A natural origin for unnatural gradient phonotactics

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Introduction

- Can gradient phonotactics be “unnatural”?
- What is unnatural?
- A model for explaining unnaturalness
- How to capture (unnatural) gradience theoretically?

Outline

- Gradience and naturalness
- Data
- A new explanation
- Phonetics
- A problem for theory?
- Conclusion

Naturalness

- Both “naturalness” and “gradience” are to some degree confusing
- Traditionally, unnatural all processes that lack phonetic motivation
- This division misses one important aspect: phonetically unmotivated vs. going in the opposite direction

Naturalness

- A new proposal:
  - Natural: phonetically grounded
  - Unmotivated: lack phonetic motivations
  - Unnatural: operating in the opposite direction from universal phonetic tendency

Naturalness

- Natural processes phonetically motivated, typologically common, usually attested as minor phonetic tendencies cross-linguistically
- Unmotivated: lack motivation
- Most processes in the survey (Blevins 2008) unmotivated
  a) p → s/ i
  b) i → u/d
- No universal phonetic tendency operating against these processes

Naturalness

- Unnatural: operating against universal phonetic tendency (UPT)
- UPT: phonetically (articulatory) motivated, typologically common, attested as phonetic tendency in languages without phonological process. Reverse processes usually not attested
Phonotactics

- Most studies on phonotactics involve unmotivated restrictions (Hayes and White 2013, Albright 2009)
- Likewise, studies on gradience only include natural processes
- No cases of unnatural gradient phonotactics so far

Gradient phonotactics

- Gradient phonotactics subject of in depth theoretical study only recently (Frisch et al. 2004, Antilla 2008, Coetzee and Pater 2008)
- Generally accepted that gradience needs to be encoded in grammar
- Shows necessity for weights in phonology

Data

- Tarma Quechua, a dialect of Quechua spoken in Tarma, Junín, Peru (Adelaar 1977, Nazarov 2008)
- Stop voicing
  - Proto-Quechua, Pre-Tarma only voiceless stops
  - Voicing occurs: intervocally, post-consonantically, but not post-nasally
  - Bilabial, velar series undergo voicing, dental remain voiceless

- Post-consonantly voicing after (Nazarov 2008): t, ñ, ñ, k, s, f, x, l, ñ, ñ, w

- First locus of unnaturalness: kb, tb, tg

- Intervocalic stop-stop cluster: VC_1C_2V when C_2 = [b] or [g]

- Clusters that agree in voice preferred
- Pre-voicing preferred
- Tarma Quechua gradience in the opposite direction

Data

- Even more surprising is the distribution

Native vocabulary analyzed by Nazarov (2008)
Data

▶ Post-nasally voiced stops universally preferred
(Hayes and Stivers 2000)
▶ After voiceless stops voiced stops universally dispreferred
(voice disagree)
▶ Intervocally, voiced stops universally preferred
▶ Gradience goes in the opposite direction!

Data

▶ More voicing after T than after Y, R
(Nazarov 2008)

<table>
<thead>
<tr>
<th></th>
<th>Y,R</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voiced</td>
<td>66</td>
<td>66</td>
</tr>
<tr>
<td>Voiceless</td>
<td>14</td>
<td>6</td>
</tr>
</tbody>
</table>

However, this is not significant $p < 0.10$

Data

▶ Not many explanations
▶ As with other cases of unnatural processes, the origins often sought in Ohala’s hypercorrection
▶ Problems:
  ▶ Why such distribution?
  ▶ Why the asymmetry: dental vs. labial and velar?

Explanations

Outline

Gradience and naturalness:

Data

A new explanation

Phonetics

A problem for theory?

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Blurring cycle

▶ Combination of sound changes:
(Beguš 2015a)

\[
\begin{align*}
D & > Z / [-\text{nas}] \\
D & > T \\
Z & > D
\end{align*}
\]

Blurring cycle

▶ Universal phonetic tendency

\[
A > B / X
\]

▶ Unnatural process

\[
B > A / X
\]

▶ Blurring cycle

\[
\begin{align*}
B & > C / Z; Z \text{ complement of } X \\
B & > A \\
C & > B
\end{align*}
\]

(a) a set of segments enters complementary distribution;

(b) a sound change occurs that operates on the unchanged subset of those segments;

(c) optionally, another sound change occurs that blurs the original complementary distribution.
**Blurring chain**

- Another logically possible scenario
  \[ B > A / X \]
- **Blurring chain**
  \[ B > C / X \]
  \[ C > D \]
  \[ D > A \]

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**Berawan dialects (Blust 2005)**

- Blurring chain explains **intervocalic devoicing** in Kiput and Berawan
- Unnatural sound change/phonotactics: voice contrastive initially
- Intervocally neutralization in the dispreferred direction

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**Berawan dialects (Blust 2005)**

- Berawan stops
  - # ___ V V
  - \# *b b k
  - *d d r
  - *g g k
- **Scenario 1**
  1. b > p
  2. p > k
- **Scenario 2**
  1. b > g
  2. g > k

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**Berawan dialects (Blust 2005)**

- Blurring chain
  - **Blurring chain**
  - Berawan
  - B > C / X
  - C > D
  - D > A

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**Tarma Quechua**

- How to explain such a distribution

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**Tarma Quechua**

- Claim: Tarma Quechua too underwent three sound changes

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**Tarma Quechua**

- If we accept blurring chain, the explanation becomes straightforward
- Fricativization: very common in consonant clusters, intervocally
- Fricatives in post-nasal position highly dispreferred
Tarma Quechua

- Fricativization in consonant clusters nearly categorical, intervocally variation
- After that, voicing of fricatives occurs, which in pre-vocalic position is a common, motivated, and natural sound change
- Third sound change: fricative occlusion

Advantages

- Asymmetry in place of articulation: velar and labial vs. dental
- Distribution of voicing:
  a) 4% post-nasally
  b) 49% intervocally
  c) 87% in clusters

Three natural, well-motivated sound changes in combination gave rise to unnatural gradient phonotactics

Phonetics

- There exist strong phonetic evidence in favor of my proposal
- Old recordings by Willem Adelaar in Tarma, Peru
- Echoing disturbs the analysis
- The dialect highly endangered (Adelaar, p.c.)

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BLUERING CHAIN

<table>
<thead>
<tr>
<th>B &gt; C / X</th>
<th>Tarma Quechua</th>
</tr>
</thead>
<tbody>
<tr>
<td>C &gt; D</td>
<td>S &gt; Z</td>
</tr>
<tr>
<td>D &gt; A</td>
<td>Z &gt; D</td>
</tr>
</tbody>
</table>
Phonetics

- Stops surface as fricatives sometimes

This indicates that there was a stage in the development with voiced fricatives
- Occlusion to stops not operated categorically

Outline

Gradience and naturalness
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A problem for theory?

- It is generally agreed upon that gradient phonotactics has to be encoded in the grammar (Coetzee and Pater 2008, Antilla 2008)
- Various approaches for capturing gradience theoretically
- The problem: how to derive a system in which unnatural element is more common?

- Harmony (HG) can be transformed to percentages, but given richness of the base, we cannot derive a system in which the unnatural element is more frequent
- Faith and a markedness constraint *X
- If equal weights, \( P(\text{Unnat}) < .5 \)
- If either Faith or *X have greater weights:
  a) If Faith > *X: \( P(\text{Unnat}) = .5 \)
  b) If Faith < *X: \( P(\text{Unnat}) < .5 \)
A problem for theory?

![Graph showing percentage of No Voicing and Voicing for N, V, Y, R, S, T]

<table>
<thead>
<tr>
<th>Count</th>
<th>TT</th>
<th>TD</th>
<th>DT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labial</td>
<td>41</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Voiced</td>
<td>55</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>% Voil</td>
<td>79</td>
<td>100</td>
<td>53</td>
</tr>
</tbody>
</table>

Berawan dialects (analysis based on data from Burkhardt 2014)

A new proposal: Inherently Weighted Constraints

 ◦ Should Con be restricted?
 ◦ *−X
 ◦ DisAgree?
 ◦ *VDV?
 ◦ Problem: how to encode these are rare?
 ◦ Not just Tarma Quechua

Berawan

![Graph showing percentage of Vless and Voiced for labial and velar]

A new proposal

 ◦ A new proposal: Inherently Weighted Constraints
 ◦ Both *X and *−X
 ◦ Constraints weighted, subject to normal distribution
 ◦ Derives such systems and encodes typology

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 ◦ Gradient phonotactics can be unnatural
 ◦ Sound change restricted: combinations result in unnatural processes
 ◦ Blurring chain
 ◦ In non-negligible part of unnatural processes Blurring Cycle/Chain more successful than hypercorrection
 ◦ Theoretical implications: a new constraint architecture required
References


Begül, Gábor. 2015a. Post-nasal devoicing as a sound change. Presentation at the 89th Annual LSA Meeting, Portland, OR.

———. 2015b. Intervocalic Devoicing in Kiput and Berawan Dialects. Presentation at the 22nd AFLA, McGill University.


Thank you!

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