

Phonological reflexes of movement in morphology: An argument for Harmonic Serialism

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1. *Goal* We argue that instances of seemingly non-local phonological operations triggered by inflectional exponents provide evidence for movement in morphology; and we show that an approach to inflectional morphology based on harmonic serialism, a strictly derivational version of optimality theory (McCarthy (2016), Müller (2020)), systematically predicts such movement to take place, and is thus supported by these phonological reflexes of moved exponents.

2. *Data* Phonological operations triggered by inflectional exponents that are non-local on the surface have been observed in a number of languages. We will address de-spirantization apparently triggered by non-local agreement exponents across a remote marker *wa* in Barwar Aramaic (Khan (2008)); Saussurean accent shift apparently triggered by non-local person/number exponents across a theme vowel in Lithuanian (Kushnir (2018)); *ni*-insertion apparently triggered by non-local possessive markers across *lla* ('just') in Quechua (Myler (2013)); non-local *ruki* rule application in verbal forms across a past augment *a* in Sanskrit (Kiparsky (1982)); and vowel harmony apparently applying with non-local Q morphemes across an instrumental affix *men* in Kazakh (Bowman & Lokshin (2014)). These phenomena instantiate the abstract pattern in (1), with the phonological operation involving the stem S and the inflectional exponent A. Here, the order S A B in (1a) is what is expected if the phonological operations apply strictly locally, under adjacency; it is also the order that corresponds to standard assumptions about the sequence of functional categories (f-seq, Starke (2001)) for α and β , given some version of the Mirror Principle. However, the surface linearization in all the relevant cases is S B A, as in (1b).

- (1) a. [s [S A $_{\alpha}$] B $_{\beta}$]
b. [s [S] B $_{\beta}$ [A $_{\alpha}$]]

3. *State of the art* So far, essentially two kinds of analyses have been suggested for the pattern in (1): non-local phonology and interfixation. According to the first approach, phonological operations can apply non-locally (Bowman & Lokshin (2014), Myler (2017)); and only (1b) does in fact exist. However, these approaches overgenerate since the phonological processes in the cases at hand can all be shown to be strictly local otherwise. According to the second approach, there is initially a structure S A that serves as the input to the phonological operation (which is thus local), and an operation of interfixation then counter-cyclically puts B between S and A, yielding S B A (Hyman (1994; 2002; 2003); Kiparsky (1982; 2017); Myler (2013); Kushnir (2018)). However, these kinds of proposals are fundamentally incompatible with all versions of the Strict Cycle Condition (Chomsky (1973; 1995; 2001; 2019)); and they also lead to overgeneration. In view of this, we will pursue what strikes us as the classical hypothesis in grammatical theory to account for structural paradoxes of this type: The exponents S and A are adjacent at the point where the phonological operations mentioned above take place (1a), but A ends up in a non-local position as a consequence of subsequent *movement* (1b). As it turns out, movement of inflectional exponents is predicted without further ado if standard parallel optimality-theoretic approaches to affix order are transferred to harmonic serialism.

4. *Inflectional morphology in harmonic serialism* Harmonic serialism (McCarthy (2016)) is a cyclic version of optimality theory where generation and harmony evaluation alternate constantly: Given an initial input, competing output candidates are generated that differ from the input by application of *at most one operation*. The optimal output then forms the input for the next generation procedure, and so on; this way the overall constraint profile is gradually improved. Once improvement is not possible anymore, the derivation converges. In Müller (2020), the outlines of a harmonic serialist approach to inflectional morphology are developed. A basic assumption is that exponence in inflectional morphology involves structure-building via Merge (Alexiadou & Müller (2008), Bruening (2017)), rather than substitution transformations applying

to terminal nodes (Halle & Marantz (1993)) or entire subtrees (Ackema & Neeleman (2004), Caha (2013)); such structure-building takes place in a pre-syntactic autonomous morphological component. Initially, a stem is taken from the lexicon with its inherent features, and enriched by non-inherent features, yielding a fully specified feature matrix (comparable to the paradigm cell, or a syntactic insertion context in other approaches). Triggered by high-ranked Merge Conditions (MCs) for structure-building features [$\bullet\alpha\bullet$], [$\bullet\beta\bullet$], etc., inflectional exponents of type [α], [β], ... are then successively merged with the stem, thereby eventually generating whole words, as in (1). The morphological categories [α], [β], involved here are determined by *morphological arrays*, i.e., sets of exponents connected by shared morpho-syntactic features. In addition to MCs, there are alignment constraints determining the order of exponents (Trommer (2001; 2008), Ryan (2010)). Finally, the fully inflected word is transferred to the syntactic component, which cannot see the internal structure of the word generated in the morphological component but can access all the morpho-syntactic features associated with the stem, and carry out Agree operations with them (Chomsky (2001), Bruening (2017)).

5. Morphological movement This approach automatically predicts the existence of movement of morphological exponents in words. Morphological movement will almost invariably arise when the ranking of two MCs (itself determined by f-seq) is identical to the ranking of the respective alignment constraints, but not if the two rankings diverge. In (2), $\alpha \Rightarrow R$ and $\beta \Rightarrow R$

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| (2) a. $MC(\alpha) \gg MC(\beta) \gg L \Leftarrow S \gg \beta \Rightarrow R \gg \alpha \Rightarrow R$ | demand right-alignment (suffixation) |
| b. $MC(\alpha) \gg MC(\beta) \gg L \Leftarrow S \gg \alpha \Rightarrow R \gg \beta \Rightarrow R$ | of α - and β -exponents, respectively;
and a higher-ranked ban on prefixa- |

tion $L \Leftarrow S$ ensures that neither the α -exponent nor the β -exponent can ever show up as a prefix of the stem S in the course of the derivation. Given (2a), an inflectional exponent A_α is first merged with a stem S as a suffix ($MC(\alpha)$ is ranked highest); next, B_β is merged with the extended stem as a suffix (thereby producing a violation of lowest-ranked $\alpha \Rightarrow R$); and then the derivation converges, yielding $S A_\alpha B_\beta$. In contrast, given (2b), A_α is again merged as a suffix first; next, B_β is again merged as a suffix at the current stem, yielding $S A_\alpha B_\beta$; but this time the derivation cannot yet converge: A_α has to move across B_β in a third step so as to improve the constraint profile further (because $\alpha \Rightarrow R$ outranks $\beta \Rightarrow R$), thereby producing the linear order $S B_\beta A_\alpha$. Note that merging B_β between S and A_α in the second step would satisfy the higher-ranked alignment constraint directly; but this is ruled out by the Strict Cycle Condition.

6. Proposal At this point, all the necessary assumptions for an analysis of the initially surprising phonological processes in Barwar Aramaic, Lithuanian, Quechua, Sanskrit, and Kazakh based on linearization changes resulting from movement are in place, except for one: It needs to be determined when phonological operations can take place in harmonic serialist derivations. We would like to suggest that phonological operations apply to the output of a morphological cycle, and that there are *two* morphological cycles: The first morphological cycle (or ‘phase’; Marvin (2002), Embick (2010)) is finished when all MC-triggered Merge operations have applied, and the morphological arrays are exhausted (intuitively, this is the stage where the word is potentially complete for the first time). After this, a first phonological cycle is triggered, which locally produces the phonological effects at hand. Then, the morphological derivation continues by (i.a.) carrying out alignment-driven movement. The second morphological cycle is finished when the derivation has converged on a final output, and triggers a second phonological cycle.

7. Outlook Finally, we briefly compare our proposal to potential movement-based alternatives in Distributed Morphology. It turns out that whereas a constraint-based view of triggers for morphological movement can in principle also be adopted here (Embick & Noyer (2007), Arregi & Nevins (2012)), standard assumptions about the order of linearization and vocabulary insertion make it impossible to straightforwardly derive the data as phonological reflexes of movement.

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