Computational accounts of human learning bias: Implications for locality in ABC

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In terms of computational language theory, attested consonant harmony and dissimilation patterns can be situated within the subregular hierarchy (McNaughton & Papert 1971, Rogers & Pullum 2011) as Strictly Local, Strictly Piecewise, or Tier-based Strictly Local languages (Heinz 2010, Heinz et al. 2011). However, several unattested patterns, though still subregular, are outside of these language classes, suggesting that language learners have a hypothesis space that is restricted to a particular subset (or subsets) of subregular patterns. Indeed, experimental evidence suggests that humans are equipped with certain learning biases that allow some patterns to be more easily learned than others (e.g. Lai 2012, Finley 2011, 2012, Moreton 2012). These biases tend to reflect the typology of long-distance phonotactics as well as the properties of computational algorithms that can learn non-adjacent interactions (Heinz 2010).

The computational approach to learnability should be informing theories of phonology, but in doing so, Agreement by Correspondence is faced with at least one problem. Locality in ABC is often addressed with a constraint that penalizes correspondence outside of a transvocalic (or syllable-adjacent) window, allowing for systems with either transvocalic or unbounded harmony, but nothing else. Such a constraint (e.g. PROXIMITY in Rose & Walker 2004; CC-SYLLADJ in Bennett 2013) is supported by a typologically attested dichotomy (Hansson 2010, Rose & Walker 2004) as well as experimental results showing that humans can only learn these two types of harmony (Finley 2011, 2012, McMullin & Hansson 2013). However, the use of this constraint in a surface correspondence approach to dissimilation (Bennett 2013) makes some counterintuitive predictions. For example, one constraint ranking produces a language that dissimilates only when at least two vowels separate potential correspondents, but that stays faithful in local contexts. This is potentially problematic, since it is not clear whether any such cases are attested in the typology (though for Sundanese, see Bennett 2013). Furthermore, the pattern is computationally quite complex. Specifically, I will show that it is Tier-based Locally Threshold Testable and therefore outside of any region that has previously been proposed as a set of humanly learnable phonotactic patterns. Similar problems arise from constraints that penalize correspondence outside of a morphological domain or in mismatched syllabic positions. Since a factorial typology predicts languages that are incompatible with computational learning algorithms, I will argue that we should consider alternatives to the treatment of locality in ABC, or at least have a theory of why certain constraint rankings might be unlearnable.

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