**Positional Faithfulness, Non-locality, and the Harmonic Serialism Solution**

Karen Jesney, University of Massachusetts Amherst

**Overview:** This paper demonstrates that output-oriented Positional Faithfulness constraints (Beckman 1998) can induce a range of unnatural non-local effects in parallel Optimality Theory (Prince & Smolensky 1993/2004, McCarthy & Prince 1995). After identifying the conditions under which these patterns to arise, I argue that they can only be avoided if prosodification exists at some level prior to the output and positional faithfulness constraints reference this level. OT with Harmonic Serialism (McCarthy 2006, 2007a,b, Prince & Smolensky 1993/2004) offers a straightforward solution that avoids the pitfalls of other approaches while retaining the desirable optimization properties of standard OT.

**Unnatural patterns:** Output-oriented Positional Faithfulness constraints can cause underlying featural contrasts to be opaquely displaced onto the output prosodic structure; the contrastive syllabification pattern identified in Beckman (1998: 37fn) is one example, but, as I show, there are many others. In each case, these unnatural patterns arise when a positional faithfulness constraint and a conflicting featural markedness constraint dominate the constraints responsible for default prosodification or segment preservation (see 1). The tableaux in (2) provide an illustration. The language here normally parses syllables into consistent binary trochaic feet, based on high-ranking *CLASH / *LAPSE (not shown) and the TROCHEE >> IAMB ranking. These structural constraints are dominated by the output-oriented positional faithfulness constraint IDENT[±ATR]/STRESS and the conflicting featural faithfulness constraint *[-ATR], however. As a result, when the input form contains a [-ATR] vowel in an odd-parity syllable, the default trochaic pattern is overridden; the word is parsed into iambs, and the vowel is realized unfaithfully as [+ATR]. The iambic parsing ensures that the unfaithful /+ATR/→[-ATR] mapping occurs on an unstressed vowel, preventing violation of high-ranking IDENT[±ATR]/STRESS (2a). This marked iambic footing only proves optimal, however, when there are more underlying [-ATR] vowels in odd-parity syllables than in even-parity syllables. In (2b), for example, there is no advantage to iambic footing and the word receives a trochaic parse with output stressed vowels realized faithfully as [-ATR] (2b). The footing in this language is, at every point, determined by the number of [-ATR] vowels in odd- and even-parity syllables throughout the word – a non-local, opaque, and highly-unnatural effect.

**Harmonic Serialism solution:** Unnatural patterns of this type arise because output-oriented positional faithfulness constraints are vacuously satisfied when the locus of the unfaithful mapping is not in a privileged position in the *output*. Given that candidates differ in their output prosodification, marked prosodic patterns can emerge as optimal when this allows for such vacuous satisfaction. Excluding these unnatural mappings requires a stable level of prosodification prior to the output that can serve as a consistent basis for defining privileged positions. Simply referring to a prosodified input is not adequate, however, as this prevents transparent application of processes in cases where the prosodic structure independently changes between the input and the output. OT with Harmonic Serialism (HS) offers a solution. In HS candidates are generated gradually in a series of steps, with GEN restricted to performing a single harmonically-improving operation at a time (McCarthy 2006, 2007a,b). I propose that domains of privilege are defined based on these *intermediate* steps, and can therefore change as the derivation proceeds. A reanalysis of the example from (2) is sketched in (4). The first step in the derivation is an initial prosodification, giving (ˈpe.te)(ˈpɛ̲.te) in (4a). The stress profile of (ˈpe.te)(ˈpɛ̲.te) identifies the first and third syllables as privileged for the next step. The iambic form (pe.ˈte)(pe.ˈte) – the winner in (2a) – consequently incurs a fatal violation of high-ranking IDENT[±ATR]/STRESS, and is excluded from the derivation. The faithful parse is ultimately the most harmonic alternative. A similar pattern is seen in (4b). Here, the initial prosodification is (ˈpe.tɛ̲)(ˈpɛ̲.tɛ̲), again identifying the odd-parity syllables as privileged. At the next step, the [-ATR] specification of the second vowel is altered, but the stress pattern and resulting domains of privilege are unchanged. The derivation proceeds until no further harmonically-improving steps are possible. The constraint hierarchy in (4) is the same as in (2), but the unnatural patterns seen in parallel OT are not generated here, nor can they be under any ranking of these constraints in HS. The reference to intermediate forms made possible by HS prevents these non-local and unnatural opaque effects from emerging, providing a novel argument for Harmonic Serialism.

(1) *General ranking to induce opaque, non-local positional faithfulness effects*
Positional Faithfulness >> Featural Markedness >> Default structure constraints - e.g., TROCHEE, MAX

(2) a. *Trochees are normally preferred ... except when odd-parity syllables contain input [-ATR] vowels - then iambs are optimal (only candidates satisfying *CLASH, *LAPSE, PARSE-σ and MAX are included)*

| /petepɛte/ | IDENT[±ATR]/STRESS | *[-ATR] | IDENT[±ATR] | TROCHEE | IAMB |
|---|---|---|---|---|---|
| ('pe.te)('pɛ.te) | | *! | | | ** |
| (pe.'te)(pɛ.'te) | | *! | | ** | |
| ('pe.te)('pe.te) | *! | | * | | ** |
| ☞ (pe.'te)(pe.'te) | | | * | ** | |

b. *... unless more even-parity vowels are [-ATR] in the input - then trochees are again preferred*

| /petɛpɛtɛ/ | IDENT[±ATR]/STRESS | *[-ATR] | IDENT[±ATR] | TROCHEE | IAMB |
|---|---|---|---|---|---|
| ('pe.tɛ)('pɛ.tɛ) | | ***! | | | ** |
| (pe.'tɛ)(pɛ.'tɛ) | | ***! | | ** | |
| ☞ ('pe.te)('pɛ.te) | | * | ** | | ** |
| (pe.'tɛ)(pe.'tɛ) | | **! | * | ** | |
| ('pe.te)('pe.te) | *! | | *** | | ** |
| (pe.'te)(pe.'te) | **! | | *** | ** | |

(3) *Mappings in (2) form an unnatural chain shift:* petɛpɛtɛ ●⟶ petepɛte ●⟶ petepete

(4) a. *Trochees are preferred, with odd-parity vowels preserving their underlying specification for [±ATR]*

| /petepɛte/ | IDENT[±ATR]/STRESS | *[-ATR] | IDENT[±ATR] | TROCHEE | IAMB |
|---|---|---|---|---|---|
| ('pe.te)('pɛ.te) *initial footing... is **more** harmonic than:* | | * | | | ** |
| (pe.'te)(pe.'te) | * | | * | ** | |

***Winning chain:*** **<petepɛte, ('pe.te)('pɛ.te)>**

b. *... regardless of the distribution of [-ATR] vowels in the input*

| /petɛpɛtɛ/ | IDENT[±ATR]/STRESS | *[-ATR] | IDENT[±ATR] | TROCHEE | IAMB |
|---|---|---|---|---|---|
| ('pe.tɛ)('pɛ.tɛ) *initial footing... is **less** harmonic than:* | | *** | | | ** |
| ('pe.te)('pɛ.tɛ) *is **less** harmonic than:* | | ** | * | | ** |
| ('pe.te)('pɛ.te) *is **more** harmonic than:* | | * | ** | | ** |
| (pe.'te)(pe.'te) | * | | *** | ** | |

***Winning chain:*** **<petɛpɛtɛ, ('pe.te)('pɛ.te), ('pe.te)('pɛ.tɛ), ('pe.te)('pɛ.te)>**

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