Week 8: Conspiracies, intro to OT

Overview
- Review
- Conspiracies
- Intro to OT
- Nisgha + OT reanalysis

Review

Basic concepts
- Contrast vs. predictability
  - Sounds with identical distributions contrast
  - Sounds in complementary distribution do not contrast (choice is predictable)
- The phoneme
  - Psychological category—may be realized by different actual sounds
  - Underlying representation (phonemes) vs. surface representation (pronunciation)
- “Sound syntax”
  - Not all sequences are well-formed
  - Which allophone of a phoneme will occur in a particular context is predictable
  - Morphology can cause alternations
- Features = acoustic or articulatory properties of sounds
  - Features define natural classes
  - A good feature system is one that defines all and only the natural classes we observe phonologically

Linear, rule-based phonology
- Underlying representation is a sequence of feature matrices (segments)
- UR is subjected to a sequence of rules, which can...
  - change one or more feature values of a segment
  - delete a segment
  - insert a segment
  - change the order of segments
- Rule ordering = the output of one rule is the input to the next rule.
  - Rules can’t see back (to UR) or ahead (to SR)
  - This can result in opacity
Example of linear rule:

\[
[+\text{nasal}] \rightarrow \begin{array}{cccc}
\text{αlabial} & \beta\text{round} & \gamma\text{coronal} & \delta\text{anteriorty} \\
\varepsilon\text{distributed} & \zeta\text{anteriorty} & \eta\text{dorsal} & \theta\text{back} \\
\kappa\text{low} & \lambda\text{high} & & \\
\end{array} / \_\_ \ C
\begin{array}{cccc}
\text{αlabial} & \beta\text{round} & \gamma\text{coronal} & \delta\text{anteriorty} \\
\varepsilon\text{distributed} & \zeta\text{anteriorty} & \eta\text{dorsal} & \theta\text{back} \\
\kappa\text{low} & \lambda\text{high} & & \\
\end{array}
\]

**Syllables, the CV tier**

We enriched linear phonology a bit by adding some hierarchical prosodic structure (the CV tier, syllable structure).

- Justification for syllables:
  - Languages seem to treat onsets and codas differently
- Justification for CV tier:
  - We need a way to represent length—long segments don’t always look like a sequence of two segments (geminate inalterability)
  - We need a way to represent affricates—they count as just one segment, but can behave like stops on the left and fricatives on the right
  - CV pattern can behave independently from “melody” (features)

**Nonlinear phonology/Autosegmentalism**

No change in the basic architecture (UR undergoes Rule 1, output of Rule 1 undergoes Rule 2, output of Rule 2 undergoes Rule 3, etc.). Representations are different, though: Tones and features have an “independent” existence on their own tiers (they are “autosegments”).

- Implications
  - A tone or feature can be associated to multiple segments (i.e., CV slots) at once
  - A tone or feature can be associated to just some portion of a segment
- What can autosegments do?
  - Spread
  - Be inserted
  - Delink
  - Change value
Example of autosegmental rule:

C

[+nasal]

αlabial
βround
γcoronal
δanterior
εdistributed
ζanterior
ηdorsal
θback
tfront
κlow
λhigh

C

[+nasal]

µlabial
νround
ξcoronal
οanterior
πdistributed
ρanterior
σdorsal
τback
υfront
φlow
χhigh

or

C

[+nasal]

αlabial
βround
γcoronal
δanterior
εdistributed
ζanterior
ηdorsal
θback
tfront
κlow
λhigh

C

[+nasal]

µlabial
νround
ξcoronal
οanterior
πdistributed
ρanterior
σdorsal
τback
υfront
φlow
χhigh
Feature geometry
An enhancement to autosegmental phonology, which again alters the representations rather than the basic architecture.
Instead of giving each feature its own tier (the “bottle-brush”), there is a hierarchical grouping. When a node spread, all its dependents spread with it.
- Tests for hierarchical grouping (cf. constituency tests in syntax)
  - Do rules exist in which the proposed node spreads?
  - Do rules exist in which the proposed node delinks?
  - Do OCP effects (dissimilation) exist on the proposed node?

Example of autosegmental rule using feature geometry

Some things to notice
- Increasing interest in representations rather than rules (though rules and representations still play the same role in the theory)
- Constraints have started to appear (No-Crossing Constraint, Obligatory Contour Principle), but their status is unclear: Do they block rules? Do they trigger rules? How do you know which rules to trigger? Do they always have to be obeyed?
Some rules we’ve seen in class (many details omitted)

oddball = I don’t know any other instances of this
common = I’ve heard of it in a few unrelated languages
very common = I’ve heard of it in many unrelated languages
super-common = most languages probably have this

Sometimes it’s hard to say, because there aren’t that many languages that have the structure in question to begin with.

Final devoicing
Farsi final [r] devoices
Polish final obstruents devoice (very common)

Intervocalic lenition
Farsi intervocalic [r] flaps
Spanish spirantization (very common)

Assimilation
Mokilese vowels devoice between voiceless consonants (common)
Lithuanian nasals assimilate in place to following C (super-common)
Greek Cs assimilate in voicing and aspiration to a following C (common)
English coronals assimilate in place to a following coronal (super-common)
Puyo Pongo Quichua stops become voiced after a nasal, but only across a morpheme boundary (postnasal voicing is common)
Toba Batak nasals assimilate completely to following C

Vowel harmony (very common)
Moore vowels harmonize for [hi]
Finnish vowels agree in backness (e and i transparent)
Turkish high vowels undergo round harmony
Turkish vowels undergo front harmony
Arbore vowels assimilate totally to a preceding vowel if separated only by h
Basque a becomes e when preceded by a high vowel (intervening Cs OK)

Nasal harmony (common)
Guarani nasality spreads left and right from nasal vowels until blocked by a voiced stop
Bahasa Indonesia nasality spreads from nasal C rightward until blocked by obstruent

Consonant place harmony
Navajo sibilants agree in place (s vs. j)
Sanskrit n becomes retroflex in the presence of another retroflex

Lenition in codas/unstressed syllables, fortition in onsets/stressed syllables/word onsets
English aspiration (aspirated word-initially and in stressed onsets; unaspirated elsewhere)
Quechua dorsal stops become fricatives when in coda position (common)
Korean codas lose laryngeal and continuancy distinctions (all become voiceless, unaspirated stops)—pretty common in languages that have those distinctions
Spanish coda s → h
Serbo-Croatian l → o when final (common)

_Hiatus resolution_
Bizcayan Basque high V + V sequences are broken up by a glide (super-common)
Ilokano o becomes w before a vowel (very common)
Tonkawa vowels delete before other vowels (very common)
Basque low and mid vowels raise before another vowel

_Consonant-cluster avoidance_
Greek Cs get deleted when unsyllabifiable (common)
Arabic CCC sequences get broken up with i (common)
Serbo-Croatian final C+sonorant clusters are broken up with a (common)

_OCP_
Japanese Lyman’s Law: only one voiced obstruent allowed per word
Latin l becomes r in the presence of another l (common)
Korean coronal obstruents not followed by high front vowels underlyingly (common)
Korean labial obstruents not followed by round vowels underlyingly (common)

_V-C interactions_
Kenyang [k] after e, u, i; [q] after ɔ, ə, a
Quechua high vowels lower to mid next to uvulars (common)
Polish u → o before voiced, nonfinal consonant (oddball)
Nisgha i becomes u next to a round C (common)
Nisgha i becomes a next to a glottal or uvular C
Maltese: some vowels become [i] before coronal consonants

_Miscellaneous_
Japanese Rendaku: the initial obstruent of the second member of a compound voices (oddball)
Lithuanian nasals delete before fricatives, with compensatory vowel lengthening (it’s common for languages not to tolerate nasal + fricative clusters)
Chickasaw V+nasal becomes long nasal vowel
Ilokano ʔ and glide optionally metathesize
Tonkawa word-internal vowels delete when they can do so without creating a non-vowel-adjacent consonant (this is a combination of rampant vowel deletion and consonant-cluster avoidance)
Serbo-Croatian t deletes before l
Conspiracies (Kisseberth)

*Evaluation metric* of SPE: rules with fewer symbols should be more widespread among the world’s languages.

Thus, a shorter grammar for a given language is likely to be one that does a better job of representing the “linguistically significant” aspects of that language.

Using the brace notation to collapse

\[ \emptyset \rightarrow V / C \_\_ C\# \]
\[ \emptyset \rightarrow V / C \_\_ CC \]

into the shorter

\[ \emptyset \rightarrow V / C \_\_ C\{C,#\} \]

says that these rules have something significant in common.

But these rules have something in common too:

\[ \emptyset \rightarrow V / C \_\_ CC \]
\[ C \rightarrow \emptyset / CC + \_ \]

(what they have in common is that they avoid CCC sequences)

Kisseberth proposes using a constraint to make the rules of Yawelmani simpler:

Instead of

\[ V \rightarrow \emptyset / V C \_\_ C V \]
\[ \text{[-long]} \]
\[ V \rightarrow \emptyset / C \_\_ C \text{ subject to } *CCC \]
\[ \text{[-long]} \]

The constraint can trigger rules or block them.

Many more conspiracies were identified, giving rise to more constraints.

People liked constraints, because they gave theoretical status to markedness (beyond default values for features).
**Intro to OT**
OT sought to solve some problems with constraints:

- Do we need both rules and constraints?
- Why aren’t constraints always obeyed?
- Why don’t any languages try to obey all the constraints (whatever they are) at once?

**Rule-based architecture vs. OT architecture**

<table>
<thead>
<tr>
<th>rule-based</th>
<th>OT</th>
</tr>
</thead>
<tbody>
<tr>
<td>start with UR (from mental lexicon)</td>
<td>start with UR (from mental lexicon)</td>
</tr>
<tr>
<td>apply rules in sequence—output is fully determined at all times</td>
<td>apply all possible rules, producing a set of candidate outputs</td>
</tr>
<tr>
<td>constraints may block or trigger rules</td>
<td>constraints picking the best candidate</td>
</tr>
<tr>
<td>interaction of constraints is nonexistent or sketchy</td>
<td>constraints interact through strict domination</td>
</tr>
<tr>
<td>similarity to UR is the result of not applying too many rules and not having too many constraints</td>
<td>similarity to UR is enforced by specific constraints</td>
</tr>
<tr>
<td>end with SR (send it to the phonetic system)</td>
<td>end with SR (send it to the phonetic system)</td>
</tr>
</tbody>
</table>

**A computational point**
This standard description of OT is meant as a function definition

$$SR = \text{Eval}(\text{Con}, \text{Gen}(\text{UR}))$$

where Gen(UR) is the set that results from applying all possible rules to UR, and Eval(Con, CandSet), is the member of the candidate set CandSet that best satisfies the constraint hierarchy Con.

This does not, however, supply a procedure for calculating Eval(Con, Gen(UR)).

Example of computational procedure (for syllable constraints only): Bruce Tesar’s “Computing Optimal Forms in Optimality Theory: Basic Syllabification”, available from the Rutgers Optimality Archive (http://ruccs.rutgers.edu/roa.html).

If you’re interested in these issues, take my seminar next semester, “Computation in Optimality Theory”.

**Constraints**

- **Markedness** constraints are constraints on the output (SR) (they require articulatory ease, or perceptual clarity, or other “natural” drives). Example: *CCC

- **Faithfulness** constraints are constraints on the relationship between the input (UR) and the output (they require similarity). Example: DEP-V
Yawelmani: *CCC >> DEP-V
English: DEP-V >> *CCC

The tableau
The tableau (French, pronounced [tʰæˈblou]) is a way of representing this calculation. Naturally, not all candidates can be shown, and not all constraints are shown.

This tableau shows a ranking argument for *CC >> DEP-V:

<table>
<thead>
<tr>
<th>/at+ka/</th>
<th>*CC</th>
<th>DEP-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>a [ødka]</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b [atka]</td>
<td>!</td>
<td></td>
</tr>
</tbody>
</table>

Important parts of the tableau:
- input
- output candidates
- pointing finger
- constraints
- asterisks
- exclamation marks
- shading

How do I know which candidates to include?

Some candidates are obviously unnecessary in arguing for a particular ranking:

<table>
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<th>*CC</th>
<th>DEP-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>a [ødka]</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>b [atka]</td>
<td>!</td>
<td></td>
</tr>
<tr>
<td>c [atøaka]</td>
<td>**!</td>
<td></td>
</tr>
</tbody>
</table>

You should try to include candidates that show every possible way to satisfy each markedness constraint in the tableau, except when you have already established that they could not win. Here, including candidate c shows that we’re missing some constraints:
How do I know which constraints to include?
You need enough constraints (in the correct ranking) to ensure that the right candidate wins:

<table>
<thead>
<tr>
<th>/at+ka/</th>
<th>MAX-C</th>
<th>*CC</th>
<th>DEP-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>
<tr>
<td>c</td>
<td></td>
<td></td>
<td>*!</td>
</tr>
</tbody>
</table>

You should try to include all the faithfulness constraints that are violated by any of your candidates (which should be all the faithfulness constraints that are in conflict with any of your markedness constraints).

Yawelmani in OT
Let’s try to do Yawelmani in OT.

How to come up with an OT analysis

1. List all the markedness constraints that seem to be playing a role
2. List all the faithfulness constraints that the markedness constraints conflict with
3. For each form, list candidates that exhibit different ways of satisfying the markedness constraints. List each one’s constraint violations. Look for ranking arguments.

Preview of next time
- faithfulness vs. markedness
- factorial typology

To do for next time
Read
- Kager pp. 34-48, 91-109
  (pp. 34-48 present the ideas essential to next time’s discussion; pp. 91-109 give examples that may be helpful to you in doing the Tibetan assignment)

Problem
- Tibetan numerals