Derivations

Paul Kiparsky
Argue with me!
And with each other!
Derivations in phonology: a brief history


   - Argument 1: rules impose an arbitrary direction of dependence on co-occurrence restrictions.
   - Argument 2: rule ordering is not needed for phonotactics.

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Pāṇini (ca. 500 B.C.), Chomsky (1951), Halle (1962): ordered rules derive phonetic representations from underlying representations.

Stanley (1967): ordered rules plus morpheme structure constraints (well-formedness conditions).

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- you can’t simplify rules which are triggered by a constraint,
- rules can create prohibited configurations if the output is repaired by a subsequent rule, and
- there was no substantive theory of targets.

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1. Prince & Smolensky (1993): ranked constraints uniquely determine the processes that implement them.

2. Constraints are violable, but violation is minimal.

3. Constraints can both “trigger” and “block” processes. Schematically:
   - \( P \rightarrow Q \) is triggered in the context \( X___Y \) if \( *XPY \gg *Q \),
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4. The constraint system evaluates output representations. (Under Harmonic Serialism, it evaluates each step in a derivation.)

5. A ranking determines a grammar, the possible rankings determine the typological space.

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1. Two major problems
   - Opacity
   - Cyclicity

2. Two types of solutions
   - Introduce transderivational faithfulness constraints (Sympathy, O/O) and/or transderivational constraints formulated over faithfulness relations (OT-CC).
   - Modularity: level-ordered cascade of classic OT constraint systems (Stratal OT). Expressions are interpreted incrementally as they are built up, so morphology and phonology are intrinsically cyclic and local. (Interleaving now also in DM, Embick 2010).
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**Leading ideas:**

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   - Rules plus (i) constraints that block rules, (ii) constraints that trigger rules.
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- Paradigmatic markedness: *[μF]
- Faithfulness: IDENTSTEM(F), IDENT-σ₁(F)...

2 Constraints may be conjoined.

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• järje-st-el-mä-llis-ty-ttä-mä-ttööm-yyde-llä-nsä-käänt-kö-hän
‘maybe not-even with his failure to have systematized?’

• suunn-it-el-ma-llis-tu-tta-ma-ttom-uude-llä-nsa-kaan-kö-han
‘maybe not-even with his failure to have caused planning to be introduced?’

• es-it-el-mä-llis-ty-ttä-mä-ttööm-yyde-llä-nsä-käänt-kö-hän
‘maybe not-even with his failure to have lecturing caused to be introduced?’
### The vowel system

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- **Harmony**: *u, o, a* and *y, ö, ä* don’t co-occur.
  - **Stems**: *pouta* ‘fair weather’, *pöytä* ‘table’, *poutä*, *poytä*, *poyta*, *pöuta*...
  - **Suffixes**: *maa-ta* ‘land’ (Part.Sg.), *pää-tä* ‘head’ (Part.Sg.)
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- **Stems:** *pouta* ‘fair weather’, *pöytä* ‘table’, *poutä*, *poytä*, *poyta*, *pöuta* . . .
- **Suffixes:** *maa-ta* ‘land’ (Part.Sg.), *pää-tä* ‘head’ (Part.Sg.)
The neutral vowels \(i\), \(e\) in Finnish

- Unpaired in the underlying vowel inventory. Do not undergo suffixal harmony.
- Transparent to suffixal harmony, e.g. \(tarina\) ‘tale’, \(tärinä\) ‘vibration’ (*tarinä*, *tärina*)
- Freely co-occur with back vowels in stems, e.g. \(piina\) ‘torture’, \(viitta\) ‘cloak’
- Trigger front harmony in suffixes, e.g. \(pii-nä\) ‘silicon’ (Ess.Sg.), \(viit-tä\) ‘five’ (Part.Sg.)
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- Transparent to suffixal harmony, e.g. *tarina* ‘tale’, *tärinä* ‘vibration’ (*tronä*, *trina*)

- Freely co-occur with back vowels in stems, e.g. *piina* ‘torture’, *viitta* ‘cloak’

- Trigger front harmony in suffixes, e.g. *pii-nä* ‘silicon’ (Ess.Sg.), *viit-tä* ‘five’ (Part.Sg.)
Text frequency of Finnish vowels

<table>
<thead>
<tr>
<th>Vowel</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>27</td>
<td>24.97%</td>
</tr>
<tr>
<td>a</td>
<td>23</td>
<td>22.88%</td>
</tr>
<tr>
<td>e</td>
<td>16</td>
<td>15.49%</td>
</tr>
<tr>
<td>u</td>
<td>10</td>
<td>11.91%</td>
</tr>
<tr>
<td>o</td>
<td>10</td>
<td>10.67%</td>
</tr>
<tr>
<td>ä</td>
<td>9</td>
<td>7.60%</td>
</tr>
<tr>
<td>y</td>
<td>3</td>
<td>4.75%</td>
</tr>
<tr>
<td>ö</td>
<td>1</td>
<td>1.78%</td>
</tr>
</tbody>
</table>
Finnish constraint ranking

1. *ɨ, *

2. MARKEDHARMONY: *[αBack][–αBack] & *[ɛBack]: a domain cannot contain both a disharmonic vowel and a marked vowel.

3. FAITHFULNESS:
   - IDENTSTEM(BACK): An input [αBack] vowel in a Stem must be [αBack] in the output.
   - IDENT-σ₁(Back): An initial input [αBack] vowel must be [αBack] in the output.

4. HARMONY: *[αBack][–αBack]

This ranking gives Finnish, others generate an empirically supported factorial typology.
**Finnish constraint ranking**

1. *i, *y

2. **MARKED HARMONY**: *[αBack][−αBack] & *[μBack]: a domain cannot contain both a disharmonic vowel and a marked vowel.

3. **FAITHFULNESS**:
   - **IDENTSTEM(Back)**: An input [αBack] vowel in a Stem must be [αBack] in the output.
   - **IDENT-σ₁(Back)**: An initial input [αBack] vowel must be [αBack] in the output.

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   - **IDENT-σ₁(Back)**: An initial input [αBack] vowel must be [αBack] in the output.

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3. **FAITHFULNESS**:
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   - **IDENT-σ₁(Back)**: An initial input [^ Back] vowel must be [^ Back] in the output.

4. **HARMONY**: *[^ Back][−^ Back]

This ranking gives Finnish, others generate an empirically supported factorial typology.
Finnish constraint ranking

1. *i, *γ
2. Marked Harmony: *[αBack][–αBack] & *[µBack]: a domain cannot contain both a disharmonic vowel and a marked vowel.
3. Faithfulness:
   - IDENT STem(Back): An input [αBack] vowel in a Stem must be [αBack] in the output.
   - IDENT-σ₁ (Back): An initial input [αBack] vowel must be [αBack] in the output.
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This ranking gives Finnish, others generate an empirically supported factorial typology.
Stems are subject only to **MARKEDHARMONY**

**MARKEDHARMONY**: a domain cannot contain both a marked vowel and a disharmonic vowel.

```
* [ aD  äDM ]α
✓ [ iD  aD  ]α
✓ [ i    äM  ]α
✓ [ aD  iD  aD  ]α
* [ aD  iD  äM  ]α
* [ äDM iD  aD  ]α
✓ [ äM  i    äM  ]α
```
## Suffixes undergo also HARMONY

<table>
<thead>
<tr>
<th>Input</th>
<th>Candidates</th>
<th>*ί, *γ</th>
<th>MARKEDHARMONY</th>
<th>IDENTSTEM(B)</th>
<th>HARMONY</th>
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</thead>
<tbody>
<tr>
<td>[ί]a</td>
<td>ia</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>ιά</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ία]</td>
<td>ια</td>
<td></td>
<td></td>
<td></td>
<td>*</td>
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<tr>
<td>ιὰ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[ίά]</td>
<td>ια</td>
<td></td>
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<td></td>
<td>*</td>
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<tr>
<td>ιά</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>[αι]a</td>
<td>αια</td>
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<tr>
<td>αια</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

Note: * indicates a conflict with the HARMONY constraint.
1. Harmony applies in suffixes and within roots.

2. A needy vowel seeks a contrastive feature to its left (‘needy’ ≈ ‘unspecified’).

3. Transparent i, e are excluded from the search.

4. If the search fails, default [–Back] is assigned.

5. Non-initial stem syllables also undergo harmony (evidence from language games). Disharmony handled by specifying vowels as non-needy.
Harmony applies in suffixes and within roots.

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Non-initial stem syllables also undergo harmony (evidence from language games). Disharmony handled by specifying vowels as non-needy.
Argument 1: stem harmony

1. Non-standard speakers nativize disharmonic stems: 
   \textit{Peugeot} \rightarrow \textit{pösö}, \textit{trotyyli} \rightarrow \textit{rotuli} ‘TNT’, \textit{olympia-} \rightarrow \textit{olumpia-}, \textit{pulityyri} \rightarrow \textit{pulituuri} ‘furniture polish’. 
   Never \textit{Kiina} \rightarrow \textit{*Kiinä} ‘China’, \textit{metro} \rightarrow \textit{*metrõ}.

2. Ranking MH $\gg$ IDSTEM(B) $\gg$ H excludes \textit{Peugeot}, \textit{trotyyli}, but not \textit{Kiina, metro}.

3. The search-and-copy approach doesn’t have a harmony constraint. It must specify the distribution of neediness by a lookahead rule: “a stem vowel is needy only if its needs will be satisfied by copying, not by default assignment.”
Argument 1: stem harmony

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   Never \text{Kiina} \rightarrow *\text{Kiinä} ‘China’, \text{metro} \rightarrow *\text{metrö}.

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   \( olympia- \rightarrow \text{olumpia-}, \text{pulityyri} \rightarrow \text{pulituuri} \) ‘furniture polish’.  
   Never \( \text{Kiina} \rightarrow *\text{Kiinä} \) ‘China’, \( \text{metro} \rightarrow *\text{metrö} \).

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Argument 2: *i,e* don’t trigger harmony from monosyllabic C-roots

<table>
<thead>
<tr>
<th>Word</th>
<th>Meaning</th>
<th>Word</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>itk-u</td>
<td>‘crying’</td>
<td>itke-sk-el-y</td>
<td>‘crying’ (durative)</td>
</tr>
<tr>
<td>hiill-os</td>
<td>‘embers’</td>
<td>piene-nn-ös</td>
<td>‘reduction’</td>
</tr>
<tr>
<td>tek-o</td>
<td>‘deed’</td>
<td>tee+sk+ent+el+y</td>
<td>‘pretending’</td>
</tr>
<tr>
<td>pit-uus</td>
<td>‘length’</td>
<td>pid-emm-yys</td>
<td>‘greater length’</td>
</tr>
<tr>
<td>pien-uus</td>
<td>‘small size’</td>
<td>pien-emm-yys</td>
<td>‘smaller size’</td>
</tr>
</tbody>
</table>

Analysis: the minimal stem is disyllabic, so the Root+Suffix combination is the first cyclic constituent.

- \((\text{itk-u})_\omega\) (like monomorphemic *letku* ‘hose’)
- \(((\text{itk-esk-el})_\omega\cdot\text{y})_\omega\)
Non-needy (fully specified) vowels can harmonize, as predicted by constraint-based theory.

- moinen ‘such’
- kum+moinen ‘which kind of?’
- mim+moinen ‘what kind of’
- täm+möinen ‘this kind of’

- moinen has underlying [+Back] /o/
- kum+moinen [+Back] after [+Back]
- mim+moinen [+Back] after neutral [–Back]
- täm+möinen [–Back] after harmonic [–Back]

- Similar examples in Hungarian VH (Vago).
- Consonant assimilation is also applicable to fully specified vowels (Wetzels & Mascaró 2001).
- Constraint-based theory unifies VH with other assimilation processes.
## Argument 4: Seto/Võru

- Harmony like Finnish, but with two extra vowels /ɨ/, /ʉ/

<table>
<thead>
<tr>
<th></th>
<th>u</th>
<th>o</th>
<th>a</th>
<th>ɨ</th>
<th>ʉ</th>
<th>ü</th>
<th>ö</th>
<th>ä</th>
<th>a</th>
<th>i</th>
<th>e</th>
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<tbody>
<tr>
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<td>+</td>
<td>+</td>
<td>+</td>
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<td>−</td>
</tr>
</tbody>
</table>

- /ɨ/ back harmonic, occurs only in initial syllables.
- /ʉ/ occurs in any syllable, reduced to [ə] non-initially.
- /e/ is a neutral in initial syllables, front harmonic elsewhere.
- /o/ is opaque.
- /ö/ occurs only in initial syllables.
Argument 4: Seto/Võru

- Harmony like Finnish, but with two extra vowels /ɪ/, /ʌ/

<table>
<thead>
<tr>
<th></th>
<th>u</th>
<th>o</th>
<th>a</th>
<th>i</th>
<th>ʌ</th>
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<table>
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<tr>
<th></th>
<th>u</th>
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- Harmony like Finnish, but with two extra vowels /ɨ/, /ɤ/.

<table>
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</tr>
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<td>+</td>
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<td>-</td>
</tr>
</tbody>
</table>

- /ɨ/ back harmonic, occurs only in initial syllables.
- /ɤ/ occurs in any syllable, reduced to [ə] non-initially.
- /e/ is a neutral in initial syllables, front harmonic elsewhere.
- /o/ is opaque.
- /ö/ occurs only in initial syllables.
**Argument 4: Seto/Võru**

- Harmony like Finnish, but with two extra vowels /ɪ/, /ə/.

<table>
<thead>
<tr>
<th></th>
<th>u</th>
<th>o</th>
<th>a</th>
<th>i</th>
<th>ᵃ</th>
<th>ü</th>
<th>ŏ</th>
<th>ä</th>
<th>å</th>
<th>e</th>
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</thead>
<tbody>
<tr>
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<td>−</td>
</tr>
</tbody>
</table>

- /ɪ/ back harmonic, occurs only in initial syllables.
- /ə/ occurs in any syllable, reduced to [ə] non-initially.
- /e/ is a neutral in initial syllables, front harmonic elsewhere.
- /o/ is opaque.
- /ö/ occurs only in initial syllables.
Initial /i/ and /ɪ/ are distinctive, /ɪ/ triggers harmony

1. *sina ‘word’, klībisɣ-ma ‘to rattle’
   *sinä ‘you’, libise-mä ‘to flutter’, silmä ‘eye’s’, hinneq ‘fiber’
   *ilma ‘without’, minnu ‘me’, hinnɣq ‘grade’
   *CiCä, *CiCö, *CiCe...

2. MH predicts this. Search procedure has a problem with identifying the source.
   - Search for distinctive values excludes grammatical CiCa, CiCu, CiCɣ.
   - Search for marked values fails to exclude either *CuCä, *CaCü, *CɣCe..., or *CäCu, *CüCa, *CöCɣ..., both ungrammatical.
Initial /i/ and /ɪ/ are distinctive, /ɪ/ triggers harmony

1. *sīna* ‘word’, *klībisɔ*-ma ‘to rattle’
   *sinä* ‘you’, *libise-ма* ‘to flutter’, *silmä* ‘eye’s’, *hinneq* ‘fiber’
   *ilmɑ* ‘without’, *minnu* ‘me’, *hinnaq* ‘grade’
   *CiCä*, *CiCö*, *CiCe*...

2. MH predicts this. Search procedure has a problem with identifying the source.

   - Search for distinctive values excludes grammatical *CiCa*, *CiCu*, *CiCɨ*.
   - Search for marked values fails to exclude either *CuCä*, *CaCū*, *CɨCe*..., or *CāCu*, *CūCa*, *CőCɨ*..., both ungrammatical.
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   *CīCā, *CīCō, *CīCe... 

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     CiCu, CiCy.
   - Search for marked values fails to exclude either *CuCā, 
     *CaCū, *CyCe..., or *CāCu, *CūCa, *CōCy..., both ungrammatical.
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The domain of harmony is the prosodic word

<table>
<thead>
<tr>
<th>Harmony (local cases)</th>
<th>-t-Deletion in Part.Pl.</th>
</tr>
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<tbody>
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<tr>
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<td>ártikkelli</td>
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</tbody>
</table>

- V, V: lexical accents. Analysis: monomorphemic words consisting of two full feet are optionally prosodic compounds, e.g. (kúverne)₀(mèntti)₀, (kára)₀(mèlli)₀ (Kiparsky 2003).
Conceptual advantages

1. The computation need not refer to “distinctiveness”, an inherently global property.
2. Unifies harmony with other assimilation processes.
3. Relies on independently motivated prosodic domains.
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Basque clitics

1 Basic order of clitics in the auxiliary is Abs – T – Dat – Erg, the reverse of the normal Subject – Indirect Object – Direct Object order of arguments.

2 CASEALIGNMENT
A clitic C₁ c-commands C₂ iff C₁’s Th-role outranks C₂’s Th-role.
Basque clitics

1 Basic order of clitics in the auxiliary is Abs – T – Dat – Erg, the reverse of the normal Subject – Indirect Object – Direct Object order of arguments.

2 CASEALIGNMENT
A clitic $C_1$ c-commands $C_2$ iff $C_1$’s Th-role outranks $C_2$’s Th-role.
1. Basic order of clitics in the auxiliary is Abs – T – Dat – Erg, the reverse of the normal Subject – Indirect Object – Direct Object order of arguments.

2. \[
    \text{Abs} \rightarrow \text{T} \rightarrow \text{Dat} \rightarrow \text{Erg}
    \]

3. **CASEALIGNMENT**
   A clitic $C_1$ c-commands $C_2$ iff $C_1$’s Th-role outranks $C_2$’s Th-role.
Second position requirement

1. **Noninitiality:**
   T in a finite verb cannot be the leftmost morpheme within the word.

2. **Enclisis:**
   Clitics are adjoined to the right of their host T.
Second position requirement

1 \textbf{NONINITIALITY:}\n\hspace{10pt} T in a finite verb cannot be the leftmost morpheme within the word.

2 \textbf{ENCLISIS:}\n\hspace{10pt} Clitics are adjoined to the right of their host T.
<table>
<thead>
<tr>
<th>Pres + Abs.1Sg + Erg.2Sg</th>
<th>NONINITIALITY</th>
<th>ENCLISIS</th>
<th>CASEALIGNMENT</th>
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<tbody>
<tr>
<td>a. *a-t-su T-1Sg-2Sg</td>
<td>*</td>
<td></td>
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</tr>
<tr>
<td>b. ☞ n-a-su 1Sg-T-2Sg</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. *n-su-a 1Sg-2Sg-T</td>
<td>**</td>
<td></td>
<td></td>
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<tr>
<td>d. *a-su-t T-2Sg-1Sg</td>
<td>*</td>
<td>*</td>
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<tr>
<td>e. *s-a-t 2Sg-T-1Sg</td>
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<td>*</td>
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</tr>
<tr>
<td>f. *s-n-a 2Sg-1Sg-T</td>
<td>**</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>
Morphological dissimilation

Delete 1pl.Abs/1pl.Dat in context of 2.Erg (Ondarru)

1 *2/1PL
   An auxiliary cannot contain both a first plural clitic and a second person clitic.

2 MAX-2P
   A second person argument must correspond to a clitic (or: it must agree).
Morphological dissimilation

Delete 1pl.Abs/1pl.Dat in context of 2.Erg (Ondarru)

1. \( ^*2/1\text{PL} \)
   An auxiliary cannot contain both a first plural clitic and a second person clitic.

2. MAX-2P
   A second person argument must correspond to a clitic (or: it must agree).
The proclitic morpheme $d(o)$- is assumed to mark present indicative (Trask 1977, 1997, Donohue 2004); the T head to which it is attached is unspecified for tense.

A&N treat it as a featureless epenthetic clitic, inserted to satisfy a morphological constraint which requires that Tense must not begin a word. $d$-insertion is bled by a rule which moves an ergative clitic to the beginning of the auxiliary (Enclitic Metathesis). By stipulation, Enclitic Metathesis only applies in the past tense; so $d$-insertion only applies in the present tense.
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do-su ‘Present-2.Sg.’ is multiply ambiguous

1 Su-k gu-Ø ikus-i do-su  (Present + Abs.1Pl + Erg.2Sg)
you.Sg-E us-A see-Prf Present-2Sg
‘You(Sg) have seen us.’

2 Su-k gu-ri emo-n do-su  (Present + Dat.1Pl + Erg.2Sg)
you.Sg-E us-D give-Prf Present-2Sg
‘You(Sg) have given it to us.’

3 Gu-ri su-Ø gusta-ten do-su  (Present + Abs.2Sg + Dat.1Pl)
We-Dat you.Sg.Abs like-Perf Pres-2Sg
‘We like you(Sg.)’
**do-su ‘Present-2.Sg.’ is multiply ambiguous**

1. Su-k gu-Ø ikus-i do-su (Present + Abs.1Pl + Erg.2Sg)
   you.Sg-E us-A see-Prf Present-2Sg
   ‘You(Sg) have seen us.’

2. Su-k gu-ri emo-n do-su (Present + Dat.1Pl + Erg.2Sg)
   you.Sg-E us-D give-Prf Present-2Sg
   ‘You(Sg) have given it to us.’

3. Gu-ri su-Ø gusta-ten do-su (Present + Abs.2Sg + Dat.1Pl)
   We-Dat you.Sg.Abs like-Perf Pres-2Sg
   ‘We like you(Sg.)’
do-su ‘Present-2.Sg.’ is multiply ambiguous

1. Su-k  gu-∅ ikus-i do-su  (Present + Abs.1Pl + Erg.2Sg)
   you.Sg-E us-A  see-Prf Present-2Sg
   ‘You(Sg) have seen us.’

2. Su-k  gu-ri emo-n do-su  (Present + Dat.1Pl + Erg.2Sg)
   you.Sg-E us-D  give-Prf Present-2Sg
   ‘You(Sg) have given it to us.’

3. Gu-ri  su-∅ gusta-ten do-su  (Present + Abs.2Sg + Dat.1Pl)
   We-Dat you.Sg.Abs like-Perf  Pres-2Sg
   ‘We like you(Sg.)’
## dosu ‘we-Dat (like) you-Abs’ (Present)

<table>
<thead>
<tr>
<th>FaithTense</th>
<th>MAX-2p</th>
<th>*2/1Pl</th>
<th>CASEAlignment</th>
<th>ENGLISH</th>
<th>NONINITIALITY</th>
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</thead>
<tbody>
<tr>
<td>Present + Abs.2Sg + Dat.1Pl → d-o-su</td>
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</tbody>
</table>

<table>
<thead>
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<th>*a-sku</th>
<th>*a-su</th>
<th>*do-su</th>
<th>*sku-a</th>
<th>*s-a</th>
<th>*do-su-a</th>
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<tr>
<td>Past + Abs.2Sg + Dat.1Pl → s-endo-n</td>
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<td>ENGLISH</td>
<td>2/1P</td>
<td>MAX-2P</td>
<td>FAITH TENSE</td>
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<tr>
<td>1a. *s-endo-sku-n 2Sg-T-Dat.1Pl</td>
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</tbody>
</table>
**sendu(n) ‘you-Erg (saw) us-Abs’**

<table>
<thead>
<tr>
<th>Past + Abs.1Pl + Erg.2Sg → s-sendu(-n) ‘you -ed us’</th>
<th>NONINITIALITY</th>
<th>ENCLISIS</th>
<th>*2/1PL</th>
<th>MAX-2P</th>
<th>FAITH TENSE</th>
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<tbody>
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<tr>
<td>1e. ☞ s-sendu-n 2Sg-Past</td>
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<tr>
<td>1f. *g-sendu-n 1Pl-Past</td>
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<tr>
<td>1g. *d-sendu-gu-n Pres-Past-1Pl</td>
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<td>*</td>
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Note: The table indicates the satisfaction of constraints for different verb forms, with the asterisk (*) marking the constraints satisfied.
y is translucent


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<th></th>
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<td>analyysi</td>
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Other vowels are opaque

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