Gradient Phonotactics against Naturalness

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Gradient phonotactics

- Two aspects of OT widely discussed: how to handle **naturalness** and **gradience** (Frisch et al. 2004, Antilla 2008, Coetzee and Pater 2008)
- Little has been said about intersection of the two: **unnatural gradient phonotactics**
Gradient phonotactics

- Little has been said about intersection of the two: unnatural gradient phonotactics
- Question: Can gradience be unnatural?
Gradient phonotactics


- Little has been said about intersection of the two: unnatural gradient phonotactics

- **Question:** Can gradience be unnatural?

- Trends in the lexicon that operate in an unnatural direction
Naturalness

- Unnatural phonotactics primarily in light of *surfeit of the stimulus*
- What is “unnatural”? 

- **Natural**: phonetically motivated
- **Unmotivated**: lack phonetic motivations
- **Unnatural**: operating in the opposite direction from universal phonetic tendency

- UPT: phonetic processes motivated by articulatory (or perceptual) mechanisms that passively and universally operate in speech production and are typologically common.
Introduction

Many open questions:

- Are natural alternations possible?
- Restricted $\text{CON}$: some constraints not learnable?

- How unnatural processes arise?
- Is sound change natural (Blust 2005)?
# Outline

1. Introduction

2. Data

3. Background

4. Diachrony

5. Future work
Outline

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Tarma

- Tarma Quechua, a dialect of Quechua spoken in Tarma, Junín, Peru (Adelaar 1977, Puente Baldoceda 1977, Nazarov 2008)
- Distribution of [voice] in [DOR] and [LAB] stops
  - [+voice]: intervocally, post-consonantally, but not post-nasally
Data

- From Adelaar 1977 and Nazarov 2008
  
  \[b, g \, / \, C_{---}; \, C \neq N\]
  
  \[b, g \, / \, V_{---V}\]
  
  \[p, k \, / \, \text{elsewhere}\]

- Examples:

- Lexical variation

  \[
  \begin{array}{c|c}
  \#_{--} & \text{[pirwa]} \\
  ___R, \, T & \text{[rikra]} \\
  N_{--} & \text{[wampu]} \\
  V_{--V} & \text{[kuba]} \\
  R, \, T_{--} & \text{[takba]} \\
  \end{array}
  \]
Data

- From Adelaar 1977 and Nazarov 2008
  
  $b, g / C\ldots; C \neq N$
  
  $b, g / V\ldots V$
  
  $p, k / \text{elsewhere}$

- Examples:
- Lexical variation

| ______ | [pirwa] |
| _______R, T | [rikra] |
| N________ | [wampu] |
| V________V | [kuba] |
| R, T______ | [takba] |
Data

- Distribution of voicing
Data

- Recount (cf. Nazarov 2008) to include non-native vocabulary and statistical tests
- All tokens with [DOR] or [LAB] in TQ vocabulary (Adelaar 1977)
- 1119 tokens: 910 in native vocabulary, 289 in loans from Spanish
Data

Tarma Native

N_  V_V  R_  T_

Variable

Voiced  Voiceless
Data

Tarma Native+Loans

variable
- Voiced
- Voiceless

N_  V_V  R_  T_
Data

- Data was fit to a logistic regression model in R (R Core Team) with `glm()`
- DV: Voice (binominal)
- IV: Context (treatment-coded with intervocalic as the reference level) and Place (treatment-coded with velar as reference level) of articulation with no interactions (native vocabulary)
## Data

|                                | Est.  | SE    | z value | Pr(>|z|) |
|--------------------------------|-------|-------|---------|----------|
| (Intercept)                    | -0.045| 0.172 | -0.260  | 0.7952   |
| V__V vs. R__                   | 2.044 | 0.332 | 6.164   | 0.0000   |
| V__V vs. T__                   | 2.155 | 0.353 | 6.101   | 0.0000   |
| V__V vs. N__                   | -1.884| 0.421 | -4.478  | 0.0000   |
| V__V vs. #__                   | -3.437| 0.407 | -8.437  | 0.0000   |
| labial vs. velar               | -0.502| 0.214 | -2.344  | 0.0191   |
Data

![Graph showing the percentage of voiced sounds by position]

- % voiced
- Position

I N V R T

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Gradient Phonotactics against Naturalness
Data

- *Unnatural distribution of voice feature*
  
  \[
  \begin{align*}
  N__ & < V__V \\
  V__V & < T__ \\
  N__ & < T__
  \end{align*}
  \]

- Same distribution if we include loanwords (without predictor loanword in the model)

- Post-nasally voiced stops universally preferred
  
  (Hayes and Stivers 2000)

- After voiceless stops voiced stops universally dispreferred
  
  (voice disagree)

- Intervocalically, voiced stops universally preferred
Data

- **Unnatural distribution of voice feature**
  
  $\text{N}__ < \text{V}__V$
  
  $\text{V}__V < \text{T}__$
  
  $\text{N}__ < \text{T}__$

- Same distribution if we include loanwords (without predictor loanword in the model)

- Post-nasally voiced stops universally preferred
  
  (Hayes and Stivers 2000)

- After voiceless stops voiced stops universally dispreferred
  
  (voice disagree)

- Intervocally, voiced stops universally preferred

- Trend in the lexicon in the **opposite direction**: favors dispreferred segments
Data

- **Stop-stop clusters**: Only two items with no voicing: [patpatya], [pikpiʃ]
- Reduplication
- bakbaNya, kutbi, lutbi, matga, mutgi, patga, pikpi_, pukba, putga, takba, tikba, tikbi, utga, utgu, witgu, xukbuN
Data

- Post-consonantly voicing after (Nazarov 2008): t, ŧ, ŧs, k, s, f, x, l, ĭ, r, j, w

<table>
<thead>
<tr>
<th>Pre-Tarma</th>
<th>Tarma</th>
<th>Pre-Tarma</th>
<th>Tarma</th>
</tr>
</thead>
<tbody>
<tr>
<td>atška</td>
<td>atšga</td>
<td>mašška</td>
<td>maššga</td>
</tr>
<tr>
<td>atšpa</td>
<td>atšba</td>
<td>arku</td>
<td>argu</td>
</tr>
<tr>
<td>arku</td>
<td>argu</td>
<td>kuška</td>
<td>kušga</td>
</tr>
<tr>
<td>awkis</td>
<td>awgis</td>
<td>lušpi</td>
<td>lušbi</td>
</tr>
<tr>
<td>aypa</td>
<td>ayba</td>
<td>pilpa</td>
<td>pilba</td>
</tr>
<tr>
<td>tšaspu</td>
<td>tšasbu</td>
<td>luxpi</td>
<td>luxbi</td>
</tr>
<tr>
<td>tšilpi</td>
<td>tšilbi</td>
<td>mutki</td>
<td>mutgi</td>
</tr>
<tr>
<td>takpa</td>
<td>takba</td>
<td>tikpa</td>
<td>tikba</td>
</tr>
<tr>
<td>lutpi</td>
<td>lutbi</td>
<td>tikpi</td>
<td>tikbi</td>
</tr>
</tbody>
</table>
Data

□ Another locus of unnaturalness: \(kb, tb, tg\)
□ Intervocalic stop-stop cluster: \(VC_1C_2V\) when \(C_2 = [b]\) or \([g]\)

\[
\begin{array}{cccc}
\text{TT} & \text{TD} & \text{DT} & \text{DD} \\
17 & 69 & 0 & 0 \\
\end{array}
\]

Native only:

\[
\begin{array}{cccc}
\text{TT} & \text{TD} & \text{DT} & \text{DD} \\
11 & 68 & 0 & 0 \\
\end{array}
\]

□ Clusters that agree in voice preferred
□ Pre-voicing preferred
□ Tarma Quechua gradience in the opposite direction
□ Less voice in second member clusters with first \(T\) \((\beta = 1.8, z = 5.6, p < 0.0001)\)
Data

- Phonetically real
- Traces of productivity
atbi
atbi
[ukba]

akba

Time (s)
88.52 88.78
0

Frequency (Hz)
129.8
0
5000

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22 / 80
[ukba]
[asba]

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Gradient Phonotactics against Naturalness

[asba]
[axbi]
Gradient Phonotactics against Naturalness
[ampa]

![ampa waveform](image)

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Gradient Phonotactics against Naturalness
[aŋka]
Tarma

- Traces of productivity
- Loanwords

<table>
<thead>
<tr>
<th>Spanish</th>
<th>Tarma</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>cuculi</td>
<td>kuguliː</td>
<td>white-winged dove</td>
</tr>
<tr>
<td>cotpe</td>
<td>kutbi</td>
<td>an animal from mount.</td>
</tr>
<tr>
<td>sauco</td>
<td>sawgu</td>
<td>magic tree</td>
</tr>
<tr>
<td>vaca</td>
<td>waːɡa</td>
<td>cow</td>
</tr>
<tr>
<td>taruga</td>
<td>taruka</td>
<td>deer’</td>
</tr>
<tr>
<td>dios se lo pague</td>
<td>yusulpaːki</td>
<td>thank you</td>
</tr>
</tbody>
</table>
# Tarma

- **Traces of productivity**
- **Loanwords**

<table>
<thead>
<tr>
<th>Spanish</th>
<th>Tarma</th>
<th>gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>cuculi</td>
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<tr>
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<td>taruka</td>
<td>deer’</td>
</tr>
<tr>
<td>dios se lo</td>
<td>yusulpa:</td>
<td>thank you</td>
</tr>
<tr>
<td>pague</td>
<td>ki</td>
<td></td>
</tr>
</tbody>
</table>

- **Note that devoicing was never a sound change in TQ**
Tarma

- Morphophonological alternation (Creider 1968:12-13)
  - -ba -pa genitive
  - -bax -pax purposive
  - -bita -pita procedentive
  - -bis -pis ‘even, too’

(1) a. wawxi-gi-ba wayi-n
   ‘the house of your brother’
 b. wayi-n-pa pasa-jun
   ‘we’re going to walk by way of his house’
 c. tamya-ya-n nuqa-ntʃik-baq
   ‘it is raining now for us’
Tarma

- Morphophonological alternation (Creider 1968:12-13)
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  - bax - pax  purposive
  - bita - pita  procedentive
  - bis - pis  ‘even, too’

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   ‘we’re going to walk by way of his house’

  c. tamya-ya-n nuqa-ntʃik-baq
   ‘it is raining now for us’

- Limited to some suffixes: -guna, -bura, -gama, and -gasga
  show no alternation
Interim summary

Tarma Native

variable

Voiced
Voiceless
Interim summary

- Significant unnatural trend in the lexicon
- Unnatural gradient phonotactic restriction
- Traces of productivity in morphophonology
Berawan

- Restriction against [+voice] in V__V
- Significant trend in the lexicon: full contrast in [voice] initially, intervocalically the natural element dispreferred
- Voicing intervocalically (Westbury and Keating 1986)
Intervocalic Devoicing

- Intervocalic (or postvocalic) **voicing** is common

  \[ T > D / V_\_ (V) \]

- Articulation

  Keating (1986)
  Kaplan (2010), Steriade (2010)

- Very common sound change

- The most frequent type of lenition (alongside spirantization, approximatization and others)

  Kaplan (2010)

- 26 of 153 languages have intervocalic lenition

Berawan

- Analysis of the lexicon in Burkhardt (2014)
- Counts of occurrence: initial, intervocalic
Berawan

- Labial

<table>
<thead>
<tr>
<th>dialect</th>
<th>voiceless</th>
<th>voiced</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#__</td>
<td>V__V</td>
</tr>
<tr>
<td>Batu Belah</td>
<td>52</td>
<td>10</td>
</tr>
<tr>
<td>Long Teru</td>
<td>46</td>
<td>13</td>
</tr>
<tr>
<td>Long Jegan</td>
<td>49</td>
<td>10</td>
</tr>
<tr>
<td>Long Terawan</td>
<td>41</td>
<td>11</td>
</tr>
</tbody>
</table>
## Berawan

### Alveolar

<table>
<thead>
<tr>
<th>dialect</th>
<th>voiceless</th>
<th>voiced</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#_</td>
<td>V__V</td>
</tr>
<tr>
<td>Batu Belah</td>
<td>56 32</td>
<td>22 4</td>
</tr>
<tr>
<td>Long Teru</td>
<td>54 31</td>
<td>22 2</td>
</tr>
<tr>
<td>Long Jegan</td>
<td>55 32</td>
<td>22 3</td>
</tr>
<tr>
<td>Long Terawan</td>
<td>60 25</td>
<td>21 3</td>
</tr>
</tbody>
</table>

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Gradient Phonotactics against Naturalness
Berawan

- Velar

<table>
<thead>
<tr>
<th>dialect</th>
<th>voiceless</th>
<th>voiced</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#  V__V</td>
<td>#  V__V</td>
</tr>
<tr>
<td>Batu Belah</td>
<td>43 54</td>
<td>13 0</td>
</tr>
<tr>
<td>Long Teru</td>
<td>40 55</td>
<td>11 1</td>
</tr>
<tr>
<td>Long Jegan</td>
<td>44 58</td>
<td>10 0</td>
</tr>
<tr>
<td>Long Terawan</td>
<td>50 19</td>
<td>14 0</td>
</tr>
</tbody>
</table>
Data

Berawan

- BB
- LJ
- LTn
- LTu

Voice
- Voiced
- Voiceless

Introduction
Data Background
Diachrony
Future work
Data

- Data was fit to a logistic regression model in R (R Core Team) with `glm()` and `brglm()` from `brglm` package.
- DV: Voice (binomial)
- IV: Context (treatment-coded with initial as the reference level) and Place (treatment-coded with velar as reference level) of articulation with no interactions (native vocabulary).
## Data

Est. | z score | Pr(>|z|)  
---|---|---  
BB | -1.773 | -3.906 | 0.0001  
LTu | -2.028 | -4.139 | 0.0000  
LJ | -1.898 | -3.860 | 0.0001  
LTn | -1.893 | -3.479 | 0.0005
Data

- Productivity: loanwords
- Brunei Malay [pəsigupan] > Pre-Berawan *səgupan > BB [səkupen]
- Brunei Malay sigup > Pre-Berawan *sigup > BB [sigup]
Data

Berawan

<table>
<thead>
<tr>
<th>BB</th>
<th>LJ</th>
<th>LTn</th>
<th>LTu</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td>V</td>
<td>#</td>
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- voice
- voiced
- voiceless

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Gradient Phonotactics against Naturalness
Data

- Significant unnatural trend in the lexicon
- Unnatural gradient phonotactic restriction against voiced stops intervocally
How did Berawan and Tarma Quechua phonotactics arise?
# Outline

1. Introduction
2. Data
3. Background
4. Diachrony
5. Future work
Models

- Blurring process
- \( A > B / X = \text{UPT} \)
- How do we get \( B > A / X \)
- Can sound change be unnatural (Blust 2005): Berawan data results from a single sound change

**BLURRING CYCLE**
B > C / −X
B > A
C > B
Models

- Blurring process
- $A > B / X = UPT$
- How do we get $B > A / X$
- Can sound change be unnatural (Blust 2005): Berawan data results from a single sound change

**Blurring cycle**

$B > C / \overline{-X}$

$B > A$

$C > B$

**Blurring chain**

$B > C / X$

$C > D$

$D > A$
Blurring Process

- Post-nasal devoicing (Dickens 1984), Hyman (2001)
- In all twelve cases in which PND is reported as a sound change or synchronic alternation, it arises though a combination of 3 sound changes

<table>
<thead>
<tr>
<th>Blurring Cycle</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>D &gt; Z / [−nas]</td>
<td>Avestan band dasa</td>
</tr>
<tr>
<td>D &gt; T</td>
<td>Sogdian βand ūasa</td>
</tr>
<tr>
<td>Z &gt; D</td>
<td>Yaghnobi vant *ūasa</td>
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<td>Yaghnobi vant *ūasa</td>
</tr>
</tbody>
</table>

Example

Avestan band dasa
Sogdian βand ūasa
Yaghnobi vant *ūasa
Yaghnobi vant das
Blurring Process

- **Blurring Process**
- A historical model for explaining unnatural phenomena
- Addition to current strategies (hypercorrection)
  - (a) A set of segments enters complementary distribution
  - (b) A sound change occurs that operates on the changed/unchanged subset of those segments
  - (c) Another sound change occurs that blurs the original complementary distribution
Outline

1. Introduction
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Berawan

Berawan

BG

LJ

LTn

LTu

voice
voiced
voiceless

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Gradient Phonotactics against Naturalness
Berawan dialects

- g (from r) > k / V__V

  *bigiu > bikiw
  *gigiəq > giki?
  *magi > maki
  *igiəŋ > ikiŋ
  *ugat > ikit
Berawan dialects

- \( g \text{ (from } \mathcal{R}) > k / V_{\_}\_V \)
  - *bigiu > bikiw
  - *gigiʔ > gikiʔ
  - *magi > maki
  - *igiʔ > ikịʔ
  - *ugat > ikit
Berawan dialects

- **g (from r)** > k / V__V
  
  - *bigiu* > bikiw
  - *gigiŋ* > gikiŋ?
  - *magi* > maki
  - *igiŋ* > ikiŋ
  - *ugat* > ikit

- **b** > k / V__V
  
  - *abiŋ* > akiŋ
  - *bibi* > biki
  - *bəlibiəw* > bəlikiəw
  - *bibuy* > bikuy
  - *dibiŋ* > dikin
Berawan dialects

- **g (from *r*) > k / V__V**
  - *bigiu > bikiw*
  - *gigiəq > giki?
  - *magi > maki*
  - *igiəŋ > ikιŋ*
  - *ugat > ikιt*

- **b > k / V__V**
  - *abiəŋ > akiŋ*
  - *bibi > biki*
  - *baliibiəw > balikiəw*
  - *bibuy > bikuy*
  - *dibiən > dikιn*
Long Terawan

- Word-initially, stops remain voiced
  
  *gəm  >  gəm
  *gigun  >  gikuŋ
  *gimot  >  gimok
  *gitaq  >  gitaʔ
  *bitok  >  bitok
  *buliœn  >  bulin
  *busak  >  busek
  *buttan  >  buten
Long Terawan

Word-initially, stops remain voiced

\[
\begin{align*}
*gëm & \rightarrow \ gëm \\
*gigun & \rightarrow \ gikuŋ \\
*gimot & \rightarrow \ gimok \\
*gitaq & \rightarrow \ gita? \\
*bitok & \rightarrow \ bitok \\
*buliən & \rightarrow \ bulin \\
*busak & \rightarrow \ busek \\
*buttan & \rightarrow \ buten
\end{align*}
\]
Crucial problem

* $b > k \ / \ V__V$

Scenario 1  Scenario 2
1. $b > p$  $b > g$
2. $p > k$  $g > k$

Problem: if devoicing occurs before change of place, why no change of the original *p?
Crucial problem

- \( *b > k / V__V \)

**Scenario 1**
1. \( b > p \)
2. \( p > k \)

**Scenario 2**
1. \( b > g \)
2. \( g > k \)

Problem: if devoicing occurs before change of place, why no change of the original *p?

*hapuy > apuy, not **akuy
Crucial problem

- $b > k / V__V$

  **Scenario 1**
  1. $b > p$
  2. $p > k$

  **Scenario 2**
  1. $b > g$
  2. $g > k$

- Problem: if devoicing occurs before change of place, why no change of the original *p?  
  *hapuy > apuy, not **akuy

- If change of place first, why only word-internally?
Berawan dialects (Blust 2005)

- Berawan stops

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>*b</td>
<td>b</td>
<td>k</td>
</tr>
<tr>
<td>*d</td>
<td>d</td>
<td>r</td>
</tr>
<tr>
<td>*g</td>
<td>g</td>
<td>k</td>
</tr>
</tbody>
</table>
Berawan dialects (Blust 2005)

- Berawan stops

\[
D > T / V \ldots V
\]

\[
\begin{array}{ccc}
\# & V & V \\
*b & b & k \\
*d & d & r \\
*g & g & k \\
\end{array}
\]
Berawan dialects (Blust 2005)

- Berawan stops

$$D > T / V \_\_V$$

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>*b</td>
<td>b</td>
<td>k</td>
</tr>
<tr>
<td>*d</td>
<td>d</td>
<td>r</td>
</tr>
<tr>
<td>*g</td>
<td>g</td>
<td>k</td>
</tr>
</tbody>
</table>
Berawan dialects (Blust 2005)

- Blurring chain

<table>
<thead>
<tr>
<th>BLURRING CHAIN</th>
<th>Berawan</th>
</tr>
</thead>
<tbody>
<tr>
<td>B &gt; C / X</td>
<td>D &gt; Z / V__V</td>
</tr>
<tr>
<td>C &gt; D</td>
<td>Z &gt; S</td>
</tr>
<tr>
<td>D &gt; A</td>
<td>S &gt; T</td>
</tr>
</tbody>
</table>
Berawan dialects

- Berawan stops: stage 1

<table>
<thead>
<tr>
<th>Pre-Berawan</th>
<th>Berawan</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>b β</td>
</tr>
<tr>
<td>d</td>
<td>d ɽ</td>
</tr>
<tr>
<td>g</td>
<td>g γ</td>
</tr>
</tbody>
</table>
Berawan dialects

- Berawan stops: stage 1a

<table>
<thead>
<tr>
<th>Pre-Berawan</th>
<th>Berawan</th>
</tr>
</thead>
<tbody>
<tr>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>d</td>
<td>d</td>
</tr>
<tr>
<td>g</td>
<td>g</td>
</tr>
<tr>
<td></td>
<td>β</td>
</tr>
<tr>
<td></td>
<td>r</td>
</tr>
<tr>
<td></td>
<td>γ</td>
</tr>
</tbody>
</table>
Berawan dialects

- Berawan stops: stage 2

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>#_ V_V</td>
<td>b _ b_</td>
</tr>
<tr>
<td>b</td>
<td>b _ <em>b</em></td>
</tr>
<tr>
<td>d</td>
<td>d _ d_</td>
</tr>
<tr>
<td>g</td>
<td>g _ x_</td>
</tr>
</tbody>
</table>
## Berawan dialects

- **Berawan stops: stage 3**

<table>
<thead>
<tr>
<th>Pre-Berawan</th>
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</tr>
</thead>
<tbody>
<tr>
<td>#_</td>
<td>V_V</td>
</tr>
<tr>
<td>b</td>
<td>b x</td>
</tr>
<tr>
<td>d</td>
<td>d r</td>
</tr>
<tr>
<td>g</td>
<td>g x</td>
</tr>
</tbody>
</table>
Berawan dialects

- Berawan stops: stage 4

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>#_ V_V</td>
<td>b k</td>
</tr>
<tr>
<td>b</td>
<td>b k</td>
</tr>
<tr>
<td>d</td>
<td>d r</td>
</tr>
<tr>
<td>g</td>
<td>g k</td>
</tr>
</tbody>
</table>
Phonetics

- *babuj > *bibuj > *biϕuj > *bixuj > [bikuj]
- Explains dissymmetry: alveolar — labial, velar
- Solves the chronology problem

**Scenario 1**
1. b > p
2. p > k

**Scenario 2**
1. b > g
2. g > k

- Better motivates change of place: [ϕ] > [x] easier to motivate than [b] > [g]
- Natural sound changes
Explanation

**BLURRING CHAIN**

- B > C / X
- C > D
- D > A

**Tarma Quechua**

- T > S / [−nas, −#][−cons]
- S > Z
- Z > D
Explanation

Tarma Native

variable

Voiced
Voiceless

N_  V_V  R_  T_
0%  25%  50%  75%  100%
Explanation

- $T > S / [−nas,−#]_−[−cons]$
  - *aptay $> [hax^w_tay]$
  - *upyay $> [uxyay]$
  - *paki $> *p^h_aki >$ Imbabura Quechua [faki]
  - Voiced stops still surface as fricatives

- $S > Z / V _-$
  - Voicing of fricatives prevocally is a common change
    - *cops amagats [bz]*
    - $<uxδa-> [uxδa-] < *uxθa- < *ukt^h_a-$

- $Z > D$
  - Not categorical: voiced stops still surface as fricatives
  - Variation in voiceless series: [φlawta], [plauta] (Puente Baldoceda 1977)
Explanation

Tarma Native

variable

<table>
<thead>
<tr>
<th></th>
<th>Voiced</th>
<th>Voiceless</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>25%</td>
<td>75%</td>
</tr>
<tr>
<td>V</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>R</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>T</td>
<td>100%</td>
<td>0%</td>
</tr>
</tbody>
</table>
Phonetics

- Stops surface as fricatives (apparent free variation)
[atbi]
This strongly suggests that there was a stage in the development with **voiced fricatives**.

Occlusion to stops not operated categorically.
Implications of the new historical explanation

- One of rare reported cases of unnatural sound change explained as a combination of sound changes
- Allows us to maintain the long-held position that sound change is always natural
- Alternative historical device for explaining unnatural sound changes (cf. hypercorrection, Ohala 1993)
- Typology within Channel Bias
Outline

1. Introduction
2. Data
3. Background
4. Diachrony
5. Future work
Future work

- Where to go from here?
- *Harmony* (HG) $\rightarrow$ probability, but given richness of the base, we cannot derive a system in which the unnatural element is more frequent
Future work

- Where to go from here?
- *Harmony* (HG) $\rightarrow$ probability, but given richness of the base, we cannot derive a system in which the unnatural element is more frequent
- Grounds for experimental data
Conclusion

- Gradient phonotactic restrictions *can* be unnatural
- Significant unnatural trends in the lexicon with traces of productivity
- A new historical device to explain unnatural phenomena (blurring process)
References

Beguš, Gašper. 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.
References


References


References


References


Thank you!

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