(Dis)Agreement by (Non)Correspondence
Inspecting the Foundations

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Outline

1 Agreement vs. Correspondence
   - Essentials of ABC
   - Agreement
   - Correspondence

2 Rethinking correspondence
   - Projections
   - Correspondence sets vs. projections

3 The “C” of ABC: Weaknesses
   - All-purposeness of $R$
   - Transitivity of $R$
   - Transitivity + all-purposeness

4 Conclusions
Deconstructing ABC: “A” vs. “C”

Agreement by Correspondence

as a model developed for long-distance consonant agreement (LDCA) phenomena (Walker 2000a,b, 2001; Rose and Walker 2000, 2004; Hansson 2001; Bennett 2013, etc.)

Agreement...

- a set of general (not very formalism-specific) claims:
  - LDCA is driven by constraints demanding featural agreement (≈ AGREE[F])
  - not by constraints that demand spreading (SPREAD[F], ALIGN[F])
  - agreement is sensitive to, and brought on by, similarity (shared features)

Similarity-based agreement constraints can be formalized in various ways—not necessarily involving a correspondence relation in the ABC sense
Deconstructing ABC: “A” vs. “C”

...by Correspondence

- specific formal architecture
- central idea: connection between similarity (conditioning factor) and agreement (target configuration) is **mediated**, not direct
  - “middle man” is an abstract structural relation, $\mathcal{R}$ (surface correspondence)

**Correspondence relation as mediator**

- similarity $\rightarrow \mathcal{R}$ (CORR constraints)
- $\mathcal{R} \rightarrow$ agreement (CC-IDENT[F] constraints)
Agreement with or without Correspondence

- Similarity-based agreement, schematically
  - \( P = x \) and \( y \) agree in \([G, \ldots]\) (the similarity condition)
  - \( Q = x \) and \( y \) agree in \([F]\) (the harmony imperative)
- \( P \rightarrow Q \) (logical implication)
  - “if \( P \) holds, then \( Q \) holds as well”

Example: Laryngeal harmony in homorganic stops

- \( P = x \) and \( y \) agree in \([\text{son, cont, Place}]\)
- \( Q = x \) and \( y \) agree in \([\text{constr.gl.}]\)
- \( P \rightarrow Q \)
Example: Laryngeal harmony in homorganic stops

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- \( P \rightarrow Q \)

“Pure” agreement as well-formedness

- ban against \((P \& \neg Q)\) encapsulated in a single constraint
- for analogous examples, see e.g. Pulleyblank (2002)

\[ \text{AGREE}[\alpha\text{son},\beta\text{cont},\gamma\text{Place}] \]

\[
P \xrightarrow{\text{AGREE}[\alpha\text{son},\beta\text{cont},\gamma\text{Place}]} Q
\]
Agreement with or without Correspondence

Example: Laryngeal harmony in homorganic stops

- **P** = \( x \) and \( y \) agree in [son, cont, Place]
- **Q** = \( x \) and \( y \) agree in [constr.gl.]
- **R** = \( x \mathrel{\Box} y \) (the correspondence relation)

Agreement by correspondence

- ban against \((P \& \neg Q)\) by combination of two separate constraints
- if \( P \) then \( R; \ P \rightarrow R \) (= CORR)
- if \( R \) then \( Q; \ R \rightarrow Q \) (= CC-IDENT)

- CORR-[\( \alpha \)son,\( \beta \)cont,\( \gamma \)Place]
- CC-IDENT[c.g.]

\[
P \xrightarrow{\text{CORR-[\( \alpha \)son,\( \beta \)cont,\( \gamma \)Place]}} R \xrightarrow{\text{CC-IDENT[c.g.]} } Q
\]
ABC: Apportioning credit

How much is due to the “A” alone vs. to the “C” machinery?

Agreement gets us…

- inertness of intervening material (typically)
  - general absence of blocking effects

- **dissimilation** as alternative repair (Bennett 2013)
  - (with some limitations)

- **spreading** as alternative repair (Hansson 2010)
  - with possibility of blocking effects
  - and with profile distinct from other spreading processes
Agreement-driven dissimilation: Minding your Ps and Qs

Example: Laryngeal harmony in homorganic stops

- $P = x$ and $y$ agree in [son, cont, Place]
- $Q = x$ and $y$ agree in [constr.gl.]
- $P \rightarrow Q$

- Prohibited structure: $(P \& \neg Q)$
- Two conceivable repairs
  - change $\neg Q$ to $Q$ (assimilation)
  - change $P$ to $\neg P$ (dissimilation)
ABC: Apportioning credit

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  - with possibility of blocking effects
  - and with profile distinct from other spreading processes
Agreement-driven spreading: Ends and means

- **Agreement** is a well-formedness **target** (an “end”)
  - encoded in some Markedness constraint (AGREE[F], CC-IDENT[F])
  - can be achieved in multiple ways (“homogeneity of target, heterogeneity of process”)
- **Spreading** is a type of **process** (a “means”)
  - (strictly local) feature spreading/sharing/extension/etc. is one way of getting $C_1 \ldots C_2$ to agree in [F]
  - can emerge as the sole permitted repair strategy (in a given language)
  - no gapped structures assumed; spreading feature affects interveners too
- Profile of “agreement by spreading” (Hansson 2010)
  - susceptible to **blocking** (incompatible interveners)
  - spreading is **not myopic** (cf. Wilson 2006 on unbounded spreading); [F] does not spread up to blocker
  - spreading is **economical**; [F] does not continue past agreement target
- No time to go into details here; see Hansson (2010) for discussion and attested examples
ABC: Apportioning credit

How much is due to the “A” alone vs. to the “C” machinery?

Correspondence gives us…

- Constraint families already needed elsewhere (IDENT, mostly)
  - but many are missing/incompatible (MAX, DEP, LINEARITY, UNIFORMITY, CONTIGUITY, …)
  - or lack counterparts elsewhere (CC-SYLLADJ, CC-EDGE)

- A correspondence relation $\mathcal{R}$ that is
  - transitive (Bennett 2013); much more on this later
  - all-purpose (not sound-pattern-specific)
    - established by any CORR constraint
    - accessed by all CC-Limiter constraints
  - established on segment-by-segment basis, and by ranked + violable constraints other than the agreement imperative itself
    - individual (occurrences of) segments can opportunistically opt out of the harmonic class
Correspondence sets vs. autosegmental tiers: Advantages

Many advantages of correspondence sets over tiers as defined by autosegmental (feature-geometric) representations:

- **Any natural class** can in principle define a correspondence set
  - multiple, intersecting possibilities for classes
    - sibilants; same-voicing sibilants, same-voicing same-manner sibilants; same-voicing consonants; same-voicing homorganic consonants; etc.
  - no single feature geometry can accommodate all of these as tier-defined subsequences

- Loose relationship between agreement feature \([F]\) and set of conditioning (shared) features
  - e.g. laryngeal harmony in all homorganic stops vs. in all stops

- No reliance on underspecification (contrastive or radical)
  - inert intervener can carry contrastive and marked value for \([F]\) (contra Vaux 1999; Nevins 2005, 2010; see Hansson 2010 for examples)
Correspondence sets vs. autosegmental tiers: Disadvantages

But also some disadvantages in that comparison:

- Correspondence sets are **sets**, not tier-like **(sub)sequences**
  - but behave more like the latter in most (all?) relevant respects
  - pathologies arise if not treated as such

- A **single, all-purpose** partition into correspondence sets, which every agreement constraint references
  - weak (if any) empirical support for such “process-neutrality”
  - problematic cases attested

- Membership in correspondence set is **negotiable** (segment-token by segment-token)
  - due to ranked and violable nature of CORR-\([F, G, \ldots]\) constraints
  - weak (if any) empirical support for this
“Tiers” redux: Projections

Projection

Any well-defined class of segments defines (projects) a subsequence of the output string, consisting of all and only the segments belonging to that class

- e.g. the subsequence of a string $S$ which results from “removing” all non-members of the natural class $[+F, -G, +H]$ from $S$

Example

- $S = tʃuzines$
- Some projections of $S$:
  - $[\alpha\text{Place}]$ $tʃ...z...n...s$
  - $[+\text{strid}]$ $tʃ...z...s$
  - $[+\text{strid, }\alpha\text{voi}]$ $tʃ...s$
  - $z$
  - $[+\text{strid, }\alpha\text{cont}]$ $z...s$
  - $[+\text{strid, }\alpha\text{cont}]$ $tʃ$
  - $tʃ$
  - $(etc.)$
Agreement by projection?

A modest proposal

- Individual agreement constraints single out (stipulate) a particular projection on which they are to be evaluated
  - and “disagreement” constraints? (≈ OCP[F], pace Bennett 2013; cf. Pulleyblank 2002)

- Agreement (disagreement) is evaluated for pairs of segments that are adjacent on the prescribed projection

- Closely related to the “tier” notion in the Tier-based Strictly Local (TSL) class in formal language theory (Heinz et al. 2011; cf. Kevin McMullin’s talk today)
  - in effect, each (dis)agreement constraint references a TSL₂ language
  - the reference tier varies from constraint to constraint
“ABP” vs. ABC

- Projection-based agreement ("ABP"?)
  - conflates the work of (high-ranked) CORR constraints and CC-IDENT[F] into a single constraint

**Example**

<table>
<thead>
<tr>
<th>* [-F] [+ F] [αG, βH]</th>
<th>≈</th>
<th>CC-IDENT[F]</th>
<th>(or C_R C_L - IDENT[ + F])</th>
</tr>
</thead>
<tbody>
<tr>
<td>* [-F] [+ F] [...]</td>
<td>≈</td>
<td>CORR-[αG, βH]</td>
<td></td>
</tr>
<tr>
<td>* [...] [...] [αG, βH]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Comparing scenarios

“ABP”

*[-F][ + F][αG, βH]
| IO-IDENT[F]

*[-F][ + F][αG, βH]
| IO-IDENT[F]
| *

ABC

{ CC-IDENT[F], CORR-[αG, βH] }
| IO-IDENT[F]

{ CC-IDENT[F], CORR-[αG, βH] }
| IO-IDENT[F]
| CORR-[αG]
What is $\mathcal{R}$?

- Arguably the most formally coherent definition (see Bennett 2013):
  - $\mathcal{R}$ is an equivalence relation

**Properties of $\mathcal{R}$**

- reflexive ($x \mathcal{R} x$)
- symmetric (if $x \mathcal{R} y$, then $y \mathcal{R} x$)
- transitive (if $x \mathcal{R} y$ and $y \mathcal{R} z$ then $x \mathcal{R} z$)

$\mathcal{R}$ defines a **partition** of the set of segments contained in the output string into non-overlapping, non-empty subsets: correspondence sets
  - within each such correspondence set, every member is a correspondent of every member, including itself
Excursus: Strings vs. sets

String

A string is a finite totally ordered (multi)set. We can define an output string $S$ as the pairing $(\text{Seg}, \prec)$, where Seg is the (multi)set of output segments that occur in $S$ and $\prec$ is the (strict) linear precedence relation.

Example

- $S = \text{souʃəлизəʃən}$
- $\text{Seg} = \{s, \ʃ, \ʃ, z, l, n, i, ei, ou, æ, ə\}$
- $\prec = \{(s,ou), (s,ʃ), (s,n), (ʃ,z), (z,ʃ), \ldots\}$

- The correspondence relation $\mathcal{R}$ is a relation on Seg, not on $S$ as such
  - defines a partition of Seg into equivalence classes
Correspondence sets

**Correspondence set**

Let $S$ be an output string of length $k$, and let $Seg$ be the (multi)set of $k$ output segments (occurrences) contained in $S$. Then $C \subseteq Seg$ is a **correspondence set** iff for any pair of segments $x, y \in C$, it is the case that $x \mathcal{R} y$. In other words, $C$ is a correspondence set if it is one of the **equivalence classes** that the relation $\mathcal{R}$ partitions $Seg$ into.

- Bennett (2013) uses the term “correspondence class” for this notion.

**Example**

- $S = s_xou_yl_xe_zyze_l_xe_yzn_z$
- The correspondence sets for $S$ (exhaustive list):
  - $\{ s, \}$
  - $\{ ou, e, i, ei, e \}$
  - $\{ l, n \}$
  - $\{ z \}$
Correspondence sets and string-based relations

- The correspondence sets defined by $\mathcal{R}$ are unordered **sets**: subsets of $\text{Seg}$, not subsequences of $S$
- Corollary of $\mathcal{R}$ being defined as an **equivalence relation**
  - reflexivity, symmetry, transitivity
- Reference to **non**-symmetric, **non**-reflexive or **non**-transitive relations among members of a correspondence set (e.g. linear precedence, within-set “adjacency”) must be made **indirectly**

Definitions of CC-Limiter constraints must often include conditions in terms of relations **other** than $\mathcal{R}$
- weakens the parallel with other correspondence dimensions (IO, BR)
- makes “correspondence sets” less like (sub)sets and more like (sub)sequences ( = **projections**!)
Remainder of talk

- Identifying and illustrating some problematic properties of the correspondence notion
  - pathological consequences (some with stipulative fixes, others with no obvious solution)
  - weak empirical support

- The sore points
  - all-purposeness of $R$
  - transitivity of $R$
  - violability of $R$ (as such) — not covered here
All-purposeness of $R$

- Fundamental ingredient of ABC: a **single, all-purpose** $R$ relation, regardless of which CORR constraint is imposing it.
  - $R_{\text{CORR}[-F,...]} = R_{\text{CORR}[G,...]}$
  - CC-Limiter constraints (e.g. CC-IDENT) cannot be sensitive to **which** set of shared features brings $C_1$ and $C_2$ into correspondence
- Certain things that only CC-Limiter constraints can reference (not CORR constraints), such as **linear order**
  - $C_R C_L$-IDENT[$+F$] vs. $C_R C_L$-IDENT[$-F$]
  - prohibit $[-F]_x ... [+F]_x$ and $[+F]_x ... [-F]_x$, respectively

**Intractable cases**

- Impossible to selectively **prevent** harmony for a specific **combination** of similarity criterion (set of shared features) and linear-order configuration
  - not a problem for “ABP”: each agreement constraint is such a combination (and can be demoted as needed)
Similarity and linear order: Kiga sibilant harmony

- (Ru)Kiga: regressive sibilant harmony in $[\pm$ anterior] (Hyman 1999; Hansson 2001; cf. Bennett and Pulleyblank’s talk later today)

- Linear-order asymmetry emerges (*$[+\text{ant}]...[-\text{ant}]$ vs. $\checkmark [-\text{ant}]...[+\text{ant}]$)
  - but only for different-voicing pairs, not same-voicing pairs
  - (same goes for long-range vs. transvocalic pairs, incidentally)

<table>
<thead>
<tr>
<th></th>
<th>$[+\text{strid}, \alpha\text{voi}]$</th>
<th>$[+\text{strid}, \alpha\text{voi}]$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$[+\text{ant}]...[-\text{ant}]$</td>
<td>harmony</td>
<td>harmony</td>
</tr>
<tr>
<td>$[-\text{ant}]...[+\text{ant}]$</td>
<td>harmony</td>
<td>no harmony</td>
</tr>
</tbody>
</table>
Similarity and linear order: Kiga sibilant harmony

- Harmony not enforced in different-voicing [-ant]...[ + ant] sequences (Taylor 1959)

  - -ʃanzire ‘spread out (perf.)’
  - -ʃáːzja ‘bully; leave over’
  - aka-ʃúzi ‘bug’
  - omw-eʃezi ‘cattle-waterer’

<table>
<thead>
<tr>
<th></th>
<th>CORR-[ + strid, αvoi]</th>
<th>CORR-[ + strid]</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRCL-IDENT[-ant]</td>
<td>[ + ant]...[-ant]</td>
<td>harmony</td>
</tr>
<tr>
<td>CRCL-IDENT[ + ant]</td>
<td>[-ant]...[ + ant]</td>
<td>harmony</td>
</tr>
</tbody>
</table>

- Neither CORR-[ + strid] nor CRCL-IDENT[-ant] can be demoted below IO-FAITH without collateral damage
  - dismantling harmony in the adjoining cell as well
Kiga sibilant harmony: Ranking paradox

Evidence from same-voicing [–ant][+ ant] pairs:

<table>
<thead>
<tr>
<th>/ʃ...s/</th>
<th>CRCL-ID[ + ant]</th>
<th>CORR-[ + str]</th>
<th>IO-IDENT[ + ant]</th>
<th>IO-IDENT[–ant]</th>
</tr>
</thead>
<tbody>
<tr>
<td>s_x...s_x</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>~ s_x...s_x</td>
<td><strong>W</strong></td>
<td></td>
<td></td>
<td><strong>L</strong></td>
</tr>
</tbody>
</table>

Evidence from different-voicing [+ ant][–ant] pairs:

<table>
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<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>s_x...ʒ_x</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>~ s...ʒ</td>
<td><strong>W</strong></td>
<td><strong>L</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Winner for /ʃ...z/ needs to be either [ʃ_x...z_y] or [ʃ_x...z_x]

<table>
<thead>
<tr>
<th>/ʃ...z/</th>
<th>CRCL-ID[ + ant]</th>
<th>CORR-[ + str]</th>
<th>IO-ID[ + ant]</th>
<th>IO-ID[–ant]</th>
</tr>
</thead>
<tbody>
<tr>
<td>s_x...z_x</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>~ s_x...z_x</td>
<td><strong>L</strong></td>
<td></td>
<td></td>
<td><strong>W</strong></td>
</tr>
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<tr>
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<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>~ s_x...z_x</td>
<td><strong>L</strong></td>
<td><strong>W</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Correspondence sets are not (sub)sequences

- A **correspondence set**, as defined by transitive $\mathcal{R}$, is a **set**
  - each member is a correspondent of each other member
  - each pairing of correspondents should be subject to evaluation by CC-Limiter constraints

- A subsequence—such as a **projection**—is a **string**
  - **adjacency** is an inherent notion (i.e. adjacency in that subsequence)
  - **no a priori** reason to expect interaction between non-adjacent segments
Transitive $\mathcal{R}$ must be curtailed

- Problems with unrestricted transitive $\mathcal{R}$
  - combinatorics of CC-Limiter evaluation
  - wrong predictions for transvocalic/syllable-adjacent agreement
  - “solution”: make CC-Limiter definitions more restrictive

- Problems with making $\mathcal{R}$ non-transitive
  - combinatorial explosion of hypothesis space (correspondence configurations)
  - stipulating restrictions creates other pathological predictions
Transitivity of $\mathcal{R}$: Combinatorics

- With transitive $\mathcal{R}$, the number of correspondent pairs to evaluate grows **quadratically** in the size of the correspondence set
  - number of pairs in set of $n$ elements: $\binom{n}{2} = \frac{n(n-1)}{2}$
- With subsequences (projections), the number of relevant (i.e. adjacent) pairs grows **linearly** in the length of the subsequence
  - number of adjacent pairs in subsequence of $n$ elements: $n - 1$

![Graph showing the relationship between length of correspondence chain and number of C-C pairs to evaluate]
The problem with quadratic constraints

Heinz et al. (2005) on undesirable properties of quadratic constraints (e.g. gradient ALIGN)

- Constraints whose number of (potential) violations grows quadratically with the length of a word
  - make various anomalous predictions (Eisner 1997; McCarthy 2003)
  - are categorically more powerful than most other constraints that phonologists employ
  - are formally too complex to compute optimization over (with any of the current proposals for doing so; see Riggle 2004)
“Adjacency” and CC-IDENT[F]

- For pathologies arising from global-pair (vs. “adjacent”-pair) evaluation of CC-IDENT[F], see Hansson (2007)
  - majority-rule effects of certain kinds
  - parity (odd vs. even cardinality of correspondence set) starts to matter

CC-IDENT[F] (simplified from Hansson 2007)

Let X and Y be segments in the output, such that

1. $X \mathrel{\mathcal{R}} Y$; and
2. there exists no segment Z in the output such that $X \prec Z \prec Y$ and $X \mathrel{\mathcal{R}} Z$.

If X is $[\alpha F]$, then Y is also $[\alpha F]$.

- But see next section for cases where even this “fix” does not suffice
Transitive $\mathcal{R}$ must be curtailed

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Transvocalic harmony in multi-segment correspondence sets

Nasal consonant harmony in **Bemba** (Bantu; Kula 2002)

- **Applicative /-il/:**
  - /-som-ik-il-a/ → -somekela ‘plug for’ (p. 148)
  - /-tan-il-a/ → -tanina ‘refuse for’ (p. 146)
  - /-noːn-il-a/ → -noːnenena ‘sharpen for’ (p. 153)
  - /-palam-il-a/ → -palaminna ‘get closer to’ (p. 146)

- **Compleitive /-ilil/:**
  - /-kan-ilil-a/ → -kanininina ‘refuse totally’ (p. 146)

- **Reciprocal /-an/ as trigger:**
  - /-kak-an-il-a/ → -kakanina ‘become difficult for’ (p. 148)
  - /-kum-an-il-a/ → -kumanina ‘be [numerous] enough’ (p. 148)
  - /-noːn-an-il-a/ → -noːnanina ‘sharpen e.o. for’ (conjectured form)
Transvocalic harmony: Regulating locality

- **Option 1:** Separate CC-Limiter constraint
  - PROXIMITY (Rose and Walker 2004)
    - “If $x \mathcal{R} y$, then $x$ and $y$ must be in adjacent syllables.”
  - $\approx$ CC-SYLLADJ (Bennett 2013)

- **Option 2:** “Window” restriction on CORR constraints (Hansson 2001; Bennett 2013)
  - e.g. CORR_{CVC}-[cons, voi]
  - no demand for correspondence in beyond-transvocalic pairs; hence no agreement for such pairs
PROXIMITY with transitive $R$: Wrong predictions

Incorrect predictions for transvocalic harmony systems (e.g. Bemba):

<table>
<thead>
<tr>
<th>Sequence Type</th>
<th>Example</th>
<th>Actual Output</th>
<th>Predicted?</th>
</tr>
</thead>
<tbody>
<tr>
<td>...NvR...</td>
<td>/-tan-il-a/</td>
<td>tanina</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>/-kak-an-il-a/</td>
<td>kakanina</td>
<td>✓</td>
</tr>
<tr>
<td>...NvRvR...</td>
<td>/-kan-ilil-a/</td>
<td>kaninina</td>
<td>kanilila</td>
</tr>
<tr>
<td>...RvNvR...</td>
<td>/-palam-il-a/</td>
<td>palamina</td>
<td>palamila</td>
</tr>
<tr>
<td>...NvNvR...</td>
<td>/-no:n-il-a/</td>
<td>no:nena</td>
<td>no:nela</td>
</tr>
<tr>
<td></td>
<td>/-kum-an-il-a/</td>
<td>kumanina</td>
<td>kumanila</td>
</tr>
<tr>
<td>...NvNvNvR...</td>
<td>/-no:n-an-il-a/</td>
<td>no:nanina*</td>
<td>✓</td>
</tr>
<tr>
<td>...RvNvNvR...</td>
<td>/-palam-an-il-a/</td>
<td>palamanina*</td>
<td>✓</td>
</tr>
<tr>
<td>...RvRvNvR...</td>
<td>/-lu:l-an-il-a/</td>
<td>lu:lanina*</td>
<td>✓</td>
</tr>
</tbody>
</table>

* = conjectured forms
PROXIMITY with transitive $R$: Sequence of targets

Example: /-kan-ilil-a/ ➞ -kaninina ‘refuse totally’ (...NvRvR...)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>kanilila</td>
<td>***!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>kan$_x$il$_x$il$_x$a</td>
<td>*!</td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>c.</td>
<td>kan$_x$in$_x$in$_x$a</td>
<td>*!</td>
<td></td>
<td>**</td>
</tr>
<tr>
<td>d.</td>
<td>kan$_x$in$_x$ila</td>
<td>**</td>
<td></td>
<td>*!</td>
</tr>
<tr>
<td>e.</td>
<td>kanil$_x$il$_x$a</td>
<td>**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Correspondence set with >2 members violates PROXIMITY
  - (assuming 1 member per syllable, as in the CV sequences here)
- In chains of 3, one segment must opt out of correspondence; which one?
  - choice falls to low-ranked IO-FAITH considerations

Harmony fails to apply to a sequence of targets in successive syllables
**PROXIMITY with transitive Ρ: Preceding C interferes**

Example: /-palam-il-a/ → -palamina ‘get closer to’ (...RvNvR...)

<table>
<thead>
<tr>
<th>/-palam-il-a/</th>
<th>PROXIMITY</th>
<th>CORR-[cons, + voi]</th>
<th>C&lt;sub&gt;L&lt;/sub&gt;C&lt;sub&gt;R&lt;/sub&gt;-ID[nas]</th>
<th>OI-ID[nas]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. palamila</td>
<td>***!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. pal_x am_x il_x a</td>
<td>*!</td>
<td></td>
<td></td>
<td>***</td>
</tr>
<tr>
<td>c. pal_x am_x in_x a</td>
<td>*!</td>
<td></td>
<td></td>
<td>***</td>
</tr>
<tr>
<td>d. pal_x am_x ila</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. palam_x in_x a</td>
<td>**</td>
<td></td>
<td></td>
<td>*!</td>
</tr>
</tbody>
</table>

Harmony fails to apply if trigger is **preceded** by a segment belonging to the harmonizing class (here: either N or R)

- actual criterion is “...preceded by an **odd number** of segments...”!
Example: /-luːl-an-il-a/ → -luːlaninə 'praise e.o. for’ (...RvRvNvR…)

<table>
<thead>
<tr>
<th></th>
<th>PROXIMITY</th>
<th>CORR-[cons, + voi]</th>
<th>C\text{l}_C\text{R}-ID[nas]</th>
<th>OI-ID[nas]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. luːlanila</td>
<td></td>
<td>*****<em>!</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. l\text{x}uːl\text{x}an\text{x}il\text{x}a</td>
<td>!***</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>c. l\text{x}uːl\text{x}an\text{x}in\text{x}a</td>
<td>!***</td>
<td></td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>d. l\text{x}uːl\text{x}an\text{x}ila</td>
<td>!</td>
<td>***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. l\text{x}uːl\text{x}an\text{y}in\text{y}a</td>
<td>****</td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

- Four-member correspondence set = 6 C↔C pairs. If obeying PROXIMITY, minimum number of CORR violations is 4
  - by partitioning into two 2-member chains: C\text{1}R\text{2} and C\text{3}R\text{4}
  - C\text{3} is thus cleared to interact with C\text{4}

Harmony does apply if trigger is preceded by an even number of segments belonging to the harmonizing class
Solution: Going beyond $\mathcal{R}$

- Again: confining CC-Limiter evaluation to correspondents that are “adjacent” within the correspondence set

**CC-SYLLADJ (paraphrased from Bennett 2013)**

Let $X$ and $Y$ be segments in the output, such that

1. $X \mathcal{R} Y$
2. there exists no segment $Z$ in the output such that $X \prec Z \prec Y$ and $X \mathcal{R} Z$

and let $\sigma_X$ and $\sigma_Y$ denote the syllables containing $X$ and $Y$, respectively.

There exists no syllable $\sigma_Z$ such that $\sigma_X \prec \sigma_Z \prec \sigma_Y$

- Restrictions like these effectively “undo” the transitivity attributed to $\mathcal{R}$
- And they are not always sufficient...
Correspondence without similarity

Recall: a **single, all-purpose** $\mathcal{R}$ relation, regardless of which CORR constraint is contributing it

- e.g. $\mathcal{R}_{\text{CORR-}[F,\ldots]} = \mathcal{R}_{\text{CORR-}[G,\ldots]}$

- Therefore, given a sequence $\ldots C_1 \ldots C_2 \ldots C_3 \ldots$
  - if $C_1 \mathcal{R} C_2$ by CORR-$[F,\ldots]$
  - and $C_1 \mathcal{R} C_3$ by CORR-$[G,\ldots]$

- then $C_2 \mathcal{R} C_3$ **by transitivity alone**
  - even if $C_2, C_3$ share neither $[F]$ nor $[G]$, and are thus **below** the similarity threshold of either CORR constraint

**Pathological prediction:**

Agreement (or dissimilation) between $C_x$ and $C_y$ that is **parasitic** on the presence of a co-occurring “proxy” segment ($C_z$)
Pathologies of $\mathcal{R}$: Agreement by proxy

Hypothetical voicing harmony system:

- Only **homorganic** obstruent pairs participate
  - $\text{CORR-}[-\text{son, } \alpha\text{Place}] \gg \text{OI-IDENT}[\text{voi}] \gg \text{CORR-}[-\text{son}]$

- Regressive voicing harmony: only **voiceless...voiced** sequences affected
  - $\{ \text{C}_R\text{C}_L\text{-IDENT}[\text{voi}], \text{CORR-}[-\text{son, } \alpha\text{Place}] \} \gg \text{OI-IDENT}[\text{voi}]$

<table>
<thead>
<tr>
<th>/s...d/</th>
<th>CORR-[-son, $\alpha$Place]</th>
<th>$\text{C}_R\text{C}_L\text{-IDENT}[\text{voi}]$</th>
<th>OI-ID[voi]</th>
<th>CORR-[-son]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. s...d</td>
<td>*!</td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>b. $s_x...d_x$</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. $z_x...d_x$</td>
<td></td>
<td></td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>
Pathologies of $\mathcal{R}$: Agreement by proxy

Hypothetical voicing harmony system:

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  - $\text{CORR-}[-\text{son, }\alpha\text{Place}] \gg OI-\text{IDENT}[\text{voi}] \gg \text{CORR-}[-\text{son}]$

- Regressive voicing harmony: only **voiceless...voiced** sequences affected
  - $\{ C_{R}C_{L}\text{-IDENT}[\text{voi}], \text{CORR-}[-\text{son, }\alpha\text{Place}] \} \gg OI-\text{IDENT}[\text{voi}]$

<table>
<thead>
<tr>
<th>/s...g/</th>
<th>CORR-[-son, $\alpha$Place]</th>
<th>$C_{R}C_{L}\text{-ID}[\text{voi}]$</th>
<th>OI-ID[voi]</th>
<th>CORR-[-son]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. $s\ldots g$</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>b. $s_x\ldots g_x$</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. $z_x\ldots g_x$</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
</tbody>
</table>
Pathologies of $\Psi$: Agreement by proxy

Hypothetical voicing harmony system:

- Only **homorganic** obstruent pairs participate
  - $\text{CORR-}[–\text{son}, \alpha\text{Place}] \gg \text{OI-IDENT}[\text{voi}] \gg \text{CORR-}[–\text{son}]$

- Regressive voicing harmony: only **voiceless...voiced** sequences affected
  - $\{ \text{CRCL-IDENT}[\text{voi}] , \text{CORR-}[–\text{son}, \alpha\text{Place}] \} \gg \text{OI-IDENT}[\text{voi}]$

- Additional ingredient: high-ranked demand for correspondence in same-manner, same-voicing pairs ($\text{CORR-}[\alpha\text{cont}, \beta\text{voi}]$)
  - e.g. [s...x], [d...g], [g...g]
  - ought to be irrelevant for voicing harmony (since these pairs already agree in voicing)
  - but alas, the all-purposeness and transitivity of $\Psi$ makes it not so...
Pathologies of $\mathcal{R}$: Agreement by proxy

- **Recall:** no harmony in heterorganic pairs like /s…g/

<table>
<thead>
<tr>
<th>$\text{/sago/}$</th>
<th>$\text{CORR-[\alpha\text{cont}, \beta\text{voi}]}$</th>
<th>$\text{CORR-[\text{-son}, \alpha\text{Place}]}$</th>
<th>$\text{C}<em>{R}\text{C}</em>{L}\text{-ID[voi]}$</th>
<th>$\text{OI-ID[voi]}$</th>
<th>$\text{CORR-[\text{-son}]}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. $\text{sago}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$*$</td>
</tr>
<tr>
<td>b. $s_xag_xo$</td>
<td></td>
<td></td>
<td></td>
<td>$*$</td>
<td></td>
</tr>
<tr>
<td>c. $z_xag_xo$</td>
<td></td>
<td></td>
<td></td>
<td>$*$</td>
<td></td>
</tr>
</tbody>
</table>

- **But /s…g/ will undergo harmony if /x/ is nearby!**

<table>
<thead>
<tr>
<th>$\text{/s…g…x/}$</th>
<th>$\text{CORR-[\alpha\text{cont}, \beta\text{voi}]}$</th>
<th>$\text{CORR-[\text{-son}, \alpha\text{Place}]}$</th>
<th>$\text{C}<em>{R}\text{C}</em>{L}\text{-ID[voi]}$</th>
<th>$\text{OI-ID[voi]}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. $s…g…x$</td>
<td>$*$ (s,x)</td>
<td>$*$ (g,x)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. $s…g_x…x_x$</td>
<td>$*$ (s,x)</td>
<td></td>
<td></td>
<td>$*$</td>
</tr>
<tr>
<td>c. $s_x…g_x…x$</td>
<td></td>
<td></td>
<td>$*$ (g,x)</td>
<td></td>
</tr>
<tr>
<td>d. $s_x…g_x…x_x$</td>
<td></td>
<td></td>
<td></td>
<td>$*$</td>
</tr>
<tr>
<td>e. $z_x…g_x…x_x$</td>
<td></td>
<td></td>
<td></td>
<td>$*$</td>
</tr>
</tbody>
</table>
Agreement by proxy: Solutions?

**Correspondence**

\[
\text{CORR}[-\text{son, } \alpha\text{Place}] \\
\text{s} \leftrightarrow \text{g} \rightarrow x \\
\text{CORR}[-\text{acont, } \beta\text{voi}] \\
\]

\[C_R C_L-\text{IDENT}[+\text{voi}] \text{ accesses any linked pair, even across CORR dimensions}\]

**Projections**

\[
[-\text{son, } \alpha\text{Place}] \quad \ldots\text{g } x\ldots \\
[\text{acont, } \beta\text{voi}] \quad \ldots\text{s } x\ldots \\
\]

\[\star[-\text{voi}][+\text{voi}]_{[-\text{son, } \alpha\text{Place}]} \text{ accesses a projection with no } [...]\text{s g} [...]\text{ sequence}\]

- Here restricting evaluation of CG-IDENT[F] to “adjacent” pairs (Hansson 2007, cf. earlier) is of no help whatsoever
- [s...g] are “adjacent”, so fall under \(C_R C_L-\text{IDENT}[+\text{voi}]\) regardless
Conclusions

- **Agreement** is well-supported as the well-formedness target underlying long-distance consonant assimilation (LDCA)
  - even for *prima facie* problem cases (e.g. evidence for spreading/blocking)
  - and probably for many non-LDCA phenomena (e.g. much of dissimilation; and more?)

- Less clear that the same is true for **correspondence** in the ABC sense
  - typology of LDCA, as well as computational (incl. learnability) considerations, point more in the direction of “tier”-like structures
  - subsequences of the output string, formalizable as **projections** of (natural) segment classes

- Much work yet to do to reconcile the “ABP” notion with other considerations
  - e.g. the typological profile of LDCA vs. dissimilation (Bennett 2013)


References II


References III


Problems with transitive $\mathcal{R}$: Conceivable solutions

- Make $\mathcal{R}$ non-transitive (Hansson 2001, 2006)
  - combinatorial explosion of possible correspondence configurations
  - a learnability problem (configurations have different CC-Limiter implications)

- Make $\mathcal{R}$ non-transitive, with hard restrictions imposed
  - e.g. banning one-to-many and many-to-one relations (in the precedence dimension)
  - cf. the $C_L C_R$-INTEGRITY and $C_L C_R$-UNIFORMITY of Hansson (2006); here these would have to be hard restrictions on GEN
    - in effect: imposing (literal) “chain” structure $C_x \ldots C_{x,y} \ldots C_{y,z} \ldots C_{z,w} \ldots$ on all multi-correspondent sets
  - (A tier by any other name…)
  - and even this gives rise to oddities!
Non-transitive, unrestricted $\mathcal{R}$: Combinatorial explosion

- Without the transitivity restriction, the number of possible correspondence configurations becomes very large very fast.
- For an output with $n$ consonants, this number is $2^{\binom{n}{2}}$. 

![Diagram](attachment:image.png)
Non-transitive, unrestricted $\mathcal{R}$: Combinatorial explosion

- Without the transitivity restriction, the number of possible correspondence configurations becomes very large very fast
- for an output with $n$ consonants, this number is $2^{\binom{n}{2}}$

<table>
<thead>
<tr>
<th>Number of consonants in output</th>
<th>Number of distinct correspondence configurations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Transitive $\mathcal{R}$</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>52</td>
</tr>
<tr>
<td>6</td>
<td>203</td>
</tr>
</tbody>
</table>

- That is a lot of hidden-structure options to keep track of!
Problems with transitive $\mathcal{R}$: Conceivable solutions

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  - a learnability problem (configurations have different CC-Limiter implications)

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    - in effect: imposing (literal) “chain” structure $C_x \ldots C_x, y \ldots C_y, z \ldots C_z, w \ldots$ on all multi-correspondent sets
  - (A tier by any other name…)
  - and even this gives rise to oddities!
Non-transitive correspondence chains: Competition for $\mathcal{R}$

- General assumption in ABC: hierarchies of CORR constraints
  - e.g. CORR-[F,G,H] $\gg$ CORR-[F,G] $\gg$ CORR-[F]

- Recall: $\mathcal{R}$ is still a single, all-purpose relation

- The imposed restriction on correspondence configurations creates implications among correspondence pairings
  - e.g. in a C...C...C sequence, not every C can correspond to every other C
  - if $C_1 \mathcal{R} C_3$ then $\neg C_1 \mathcal{R} C_2$ and $\neg C_2 \mathcal{R} C_3$(etc.)

- Creates competition among CORR constraints for “access” to $\mathcal{R}$
  - higher-ranked CORR constraints lay stronger claim to correspondence than lower-ranked ones
  - satisfying CORR-[F,G] for one C-C pair may come at the cost of violating CORR-[F] for a different C-C pair, forcing the latter not to correspond (and hence not to harmonize)
Non-transitive correspondence chains: Odd predictions

- Ineseño-like sibilant harmony system: fricatives and affricates alike participate
  - \{ CORR-[+strid], CC-IDENT[ant] \} \preceq IO-IDENT[ANT]
- Assume that correspondence imperative is stronger for more similar (same-manner) than less similar (different-manner) pairs
  - CORR-[+strid, αcont] \preceq CORR-[+strid]

<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>a. katʃaso</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. katʃx as;o</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>c. katsx as;o</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>
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<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. satʃako</td>
<td></td>
<td></td>
<td>*!</td>
<td></td>
</tr>
<tr>
<td>b. s_xsatʃako</td>
<td></td>
<td></td>
<td></td>
<td>*!</td>
</tr>
<tr>
<td>c. ꚳ xsatʃako</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

Gunnar Öl. Hansson  
ABC: Inspecting the Foundations  
55 / 50
Non-transitive correspondence chains: Odd predictions

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  - \{ \text{CORR-}[- \text{strid}], \text{CC-IDENT[ant]} \} \gg \text{IO-IDENT[ANT]} 

- Assume that correspondence imperative is stronger for more similar (same-manner) than less similar (different-manner) pairs
  - \text{CORR-}[- \text{strid}, \alpha \text{cont}] \gg \text{CORR-}[- \text{strid}] 

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>satʃaso</td>
<td>*!</td>
<td>**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>s_x atʃ_x,y as_0</td>
<td>*!</td>
<td>*</td>
<td>**!</td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>s_x atʃ_x,y as_o</td>
<td>*!</td>
<td>*</td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>d.</td>
<td>s_z atʃz_o</td>
<td>**</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
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  \[ \{ \text{CORR-}[+\text{strid}], \text{CC-IDENT}[\text{ant}] \} \gg \text{IO-IDENT[ANT]} \]

- Assume that correspondence imperative is stronger for more similar (same-manner) than less similar (different-manner) pairs
  
  \[ \text{CORR-}[+\text{strid}, \alpha\text{cont}] \gg \text{CORR-}[+\text{strid}] \]

- End result:
  
  - harmony applies in /tʃ...s/, as well as in /s...tʃ/ (or /ʃ...ts/)
  - but no harmony in /s...tʃ...s/!
  - likewise, /ʃ...tʃ...s/ → [s...tʃ...s] (not [s...ts...s])