

24.961 Ordered rules

[1] Basque: Biscayan dialect PGG p. 22

| <u>noun</u> | <u>indefinite</u> | <u>definite</u> | |
|-------------|-------------------|-----------------|---------|
| sagar | sagar bat | sagar-a | 'apple' |
| gison | gison bat | gison-a | 'man' |
| buzten | buztem bat | buzten-a | 'tail' |
| belaun | belaum bet | belaun-e | 'knee' |
| cakur | cakur bet | cakur-e | 'dog' |
| agin | agim bet | agin-e | 'tooth' |
| mutil | mutil bet | mutil-e | 'boy' |

[2]

| <u>noun</u> | <u>indefinite</u> | <u>definite</u> | |
|-------------|-------------------|-----------------|-----------|
| erri | erri bet | erriye | 'village' |
| ari | ari bet | ariye | 'thread' |
| buru | buru bet | buruwe | 'head' |
| iku | iku bet | ikuwe | 'fig' |

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| | | | |
|------|-----------|-------|----------|
| ate | ate bat* | atie | 'door' |
| asto | asto bat* | astue | 'donkey' |

[3] Baztan dialect

| | | | |
|----|-------------|-----------------|------------|
| A. | <u>noun</u> | <u>definite</u> | |
| | gison | gisona | 'man' |
| | egun | egune | 'day' |
| | mendi | mendie | 'mountain' |
| | buru | burue | 'head' |
| | etxe | etxia | 'house' |
| | afto | aftua | 'donkey' |
| B. | <u>noun</u> | <u>definite</u> | |
| | alaba | alaba | 'daughter' |
| | neska | neska | 'girl' |
| | muge | muge | 'limit' |
| | fabrike | fabrike | 'factory' |

Basque: five vowels i,u,e,o,a,u

Biscayan cf. bat 'one'

rules:

umlaut: [+syll, +low] -> [-low,-back] / [+syll, +high] C₀ ___

glide epenthesis: 0 -> [+syll, +high, @back] / [+syll, +high, @back] ___ [+syll]

raising: [+syll] -> [+high] / ___ [+syll]

ordering

raising precedes umlaut (feeding)

/asto-a/

astu-a raising

astu-e umlaut

glide epenthesis precedes raising (counter-feeding)

/buru-a/

buruw-a ----- GE

----- astu-a Raising

buruw-e astue umlaut

[4] Baztan dialect

- has umlaut rule
- has raising rule
- no glide epenthesis
- umlaut precedes raising (counterfeeding)

/buru-a/

buru-e ----- umlaut

----- astu-a raising

- a-final noun; we expect two a's in output but just one occurs: degemination

[+syll, +low] -> 0 / ___ [syll, +low]

- muge vs. ece: a-deletion precedes raising (bleeding)

/muga/

----- mug-a ----- ----- a-deletion

muge mug-e ----- ----- umlaut

----- ----- ----- eci-a raising

- dialects may differ by having the same rules and same underlying forms but different order of their rules (Halle 1962)
- a new type of grammar/language change

[5] Feeding and Bleeding (Kiparsky 1968, 1971)

If Rule A creates potential inputs to rule B and rule B applies, we say A **feeds** B and this can be described by requiring A to precede B.

If Rule A creates potential inputs to rule B and rule B does not apply, we say A **counterfeeds** B and this can be described by requiring B to precede A.

If Rule A removes potential inputs to rule B and B does not apply we say A **bleeds** B and this can be described by requiring A to precede B.

If rule A removes potential inputs to rule B and B does apply we say A **counterbleeds** B and this can be described by requiring B to precede A. e.g. flapping and shortening + raising before a voiceless consonant in English Canadian raising.

Kiparsky (1968) proposed that rules may diachronically change their order towards feeding and bleeding relations. These are situations in which each rule is true of the surface form.

Counterfeeding and counterbleeding create situations in which the earlier rule is not true of the surface form and hence “**opaque**”. One must undo the effects of the later rule to see the full effects of the earlier rule. It was suggested by Kiparsky (1971) that opacity was more difficult to learn. It would be interesting to revisit this question today with an artificial language learning experiment.

[6] Summary

The SPE model with ordered rewrite rules defined over sounds represented as distinctive feature matrixes showed that considerable analytic insight into the structure of a language could be obtained. Its concern with formal statements and explicit representations created a generative grammar: an input-output mechanism whose scope went well beyond mere summaries of the data in a corpus. Thus a scientific research program was created in which many new questions arise in extending the ordered rule format to more data both language-internally as well as cross-linguistically.

We sample here a few of the questions that arose.

[7] Multiple rule application

Vowel harmony is a challenge to the rewrite rule mechanism since the harmony may extend over an entire word, which can be very long in agglutinative languages such as Turkish

ılımlı-laş-tır-dık-lar-ımız-dan # mı-sın 'are you the ones who we made calm?'

sınırlı-leş-tir-dik-ler-imiz-den # mi-sin? 'are you the ones who we made angry?'

root-DER. Verb.-CAUS-NOM-PLU-1PLPOSS-ABL # Q-2SG

A. Turkish vowel harmony

| | <u>front</u> | | <u>back</u> | |
|---------|--------------|---|-------------|---|
| high | i | y | ɯ | u |
| mid/low | ɛ | œ | a | ɔ |

| <u>noun</u> | <u>pl.</u> | <u>his N.</u> | |
|-------------|------------|---------------|------------|
| dal | dal-lar | dal-ɯ | 'branch' |
| kɔl | kɔl-lar | kɔl-u | 'arm' |
| kuuz | kuuz-lar | kuuz-ɯ | 'daughter' |
| kul | kul-lar | kul-u | 'slave' |
| yel | yel-ler | yel-i | 'wind' |
| gœl | gœl-ler | gœl-y | 'sea' |
| dif | dif-ler | dif-i | 'tooth' |
| gyl | gyl-ler | gyl-y | 'rose' |

- roots contrast for eight possible vowels
- most suffixes contrast for just [\pm high]; values for [back] and [round] determined by harmony

[- cons] -> [α back] / [α back] Co __ (palatal harmony)

[- cons, + high -> [α round] / [α round] Co __ (labial harmony)

- what does grammar predict for 'his slaves'? it could be [kul-lar-ɯ] or [kul-lar-u] depending on whether the [round] value of the possessive suffix is determined by the vowel of the preceding syllable or the first vowel of the root.
- In fact it is [kul-lar-ɯ], suggesting that the harmony arises by successive applications of the rule over adjacent syllables, with one application creating the input to the next.

[8] A couple of examples of problems with this view

A. Istanbul Turkish (Kumbaraci 1966) [warning: I have not been able to confirm this data]

- raising and unrounding before palatals y, ʃ, dʒ

| <u>infin.</u> | <u>Imper.</u> | | <u>Standard written form</u> |
|---------------|---------------|-----------|------------------------------|
| ye-mek | yi-yin | 'eat' | yi Yin |
| üfü-mek | üfi-yin | 'be cold' | üs.üyün |
| oku-mak | oku-yun | 'read' | okuyun |
| sakla-mak | saklu-yun | 'hide' | saklayın |

[+syll] -> [+high, -round] / ____ [-syll, +high, -back, -round]

- problems in obtaining correct output (I denotes the "archiphoneme" [+high, 0back, 0round])

/okI-yIn/

oku-yun labial (and back) harmony

oku-yun derounding

/okI-yIn/

oku-yIn derounding

oku-yun labial (and back) harmony

- cycle

/okI-yIn/

okI stem cycle

oku labial (and back) harmony

----- derounding

oku-yIn word cycle

oku-yun labial (and back) harmony

oku-yun derounding

/okI-yIn/

okI stem cycle

----- derounding

oku labial (and back) harmony

oku-yIn word cycle

oku-yIn derounding

oku-yun labial (and back) harmony

- the local unrounding change before the palatal must be insulated from labial harmony imposed by the preceding vowel but the output of derounding triggers harmony on what follows
- how can we intercalate one rule inside another?
- one approach (inspired by Chomsky's (1979) strict cycle (cf. phase)) distinguished application within a stem and application across a boundary; once the stem application occurred, the rule could not return on a later cycle to undo the effects in prior cycle
- stem application would normally yield a constant shape for the stem in a paradigm while suffixes could alternate; due to this side effect, it was sometimes called the Alternation Condition (Kiparsky 1973)

| | |
|-----------|---|
| /okI-yIn/ | |
| okI | stem cycle |
| ----- | derounding |
| oku | labial (and back) harmony |
| | |
| oku-yIn | word cycle |
| oku-yIn | derounding |
| oku-yuun | labial (and back) harmony across boundary |
| oku-yun | blocked by strict cyclicity |
| oku-yun | blocked by locality |

another possible solution (based on Nevins 2010 Locality in Vowel Harmony)

- vowel harmony is not the change of following vowels based on the triggering vowel but unspecified (noncontrastive) features becoming specified through local agreement
- assimilation to consonant takes precedence since it is more local (adjacent)

| | |
|-----------|---------------------------|
| /okI-yIn/ | |
| oku-yIn | derounding |
| oku-yuun | labial (and back) harmony |

| | /okI-yIn/ | | /oku-yIn/ | | oku-yuun |
|-------|-----------|-------------|-----------|-------------|----------|
| high | - + + | --deround → | - + + | --harmony → | - + + |
| back | + 0 0 | | + 0 0 | | + + + |
| round | + 0 0 | | + - 0 | | + - - |

B. Chumash sibilant harmony (Poser 1982, 1993)

[1] ha-s-xintila his gentile ha-ʃ-xintila-waʃ his former gentile

p-ɨʃ-al-nanʔ don't you two go s-is-sili-uluaqpey-us they two want to follow it
 k-ʃapatu-tʃ I wear shoes cf. Spanish zapato
 ʃ-kamiʃa-tʃ he wears a shirt cf. kamisa

[2] anterior dissimilation cf. German¹

/s-nanʔ/ > ʃnanʔ he goes
 /s-tepuʔ/ ʃtepuʔ he gambles

[3] output of dissimilation does not undergo sibilant harmony

/s-ti-yep-us/ > ʃtiyepus he tells him

/s-ti-yep-us/
 stiyejus sibilant harmony
 ʃtiyepus dissimilation

[4] But the output of anterior dissimilation does trigger harmony to preceding sibilants

/s-is-tiʔ/ > ʃiʃtiʔ he finds it

[5] ordering paradox

/s-is-tiʔ/
 siʃtiʔ dissimilation
 ʃiʃtiʔ sibilant harmony

/s-ti-yep-us/
 stiyejus sibilant harmony
 ʃtiyepus dissimilation

- unlike in Turkish, [± anterior] is contrastive in Chumash affixes
- the harmony process might mask two changes: first neutralization of the [± anterior] contrast when followed by another sibilant in effect changing s and ʃ to S ([± anterior] > [0anterior]) followed by the anterior dissimilation and then the valuation of the 0's by harmony

¹ The underlying [+ anterior] for the 3 sg. subject/possessive is based on Beeler (1970: 16)

C. Kikerewe (Odden 2000, Bantu, Tanzania)

If rule iterates across a string, left-to-right vs. right-to-left application can maximize or minimize application of the rule (Kenstowicz & Kisseberth 1973, Howard 1973)

| | | | | |
|-------------|-----------------------|-----------------|-------------------------|-----------------|
| ku-bal-a | 'to count' | ku-bóh-a | 'to tie' | ku-bóh-á Bulemo |
| ku-bal-an-a | 'to count each other' | ku-bóh-án-a | 'to tie each other' | |
| ku-bal-il-a | 'to count for' | ku-bóh-él-a | 'to tie for' | |
| | | ku-bóh-él-an-a | 'to tie for each other' | |
| | | ku-bóh-á Bulemo | 'to tie Bulemo' | |

a -> á / á C₀ ____

á -> a / ____ pause a = any vowel

ku-twa:ng-il-a 'to pound for'

ku-tú-twá:ng-il-a 'to pound for us'

ku-té:k-él-a 'to cook for'

ku-tú-té:k-el-a 'to cook for us'

á -> a / á C₀ ____ Meeussen's Rule

/ku-tú-té:k-el-a/

ku-tú-te:k-el-a M's Rule

ku-tú-té:k-el-a H-doubling

ku-yílúch-a 'to chase'

ku-bá-yíluch-a 'to chase them'

ku-bá-tú-yilukizya 'to chase them for us'

/ku-bá-tú-yílukiza/ Right-to-left iteration leading to maximal application of rule

ku-bá-tú-yílukiza

ku-bá-tú-yílukiza

ku-bá-tú-yílukiza

ku-bá-tú-yílukiza

ku-bá-tú-yilukiza M's Rule applies

ku-bá-tu-yilukiza M's Rule applies

ku-bá-tu-yilukiza

- Left-to-Right application would incorrectly give minimal application: *ku-bá-tu-yílukiza
- High tone doubling applies minimally: right-to-left

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