# Faith-UO: Analyzing opacity in Harmonic Serialism

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## Introduction

- Harmonic Serialism (HS), a serial derivative of Optimality Theory, captures some aspects of rule ordering. Processes can apply before others through constraint ranking. Certain types of opacity are analyzable in HS (McCarthy 2000, Elfner 2009, Jarosz 2014).
- Counterfeeding opacity has continued to prove problematic.
- **Proposal:** a new class of faithfulness constraints which reference the underlying representation (UR) of forms within HS to account for opacity.

## Harmonic Serialism and counterfeeding opacity

- In HS, Gen is limited to candidates that differ from the input by at most one change.
- The output of Eval at one step is the input to the following step.
- HS can analyze certain types of opacity by forcing some processes to apply before others with constraint ranking.

(1) **Counterfeeding in Basque:** Low vowels become mid before vowels, mid become high, low do not become high. (Bakovic 2010)

a. /alab**a**-a/ → alab**e**-a ↛ *alab**i**-a
b. /sem**e**-e/ → sem**i**-e

(2) In rules:

a. **Mid to high raising:** e → i / _V
b. **Low to mid raising:** a → e / _V

- In rule ordering, (2-a) **must** precede (2-b) – (2-b) would feed (2-a) but does not. Rule (2-b) appears to have underapplied.
- **Counterfeeding is a problem:** HS predicts /alaba-a/ → alabe-a → alabi-a.

## The proposal: Faith-UO

- **Faith-UO:** a set of constraints demanding faithfulness between UR and output.

(3) **ID-UO($F$)/[$\alpha G$]**
Do not change the value of $F$ for segments that are [$\alpha G$] in the UR.

(4) **ID-UO($F$)/_[$\alpha G$]**
Do not change the value of $F$ for segments that are **in the environment of** [$\alpha G$] in the UR.

- **Example:** For Basque,

(5) **ID-UO(hi)/[+low]:** Do not change the value of [$\alpha$ hi] for segments that are [+low] in the UR.

- Referring to the UR at every step of the derivation captures the idea that speakers have access to the lexicon throughout the stages of a phonological derivation.
- $F$ and $G$ cannot be identical – this is true for any OT-based analysis of counterfeeding.

(6) **General constraint ranking for counterfeeding**:
Faith-UO >> Markedness >> Faith-IO

## Analysis with Faith-UO: CF on focus

- **Basque: Low becomes mid, mid doesn't become high:**
/alab**a**-a/ → alab**e**-a ↛ *alab**i**-a

(7) **Step 1:** /alab**a**-a/ → alab**e**-a

| /alaba-a/ | ID-UO(hi)/[+low] | *low/_V | *mid/_V | ID-IO(hi) |
|---|---|---|---|---|
| → alabe-a | | | | * |
| alaba-a | | * ! | | |

(8) **Step 2:** alab**e**-a ↛ *alab**i**-a

| /alaba-a/ alabe-a | ID-UO(hi)/[+low] | *low/_V | *mid/_V | ID-IO(hi) |
|---|---|---|---|---|
| → alabe-a | | | * | |
| alabi-a | * ! | | | |

- /sem**e**-e/ → sem**i**-e

(9) **Step 1:** /sem**e**-e/ → sem**i**-e

| /seme-e/ | ID-UO(hi)/[+low] | *low/_V | *mid/_V | ID-IO(hi) |
|---|---|---|---|---|
| → semi-e | | | | * |
| seme-e | | | * ! | |

- **Counterfeeding opacity as contrast preservation:** Underlying vowel height contrast between /a/ and /e/ is preserved as a contrast between /e/ and /i/ in ouput forms.
- **Faith-UO constraints derive contrast without explicitly requiring it.**
- **Can analyze all known examples of counterfeeding, including multi-step counterfeeding derivations.** These incorporate multiple Faith-UO constraints.
- **Nzebi:** Low becomes mid lax, mid lax becomes mid tense, mid tense becomes high (Kirchner, 1996)

(10) /sa̲l/ → sɛ̲l ↛ se̲l ↛ si̲l
/bɛ̲d/ → be̲d ↛ *bi̲d
/be̲t/ → bi̲t

(11) Constraints required:
ID-UO(ATR)/[+low]
ID-UO(hi)/[-ATR]

(12) **Step 2:** /sa̲l/ → sɛ̲l ↛ se̲l ↛ si̲l

| /sal/ sɛl | ID-UO(ATR)/[+low] | ID-UO(hi)/[-ATR] | Raise | ID-IO(hi) | ID-IO(ATR) |
|---|---|---|---|---|---|
| → sɛl | | | * | | |
| sel | *! | | | | * |
| sil | *! | * | | * | * |

## Analysis with Faith-UO: CF on environment

- **Lomongo:** deletion counterfeeds gliding (Bakovic 2010)

(13) a. /o-**b**ina/ → o-ina ↛ *w-ina
b. /**o**-isa/ → **w**-isa

(14) **ID-UO(voc)/_[+voi,−son]:** Do not change the value of [$\alpha$ vocalic] for segments that occur before [+voi,−son] in the UR.

## Analysis with Faith-UO: CF on environment (continued)

- /o-**b**ina/ → o-ina ↛ *w-ina

(15) **Step 1:** /o-**b**ina/ → o-ina

| /o-bina/ | ID-UO(syll)/_[+voi,−son] | *[+voi,−son]/V_V | *Hiatus | Max |
|---|---|---|---|---|
| → o-ina | | | * | * |
| o-bina | | * ! | | |

(16) **Step 2:** o-ina ↛ *w-ina

| /o-bina/ o-ina | ID-UO(syll)/_[+voi,−son] | *[+voi,−son]/V_V | *Hiatus | Max |
|---|---|---|---|---|
| → o-ina | | | * | |
| w-ina | * ! | | | |

- /**o**-isa/ → **w**-isa

(17) **Step 1:** /o-isa/ → w-isa

| /o-bina/ | ID-UO(syll)/_[+voi,−son] | *[+voi,−son]/V_V | *Hiatus | Max |
|---|---|---|---|---|
| → w-isa | | | | |
| o-isa | | | * ! | |

## Comparison with other analyses

- Lubowicz (2003): Counterfeeding analyzed through constraints which specifically demand contrast preservation. In our system, contrast is emergent.
- OT-CC (McCarthy 2010): Has access to all steps of the derivation simultaneously through candidate chains. Our approach is more local to each step of the derivation in HS and does not utilize look-ahead.

## Implications

- Faith-UO constraints permit the analysis of counterfeeding opacity in HS by requiring faithfulness to a particular feature in a particular class of segments in the UR.
- **Emergent contrast:** Because the constraints require faithfulness to a feature of the UR, they effectively require preservation of an underlying feature contrast. Contrast preservation is an emergent property of a system with Faith-UO constraints.
- **Prediction:** There should be no counterfeeding which manipulates noncontrastive features, such as stress (in some cases), allophonic alternations, or syllable structure, since these elements are not in the UR. To our knowledge, this prediction is observed.

## Conclusion

- **Proposal:** a new set of constraints in HS that accounts for cases of CF opacity. Faith-UO constraints demand faithfulness to the underlying representation at all stages of the derivation.
- **Results:** CF opacity analyzed in HS, contrast emerges from constraint interaction, no separate grammatical framework for contrast is needed.

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