A contrastive hierarchy approach to Tungusic and Mongolic Labial Harmony

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### Tungusic & Mongolic labial harmony

- **Van der Hulst and Smith (1988):**

<table>
<thead>
<tr>
<th>Stem</th>
<th>Ablative suffix</th>
<th>Output</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>мөрин</td>
<td>-AAs</td>
<td>мөрин-вас (*-aas)</td>
<td>horse</td>
</tr>
</tbody>
</table>

- **Standard Ewenki (Tungusic) /i/: opaque to labial harmony**

<table>
<thead>
<tr>
<th>Stem</th>
<th>Destinative suffix</th>
<th>Output</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>орор</td>
<td>-(i)glA</td>
<td>орор-игла (*-игла)</td>
<td>deer</td>
</tr>
</tbody>
</table>

- **Khalkha (Mongolic) /i/: transparent to labial harmony**

<table>
<thead>
<tr>
<th>Stem</th>
<th>Destinative suffix</th>
<th>Output</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>/i/</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>/u, у/</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Tungusic & Mongolic labial harmony

• This is a contrast between the two entire language groups.
  • Exactly the same pattern is found in all Tungusic and Mongolic languages known to have labial harmony.

• Tungusic
  • Standard Ewenki, Oroqen, Solon
  • Written Manchu
  • Ulch
  • Oroch, Udihe

• Mongolic
  • Mongolian proper: e.g., Khalkha and Chakhar
  • Buriat
Outline

• Previous analyses
  • van der Hulst and Smith (1988)
  • Problems of H&S (1988)
• My analysis
  • Framework: contrastive hierarchy (CH)
  • CH analysis of Oroqen (a Tungusic) and Khalkha (a Mongolic)
• Conclusion
Previous analyses

- van der Hulst and Smith (1988)
  - Underspecification for the transparent Mongolic /i/

- Kaun (1995)
  - Optimality Theory + transparency continuum
    - Tungusic: Search all values for [±round]
    - Mongolic: Search only marked values for [+round]
      → /i/ is unmarked, thus invisible (=transparent)

- Nevins (2010)
  - Relativized search in search-and-copy model of vowel harmony
Framework (1)

- Dependency Phonology (Anderson & Ewen 1987)
- Interpretation of vocalic features (H&S 1988: 82)
  - As a Governing Feature
    - [I]: Palatal constriction
    - [U]: Velar constriction
    - [A]: Pharyngeal constriction
  - As a Dependent Feature
    - [I]: Expanded pharyngeal cavity (ATR)
    - [U]: Expanded labial cavity (rounded)
    - [A]: Expanded oral cavity (lowered jaw)
Framework (2)

- Fusional harmony (Mester 1986)
  - Vowel harmony is dependent on the presence of some feature \([F]\), and operates within the domain delimited by occurrences of that feature.
Vowel inventory

Standard Ewenki

/i/ = I
/u/ = U
/ə/ = I
/a/ = A
/ε/ = A

Khalkha Mongolian

/i/ = I
/u/ = U
/e/ = A
/a/ = A
/o/ = A
/c/ = A

Redundancy rule:

I & ~U → I
I → I

van der Hulst and Smith (1988)
Opaque vowels

Tungusic & Mongolic /u, ʊ/

Tungusic /i/

van der Hulst and Smith (1988)
Transparent vowel

Mongolic /i/ = \textsuperscript{i}
Problems

- Simply doesn’t work for other Mongolic varieties
  - e.g., Shuluun Höh Chakhar (Svantesson et al. 2005)
    - a Southern Mongolian variety (spoken in Inner Mongolia) with richer inventory but the same harmony patterns

- /ə/ instead of /e/ \(\rightarrow\) No redundancy rule is available
- Thus, a governing specification of [I] is required in the underlying representation of /i/.
- Then, /i/ is wrongly predicted to be opaque, not transparent.
Problems (cont.)

• The palatalizing effect of Mongolic /i/
  • Palatalized consonants; vowel umlaut
    → the relevant feature is *active* in the phonology
  • Under van der Hulst and Smith’s approach:
    • [I] is a redundant value introduced later by a redundancy rule
    • A redundant feature value can operate in phonology proper?

• Two blocking features: [I] for /i/ and [U] for /u, ʊ/
    • Low vowels trigger/undergo labial harmony
    • High vowels block labial harmony
Contrastive hierarchy

- Modified Contrastive Specification
  - “The contrastive specifications of phonemes are governed by language-particular feature hierarchies” (Dresher 2009)

Two possible hierarchies with two contrastive features: the ordering of features can vary from language to language, allowing for variability (Avery et al. 2008)
Hypothesis

• Contrast and phonological activity (Dresher 2009)
  • Only contrastive features are *active* in the phonology.
  • System-redundant features are *inert*.

• Contrast and vowel harmony (Dresher and Zhang 2005)
  • Only segments with a contrastive specification for a feature [F] can trigger harmony based on [F].
Procedure

• The Successive Division Algorithm (Dresher 2009)
  • Begin with *no* feature specifications: assume all sounds are allophones of a single undifferentiated phoneme.
  • If the set is found to consist of more than one contrasting member, select a feature and divide the set into as many subsets as the feature allows for.
  • Repeat step (b) in each subset: keep dividing up the inventory into sets, applying successive features in turn, until every set has only one member.
My analysis

- The minimal contrast between Tungusic and Mongolic is due to the minimal difference in the feature hierarchy
  - Tungusic: [low] > [coronal]
  - Mongolic: [coronal] > [low]
- No need to present a new analysis:
  - I simply put together the individual analyses of
    - Mongolic: Ko (to appear)
- Languages to be compared in my analysis
  - Oroqen (a Tungusic): data and analysis from Zhang (1996)
  - Khalkha (a Mongolic):
    - data from Svantesson et al. 2005 otherwise noted
    - analysis from Ko (to appear)
Vowel inventory

Oroqen vowels

Khalkha vowels
Oroqen contrastive hierarchy

- SDA: [low] > [cor] > [lab] > [RTR] (Zhang 1996)

- Output specification:
  
  \[
  \begin{align*}
  /i/ &= [-\text{low}, +\text{cor}] \\
  /u/ &= [-\text{low}, -\text{cor}, -\text{RTR}] \\
  /ə/ &= [+\text{low}, -\text{cor}, -\text{lab}, -\text{RTR}] \\
  /a/ &= [+\text{low}, -\text{cor}, -\text{lab}, +\text{RTR}] \\
  /o/ &= [+\text{low}, -\text{cor}, +\text{lab}, -\text{RTR}] \\
  /ɔ/ &= [+\text{low}, -\text{cor}, +\text{lab}, +\text{RTR}]
  \end{align*}
  \]
Khalkha contrastive hierarchy

- SDA: [cor] > [low] > [lab] > [RTR] (Ko to appear)

- Output specification

  /i/ = [+cor]

  /u/ = [-cor, -low, -RTR] /o/ = [-cor, -low, +RTR]

  /e/ = [-cor, +low, -lab, -RTR] /a/ = [-cor, +low, -lab, +RTR]

  /o/ = [-cor, +low, +lab, -RTR] /ɔ/ = [-cor, +low, +lab, +RTR]
**Contrastive status of the features**

- **Evidence: a summary**

<table>
<thead>
<tr>
<th>[coronal]</th>
<th>Oroqen (Tungusic)</th>
<th>Khalkha (Mongolic)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Palatalization of /s/ before /i/</td>
<td>Consonant palatalization by /i/</td>
</tr>
<tr>
<td></td>
<td>[j]-formation /ee, ɛɛ/</td>
<td>Vowel umlaut</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>[RTR]</th>
<th>RTR harmony</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>[labial]</th>
<th>labial harmony</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[w]-formation by /oo, ɔɔ/ (Oroqen only)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>[low]</th>
<th>Trigger/target of labial harmony is restricted to low vowels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>blocking of labial harmony by high (rounded) vowels</td>
</tr>
</tbody>
</table>

Tungusic and Mongolic labial harmony
### [coronal]

- **Oroqen** (Tungusic): palatalization of /s/ by /i/ (Zhang 1996:171)

<table>
<thead>
<tr>
<th>[s] before a non-front vowel</th>
<th>[ʂ] before a front vowel</th>
</tr>
</thead>
<tbody>
<tr>
<td>sukə</td>
<td>[suxə]</td>
</tr>
<tr>
<td>sənta</td>
<td>[sʊnta]</td>
</tr>
<tr>
<td>səko-</td>
<td>[sɔkɔ]</td>
</tr>
<tr>
<td>sarbʊ</td>
<td>[sarbʊ]</td>
</tr>
<tr>
<td>salə</td>
<td>[sələ]</td>
</tr>
<tr>
<td>asi</td>
<td>[aɕi]</td>
</tr>
</tbody>
</table>

Cf. [j]-formation by long low front Vs /ee, ɛɛ/ (Zhang 1996: 167ff)

- **Khalkha** (Mongolic): consonant palatalization  
  Cf. vowel umlaut

<table>
<thead>
<tr>
<th>plain Cs</th>
<th>palatalized Cs</th>
</tr>
</thead>
<tbody>
<tr>
<td>pʰaɮ</td>
<td>pʲʰaɮ</td>
</tr>
<tr>
<td>aɡ</td>
<td>aɡʲ</td>
</tr>
<tr>
<td>cam</td>
<td>čam</td>
</tr>
<tr>
<td>saɮ</td>
<td>šaɮ</td>
</tr>
<tr>
<td>am</td>
<td>amʲ</td>
</tr>
<tr>
<td>‘splash!’</td>
<td>‘plate’</td>
</tr>
<tr>
<td>‘tight’</td>
<td>‘wormwood’</td>
</tr>
<tr>
<td>‘road’</td>
<td>‘law’</td>
</tr>
<tr>
<td>‘raft’</td>
<td>‘floor’</td>
</tr>
<tr>
<td>‘mouth’</td>
<td>‘life’</td>
</tr>
</tbody>
</table>
[RTR], [labial], and [low]

- Vowel harmony

<table>
<thead>
<tr>
<th>Oroqen (Tungusic) (Zhang 1996)</th>
<th>Khalkha (Mongolic) (Ko to appear)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. RTR harmony</td>
<td></td>
</tr>
<tr>
<td>ꞏaaka-wa</td>
<td>‘thing-def.obj’</td>
</tr>
<tr>
<td>bajun-mə</td>
<td>‘moose-def.obj’</td>
</tr>
<tr>
<td></td>
<td>at-aar</td>
</tr>
<tr>
<td></td>
<td>et-eer</td>
</tr>
<tr>
<td></td>
<td>‘devil-Inst’</td>
</tr>
<tr>
<td></td>
<td>‘item/property-Inst’</td>
</tr>
<tr>
<td>b. If /i/ is the only stem vowel, non-RTR suffix is selected</td>
<td></td>
</tr>
<tr>
<td>irgi-wə</td>
<td>‘tail-def.obj’</td>
</tr>
<tr>
<td></td>
<td>it-eer</td>
</tr>
<tr>
<td></td>
<td>‘strength-Inst’</td>
</tr>
<tr>
<td>c. high rounded Vs: RTR harmony, but no labial harmony</td>
<td></td>
</tr>
<tr>
<td>ḍoro-on-mə</td>
<td>‘hoof-def.obj’</td>
</tr>
<tr>
<td>kuwun-mə</td>
<td>‘cotton-def.obj’</td>
</tr>
<tr>
<td></td>
<td>ot-aar</td>
</tr>
<tr>
<td></td>
<td>ut-eer</td>
</tr>
<tr>
<td></td>
<td>‘willow’</td>
</tr>
<tr>
<td></td>
<td>‘noon, midday’</td>
</tr>
<tr>
<td>d. low rounded Vs: labial harmony</td>
<td></td>
</tr>
<tr>
<td>ꞏɔlɔ-ɔ′</td>
<td>‘fish-def.obj’</td>
</tr>
<tr>
<td>ꞏʨoŋko-wo</td>
<td>‘window-def.obj’</td>
</tr>
<tr>
<td></td>
<td>ꞏɔt-ɔɔr</td>
</tr>
<tr>
<td></td>
<td>‘star; fortune’</td>
</tr>
<tr>
<td></td>
<td>ot-oor</td>
</tr>
<tr>
<td></td>
<td>‘feathers’</td>
</tr>
</tbody>
</table>

High rounded vowels are not phonologically [+labial]!
[w]-formation in Oroqen

Labial glide formation by long low rounded vowels /oo, ɔɔ/ (Zhang 1996)
Cf. no labialization by short /o/ or /ɔ/

<table>
<thead>
<tr>
<th>a. labialization by ‘low’ rounded vowels</th>
</tr>
</thead>
<tbody>
<tr>
<td>oorin</td>
</tr>
<tr>
<td>ɔɔ-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>b. no labialization by ‘high’ rounded vowels</th>
</tr>
</thead>
<tbody>
<tr>
<td>ʊu-</td>
</tr>
<tr>
<td>ʊm-</td>
</tr>
</tbody>
</table>

High rounded vowels are not phonologically [+labial]!
### Transparent/opaque Vs

<table>
<thead>
<tr>
<th></th>
<th>Oroqen (Tungusic)</th>
<th>Khalkha (Mongolic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>/i/</td>
<td>opaque</td>
<td>transparent</td>
</tr>
<tr>
<td>/u, u/</td>
<td>opaque</td>
<td>opaque</td>
</tr>
</tbody>
</table>

### Oroqen (Tungusic) vs. Khalkha (Mongolic)

<table>
<thead>
<tr>
<th></th>
<th>Oroqen (Tungusic)</th>
<th>Khalkha (Mongolic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>/i/</td>
<td>tongorin-teera (*-teoro) 'round-DIMIN'</td>
<td>poor-ig-o 'kidney-ACC-REFL'</td>
</tr>
<tr>
<td></td>
<td>toroki-wa (*-wo) 'boar-DEF.OBJ'</td>
<td>xool-ig-o 'food-ACC-REFL'</td>
</tr>
<tr>
<td>/u, u/</td>
<td>tseonko-dulaak (*-dulook) 'window-PLACE-OBJ'</td>
<td>og-ulj-lje (*-ljo) 'to give-CAUS-DPST'</td>
</tr>
<tr>
<td></td>
<td>dzelo-dulaak (*-dulook) 'stone-PLACE-OBJ'</td>
<td>or-ulj-la (*-lja) 'to enter-CAUS-DPST'</td>
</tr>
</tbody>
</table>
Feature hierarchy (1)

- Desiderata (for both Oroqen and Khalkha)
  - D1: /i/ must bear [+coronal] specification ← palatalization
  - D2: /i/ must lack specification for [±RTR] ← neutrality to RTR harmony
  - D3: /u, ʊ/ must bear [-low] specification ← suffixal alternation and labial harmony (blocking)
  - D4: /u, ʊ/ must lack specification for [±labial] ← no triggering effect in labial harmony and [w]-formation (Oroqen)
- ...
- We are NOT considering the transparency of Mongolic /i/ for now.
Feature hierarchy (2)

• If [±RTR] first: fails, since it assigns [-RTR] to /i/, contra D2.
• If [±lab] first: fails, since it assigns [+lab] to /u, ʊ/, contra D4.
• If [±low] first: assigns [+low] to /e(ə), a, ɔ/ and [-low] to /i, u, ʊ/.
  • If [±RTR] second: fails, since it assigns [-RTR] to /i/, contra D2.
  • If [±lab] second: fails, since it assigns [+lab] to /u, ʊ/, contra D4.
  • If [±cor] second: assigns [+cor] to /i/ and [-cor] to /u, ʊ/.
    • If [±RTR] third ...
    • If [±lab] third ...
• If [±cor] first: assigns [+cor] to /i/ and [-cor] to all other Vs.
  • If [±RTR] second: assigns [+RTR] to /ʊ, ə, ɔ/ and [-RTR] to /u, e(ə), ə/  
    • [±lab] third: fails, since it assigns [+lab] to /u, ʊ/, contra D4.
    • [±low] third: assigns ...
  • If [±lab] second: fails, since it assigns [+lab] to /u, ʊ/, contra D4.
  • If [[±low] second: assigns ...
    • If [±RTR] third ...
    • If [±lab] third ...
Feature hierarchy (3)

- Hierarchies that do not fail.
  - (1) low>cor>lab>RTR
  - (2) low>cor>RTR>lab
  - (3) cor>RTR>low>lab
  - (4) cor>low>lab>RTR
  - (5) cor>low>RTR>lab
- Assuming RTR is the lowest-ranked feature, we can eliminate (2), (3), (5) leaving (1) and (4).
- Then, considering the special behavior of /i/, we assign (1) to Tungusic and (4) to Mongolic.
Oroqen

/i/: opaque

\[ \begin{array}{c}
I \\
+lo \quad \text{[+lo]} \quad -lo \quad [+lo] \\

goal
\end{array} \]

\[ \begin{array}{c}
O \\
+lo \quad [-lo] \\

goal
\end{array} \]

/u, u/: opaque

\[ \begin{array}{c}
U \\
+lo \quad [-lo] \\

goal
\end{array} \]

\[ \begin{array}{c}
O \\
[+lo] \quad [-lo] \quad [+lo] \\

goal
\end{array} \]

\[ \begin{array}{c}
U \\
[+lo] \quad [-lo] \quad [+lo] \\

goal
\end{array} \]

[-rd] \leftarrow \text{by default}
/i/: transparent

Khalkha

/u, u/: opaque

[-rd] ← by default
Conclusion

• Tungusic vs. Mongolic
  • The same set of contrastive vowel features
  • But minimally different orderings
• Another empirical evidence that contrastive specification plays special role in phonology.
• A simple but elegant solution to a well-known problem in the theory of harmony systems.
  • Requires no further machinery except for the feature specification + basic harmony process
• Which comes first, [cor] or [low]?
  • Our analysis requires both orderings between the two Fs.
  • To be answered in future research
Selected references

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Thank you very much!