
<td>+.6</td>
</tr>
<tr>
<td>2xRed-b.</td>
<td>-0.\bar{3}</td>
<td>-333.\bar{3}</td>
</tr>
<tr>
<td>s a∼s a∼s a∼s a p o</td>
<td>+.6</td>
<td>+.6</td>
</tr>
<tr>
<td></td>
<td>+.6</td>
<td>+.6</td>
</tr>
<tr>
<td></td>
<td>+.6</td>
<td>+.6</td>
</tr>
<tr>
<td></td>
<td>+.6</td>
<td>-0.3</td>
</tr>
<tr>
<td></td>
<td>+.6</td>
<td>-0.3</td>
</tr>
</tbody>
</table>

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2.3. Example 1: Lushootseed
Lushootseed Reduction (simplified)

Pattern

- vowels are reduced to /ə/ (=loss of all place features) if they are copied
Lushootseed Reduction (simplified)

Pattern

- Vowels are reduced to \( /\emptyset / \) (=loss of all place features) if they are copied.
- Reduction is triggered by (40-a) penalizing place features in unstressed positions.
- Outside of copying, (40-b) preserves vowels from reduction.

(40)

a. *UNSTRV: Assign -1 violation for every unstressed full V (=place features).

b. ID-V: For every input vowel with activity I, assign -1 violations if the corresponding output vowel has a different place feature specification.
Lushootseed: Reduction Only for Copied Vowels

(41) a. \( \text{Id-V} \gg \text{*UnstrV} \)
b. \( \text{*UnstrV} \gg -0.5 \times \text{Id-V} \)

(42) Reduction in the copied base

\[
\begin{array}{cccc|ccc}
\mu & j & \ddot{u} & b & \ddot{i} & l & \mu \\
1 & 1 & 1 & 1 & 1 & 1 & 1 \\
\hline
\text{Id-V} & 40 & \text{*UnstrV} & 30 & \text{Dep} & 10 \\
\end{array}
\]

\[
\begin{array}{cccc|ccc}
\mu & j & \ddot{u} & j & \ddot{u} & b & \ddot{i} & l & \mu \\
0.5 & 0.5 & 0.5 & 1 & 1 & 1 & 1 & \ \\
+0.5 & +0.5 & +0.5 & +0.5 & 1 & 1 & 1 & \ \\
\hline
\text{Id-V} & \text{*UnstrV} & \text{Dep} & -2 & -2 & -80 \\
\end{array}
\]

\[
\begin{array}{cccc|ccc}
\mu & j & \ddot{u} & j & \ddot{u} & b & \ddot{e} & l & \mu \\
0.5 & 0.5 & 0.5 & 1 & 1 & 1 & 1 & \ \\
+0.5 & +0.5 & +0.5 & +0.5 & 1 & 1 & 1 & \ \\
\hline
-1 & -1 & -2 & -90 \\
\end{array}
\]

\[
\begin{array}{cccc|ccc}
\mu & j & \ddot{u} & j & \ddot{e} & b & \ddot{i} & l & \mu \\
0.5 & 0.5 & 0.5 & 1 & 1 & 1 & 1 & \ \\
+0.5 & +0.5 & +0.5 & +0.5 & 1 & 1 & 1 & \ \\
\hline
-0.5 & -1 & -2 & -70 \\
\end{array}
\]
2.4. Example 2: Sikaiana
Copied Elements: Too Weak to Surface

- realizing copied elements is **costly** (=adding of activity) and deleting them does violate $\text{Max}_S$ only partially

(43) Being copied: Decreasing the chances of surfacing

<table>
<thead>
<tr>
<th>No copy</th>
<th>One copy</th>
<th>Two copies</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="UI" alt="Segment" /></td>
<td><img src="UI,Ep" alt="Segment" /></td>
<td><img src="UI,Ep" alt="Segment" /></td>
</tr>
</tbody>
</table>

Preserved by $\text{Max}_S$

Penalized by $\text{Dep}_S$

$\begin{align*}
\text{No copy} & : 1 \\
\text{One copy} & : 0.5 \\
\text{Two copies} & : 0.6
\end{align*}$

$\begin{align*}
\text{No copy} & : 0 \\
\text{One copy} & : 0.3 \\
\text{Two copies} & : 0.3
\end{align*}$
realizing copied elements is **costly** (=adding of activity) and deleting them does violate \( \text{MAX}_S \) only partially

(43) Being copied: Decreasing the chances of surfacing

\[ \begin{array}{c}
\text{No copy} & \text{One copy} & \text{Two copies} \\
\text{UI Segment} & \text{UI Ep Segment} & \text{UI Ep Segment}
\end{array} \]

predicts avoidance of copied elements just because they are copied
Sikaiana Syncope

Pattern

- syncope for the monosyllabic copy-exponent is
  - optional for single reduplication (so~sopo / s~sopo) and
  - obligatory for multiple reduplication (sopo~s~sopo)
Sikaiana Syncope

Pattern

_syncope for the monosyllabic copy-exponent is_

- optional for single reduplication (so~sopo / s~sopo) and
- obligatory for multiple reduplication (sopo~s~sopo)

-copying triggered by $\sigma > V$ and $\mu > V$

-copy-exponent deletion since copied V’s are preferably avoided

- copied elements filling affixed $\sigma^*$: never deleted
  (=high weight of $\sigma > V_p$)

- copied elements filling affixed $\mu$: can be deleted
  (=lower weight of $\mu > V_p$)

*Or those already prosodified/dominated by a $\sigma$ in the input.
Sikaiana: No Syncope for Single Reduplication (bisyllabic)

Example 2: Sikaiana

(44) \[ \sigma > V_p + 0.5 \times \text{Max} \gg 0.5 \times \text{Dep} \]

<table>
<thead>
<tr>
<th>( \sigma &gt; V_p )</th>
<th>Dep</th>
<th>Max</th>
<th>( \mu &gt; V_p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>36</td>
<td>20</td>
<td>8</td>
</tr>
</tbody>
</table>

\[ \sigma \sigma \sigma \sigma \]

\[ s o p o \]

| a. | \( \sigma \sigma \sigma \sigma \)
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>s o p o ~ s o p o</td>
<td>-4</td>
<td>-1</td>
<td>-144</td>
</tr>
</tbody>
</table>

\[ \sigma \sigma \sigma \sigma \sigma \sigma \sigma \]

\[ s o p o \]

| b. | \( \sigma \sigma \sigma \sigma \)
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>s o p o ~ s o p o</td>
<td>-1</td>
<td>-3.5</td>
<td>-0.5</td>
</tr>
</tbody>
</table>

\[ \sigma \sigma \sigma \sigma \sigma \]

\[ s o p o \]

GLOW 42

Zimmermann: Faded Copies

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Sikaiana: Optional Syncope for Single Reduplication (monosyllabic)

**Example 2: Sikaiana**

(45) \[ \mu > V_p + 0.5 \times \text{Max} \sim 0.5 \times \text{Dep} \]

<table>
<thead>
<tr>
<th></th>
<th>( \mu &gt; V_p )</th>
<th>( \text{Dep} )</th>
<th>( \text{Max} )</th>
<th>( \mu &gt; V_p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>36</td>
<td>20</td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>( \sigma &gt; V_p )</th>
<th>( \mu &gt; V_p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ( s )</td>
<td>-2</td>
<td>-72</td>
</tr>
<tr>
<td>1 ( o \sim s )</td>
<td>-1.5</td>
<td>-72</td>
</tr>
<tr>
<td>1 ( o \sim s )</td>
<td>-1.5</td>
<td>-72</td>
</tr>
</tbody>
</table>

*Simplification of the optionality that can be modeled in, e.g. MaxEnt (Johnson, 2002; Goldwater and Johnson, 2003; Wilson, 2006).*
Sikaiana: Syncope in Multiple Reduplication Contexts

(46) \(0.6x\text{Dep} + \text{OCP}_C \gg 0.3x\text{Max}\)

<table>
<thead>
<tr>
<th></th>
<th>(\sigma &gt; V)</th>
<th>Dep</th>
<th>Max</th>
<th>(\mu &gt; V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>36</td>
<td>20</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

\[\begin{array}{c}
\sigma \sigma \sigma \\
\mu \mu \mu \\
\sigma \sigma \sigma \\
\mu \mu \mu \\
\mu \mu \mu \\
\sigma \sigma \sigma \\
\mu \mu \mu \\
\sigma \sigma \sigma \\
\end{array}\]

\[\begin{array}{c}
\text{a.} \\
\text{b.} \\
\end{array}\]

-5.9  -215.9

-5.3  -206.6
Avoidance of Multiply Copied Segments: Sikaiana

- in Sikaiana multiply-copied segments are so weak that they are only tolerated under affix-syllables*, not affix-moras
- that **only vowels are deleted**, not consonants: only Dep<sub>V</sub> is important and Max<sub>V</sub> less important enough; the weighting for Dep<sub>C</sub> and Max<sub>C</sub> is different

Footnote: This is an instance of ‘anti-anti-gemination’ (Odden, 1988; Bakovic, 2005; Rose, 2000)

- attested in other Austronesian languages (e.g. Nukuoro, Carroll and Soulik, 1973)
- could alternatively triggered by an OCP that is violated by C<sub>1</sub>VC<sub>1</sub> but not by C<sub>1</sub>C<sub>1</sub> (=a geminate), cf. Rose (2000)

*And within the stem that is already prosodified prior to affix concatenation.
Avoidance of Multiply Copied Segments: Ahousaht Nuuchahnulth

- we see the expected deletion of all multiply copied elements (under certain affix nodes): \( \text{DEP}_C/\text{DEP}_V \) and \( \text{MAX}_C/\text{MAX}_V \) have same weight

(47)  

a. No Deletion under affixed \( \mu \): Single copying

\[
\begin{array}{cccc}
\mu & m & i & m \\
.5 & .5 & .5 & 1 \\
+.5 & +.5 & +.5 & +.5 \\
\end{array}
\]

b. Deletion under affixed \( \mu \): Multiple copying

\[
\begin{array}{cccccc}
\sigma & \mu & \mu & \sigma & \mu & \sigma \\
n & a & n & a & n & a \\
.3 & .3 & .3 & .3 & .3 & 1 \\
+.6 & +.6 & -.3 & +.6 & +.6 & 1 \\
\end{array}
\]
3. Discussion and Conclusion
Further Prediction 1

- **Complete reduction** in copy-exponent and copied base (e.g. Siakaiana'/Ahousaht')?
Further Prediction 1

- Complete reduction in copy-exponent and copied base (e.g. Siakaiana'/Ahousaht')?

  - systematically attested as subtraction of prosodically defined portions to express morphological category (e.g. Dressler, 2000; Arndt-Lappe and Alber, 2012; Zimmermann, 2017c)

  - e.g. Aymara accusative /wawa + Acc/ → [waw]
    (Briggs, 1976; Hardman, 2001; Coler, 2010)

(48) Aymara subtraction as ‘reduplication’

\[
\begin{align*}
w & \quad \mu & \quad w & \quad \mu & \quad a \\
1 & \quad 1 & \quad 1 & \quad 1
\end{align*}
\quad \rightarrow \quad
\begin{align*}
w & \quad \mu & \quad w & \quad \mu & \quad a & \quad \mu & \quad a \\
1 & \quad 1 & \quad 1 & \quad 1 & \quad .5 & \quad .5 & \quad .5 & \quad -.5 & \quad -.5
\end{align*}
\]
If output elements can have weak activity and thus violate markedness gradiently (cf. Zimmermann (2018a,c,b); vs. Smolensky and Goldrick (2016); Rosen (2016)), copy-exponents and copied bases are predicted to tolerate more marked structure

- e.g. marked structures in copy-exponent in Oowekeyala (Howe, 2000)
- e.g. copy-exponents as exceptional non-undergoers in Mojeño Trinitario (Rose, 2014; Marquardt, 2018)
Further Predictions 2-4

- If output elements can have weak activity and thus violate markedness gradiently (cf. Zimmermann (2018a,c,b); vs. Smolensky and Goldrick (2016); Rosen (2016)), copy-exponents and copied bases are predicted to **tolerate more marked structure**
  - e.g. marked structures in copy-exponent in Oowekyala (Howe, 2000)
  - e.g. copy-exponents as exceptional non-undergoers in Mojeño Trinitario (Rose, 2014; Marquardt, 2018)

- Weakening not only implies reduction but also being an easier target for **other phonological processes** (e.g. assimilation)
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  - e.g. marked structures in copy-exponent in Oowekeyala (Howe, 2000)
  - e.g. copy-exponents as exceptional non-undergoers in Mojeño Trinitario (Rose, 2014; Marquardt, 2018)

- Weakening not only implies reduction but also being an easier target for other phonological processes (e.g. assimilation)

- The same typology is expected for phonotactic copying (Kawahara, 2007; Kitto and de Lacy, 1999)
Further Prediction 5

- **Phonetic differences** between elements with different (underlying) activity?

  - gradient phonetic effects are well-attested: e.g. subphonemic gradience in word-final devoicing, nasal place assimilation, flapping (e.g. Braver, 2013), vowel harmony is gradient; gets weaker the farther it spreads (McCollum, 2018),…

  - optional deletion in Sikaiana single reduplication might in fact be a phonetic effect rather than optional phonological deletion (and optional variation between /C₁V₁∼C₁V₁…/ and /C₁∼C₁V₁…/ is well-attested in Austronesian, e.g. Hoava (Davis, 2003; Blevins, 2005) or Doku (Unger, 2018))
Conclusion

- extending a phonological account of reduplication based on segmental fission with the assumption that **fission is distribution of underlying activity** correctly predicts

  - that reduplication involves **symmetrical weakening** of all elements involved in the copying and reduction can affect copy-exponents and/or copied bases

  - the **gradient weakening of every copy operation** that can result in more reduction under multiple copying (main advantage over an alternative based on Existential Faithfulness (Struijke, 2000))
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Eva.Zimmermann@uni-leipzig.de
Sikaiana, tested with the Maxent Grammar Tool (Hayes, 2009)

**Weights**

<table>
<thead>
<tr>
<th>Category</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>$M/a.sc/x.sc$</td>
<td>39.510925583659265</td>
</tr>
<tr>
<td>$M/a.sc/x.sc$</td>
<td>17.130320954981542</td>
</tr>
<tr>
<td>$D/e.sc/p.sc$</td>
<td>0.0</td>
</tr>
<tr>
<td>$D/e.sc/p.sc$</td>
<td>17.143113638603637</td>
</tr>
<tr>
<td>$C/o.sc/n.sc/t.sc$</td>
<td>5.91793226522023</td>
</tr>
</tbody>
</table>

**Probabilities**

<table>
<thead>
<tr>
<th>Type</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\sigma+$ sop $o$</td>
<td>$0.9998680938615468$</td>
</tr>
<tr>
<td>so$\sim$sopo</td>
<td>$7.225023388204955E-5$</td>
</tr>
<tr>
<td>sop$&lt;o&gt;\sim$sopo</td>
<td>$1.901738415256463E-13$</td>
</tr>
<tr>
<td>&lt;sopo$\sim$sopo</td>
<td>$4.995851293881543E-21$</td>
</tr>
<tr>
<td>$\mu+$ sop $o$</td>
<td>$0.49773317757419294$</td>
</tr>
<tr>
<td>so$&lt;o&gt;\sim$sopo</td>
<td>$0.5009270527781152$</td>
</tr>
<tr>
<td>&lt;so$\sim$sopo</td>
<td>$4.900172127756463E-7$</td>
</tr>
<tr>
<td>o$\sim$sopo</td>
<td>$0.0013392796304789309$</td>
</tr>
<tr>
<td>$\sigma+$ $\mu+$ sop $o$</td>
<td>$0.0020702788740010795$</td>
</tr>
<tr>
<td>sop$o$<del>sopo</del>sopo</td>
<td>$0.995297845849349$</td>
</tr>
<tr>
<td>sopo~s$&lt;o&gt;\sim$sopo</td>
<td>$0.0026318752766498273$</td>
</tr>
</tbody>
</table>
Contiguous Morpheme Copying

(49) \( \text{MCont} \)
For every pair of output elements \( O_1 \) and \( O_2 \) corresponding to input elements \( I_1 \) and \( I_2 \) that belong to the same morpheme and \( I_1 \) directly precedes \( I_2 \):
Assign * for every \( O_1 \) that is not directly followed by \( O_2 \) and for every \( O_2 \) that is not directly preceded by \( O_1 \).

- a non-existential version demanding contiguous linear order for all instances of an element and hence subsumes (50-a+b)

(50) \( \text{Contiguity} \) (McCarthy and Prince, 1995, 123)
\( \text{I-Contig} \) ('No skipping')
The portion of \( S_1 \) standing in correspondence forms a contiguous string.
\( \text{O-Contig} \) ('No intrusion')
The portion of \( S_2 \) standing in correspondence forms a contiguous string.
Contiguous Morpheme Copying

<table>
<thead>
<tr>
<th>σ σ σ σ s o p o</th>
<th>σ&gt;VP</th>
<th>MCont</th>
<th>Dep</th>
<th>Max</th>
<th>Int</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1 1 1</td>
<td>100</td>
<td>50</td>
<td>36</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>a. σ σ σ σ s o p o ~ s o p o</td>
<td></td>
<td></td>
<td>-4</td>
<td>-4</td>
<td>-164</td>
</tr>
<tr>
<td>.5 .5 .5 .5 .5 .5 .5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+.5 +.5 +.5 +.5 +.5 +.5 +.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. σ σ σ σ o o ~ s o p o</td>
<td></td>
<td></td>
<td>-3</td>
<td>-2</td>
<td>-232</td>
</tr>
<tr>
<td>.5 .5 1 .5 .5 .5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+.5 +.5 +.5 +.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. σ σ σ σ o p o ~ s o p o</td>
<td></td>
<td></td>
<td>-1</td>
<td>-3</td>
<td>-173</td>
</tr>
<tr>
<td>.5 .5 .5 .5 .5 .5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+.5 +.5 +.5 +.5 +.5 +.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Laryngeal Reduction in Copy-Exponent and Copied Base: Tagalog

‘Contractions of this type never occur in non-reduplicated bases such as /daʔán/ ‘road’ or /bulhok/ ‘hair’, nor (as already noted) do they occur in reduplicated disyllables that do not contain a laryngeal consonant between like vowels’ (Blust, 2007, 7)

(51) Reduplication in Tagalog (Blust, 2007, 7)

<table>
<thead>
<tr>
<th>Word</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>búhos</td>
<td>‘pouring’</td>
</tr>
<tr>
<td>b-al-usbós</td>
<td>‘grain spilled from package’</td>
</tr>
<tr>
<td>laʔáb</td>
<td>‘spreading flame’</td>
</tr>
<tr>
<td>l-ag-abláb</td>
<td>‘noisy conflagration’</td>
</tr>
<tr>
<td>laʔás</td>
<td>‘cracked’</td>
</tr>
<tr>
<td>laslás</td>
<td>‘ripped’</td>
</tr>
<tr>
<td>láhad</td>
<td>‘opening of the hand’</td>
</tr>
<tr>
<td>ladrád</td>
<td>‘opened’</td>
</tr>
<tr>
<td>sáhaŋ</td>
<td>‘potency’</td>
</tr>
<tr>
<td>saŋsáŋ  ~  sansáŋ</td>
<td>‘strong agreeable odor’</td>
</tr>
<tr>
<td>súhol</td>
<td>‘bribe’</td>
</tr>
<tr>
<td>sulsól</td>
<td>‘instigation to do evil’</td>
</tr>
<tr>
<td>suʔóŋ</td>
<td>‘advance against odds’</td>
</tr>
<tr>
<td>sur̪sóŋ</td>
<td>‘go against wind’</td>
</tr>
<tr>
<td>tahán</td>
<td>‘cessation’</td>
</tr>
<tr>
<td>tantán</td>
<td>‘cessation’</td>
</tr>
</tbody>
</table>
(52) Adjectival reduplication (Inkelas and Zoll, 2005, 87)

- **gishiri**: ‘salt’  
  - gishiri-gishiri  
  - ‘salty’
- **búhu**: ‘sack’  
  - búhu-búhu  
  - ‘sacklike’
- **gári**: ‘flour’  
  - gári-gári  
  - ‘powdry’