What emerges from Merge in phonology?

Bridget Samuels & Cedric Boeckx

Harvard University

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Structure of the talk

1. Phonological framework
2. Why phonology is different
3. The PF interface & Merge’s consequences
4. Conclusions
Representations

- Representations must be flat for transduction by phonetic system
- Chunking and re-concatenation give the illusion of hierarchy
- 3-D structures (loops) introduced by morphosyntax are repaired immediately

\[ \# \rightarrow p \rightarrow u \rightarrow k \rightarrow \% \]  
\[ /puhk/ \]
Phonology is a system of abstract symbol manipulation (‘substance free’) consisting of ordered rules.

SEARCH provides a means by which two elements in a phonological string may establish a probe-goal relation.

COPY takes a single feature value or bundle of feature values from the goal of a SEARCH application and creates a copy of these feature values to the initiator.

DELETE removes an element from the derivation.
Some searches are triggered by the need to find feature values for underspecified segments, following Mailhot & Reiss (2007) for vowel harmony (also Samuels In press).

Other searches are triggered by the need to establish precedence relations between morphemes to be concatenated.

Search and subsequent phonological operations can be seen as ‘interface-driven repair’ in a quasi-Calabresean sense.

Contra Pinker & Jackendoff (2005), very few—if any—phonological operations/representations are unique to humans or to language. Phonology provides an example of a domain-general solution to a domain-specific problem.
Traditionally, we focus on UG and input. But:

“In recent years this picture has been augmented by a third type of factor: general principles of biological/physical design. [...] A particularly welcome effect produced by this shift of focus is that we may now reassess the issue of formal similarities and dissimilarities between syntax and phonology. For many years, the dominant view has been that syntax and phonology are fundamentally different. [...] But general principles of design may very well be active in syntax and phonology in similar ways.” (van Riemsdijk 2008:227)
Minimalist pursuits appear to lead to the hypothesis that there is a deep asymmetry between the mapping from syntax to meaning and the mapping from syntax to sound/sign.

Chomsky (2008): Phonology is an ‘ancillary’ module “doing the best it can to satisfy the problem it faces: to map to the SM interface syntactic objects generated by computations that are ‘well-designed’ to satisfy C-I conditions” but unsuited to communicative purposes.

Still, Minimalist re-definition of phonology & syntax makes them more commensurable
In syntax, the fundamental operation is Merge (combine $\alpha$ and $\beta$ symmetrically; ‘set-Merge’)

In phonology, objects are joined via Concatenate (asymmetrically add $\alpha$ to $\beta$) — akin to adjunction (‘pair-Merge’).

Iterative applications of Concatenate yield a flat linear structure; Merge yields a nested hierarchical structure.

\[
\# \rightarrow \alpha \rightarrow \beta \rightarrow \gamma \rightarrow \delta \rightarrow \% \quad \text{vs.} \quad \{\delta, \{\gamma, \{\beta, \alpha\}\}\}
\]

\[
\begin{tikzpicture}
\node (delta) {$\delta$} ;
\node (gamma) [below of=delta] {$\gamma$} ;
\node (beta) [below of=gamma] {$\beta$} ;
\node (alpha) [right of=beta] {$\alpha$} ;
\draw (delta) -- (gamma) ;
\draw (gamma) -- (beta) ;
\draw (beta) -- (alpha) ;
\end{tikzpicture}
\]
- Syntactic structures must be linearized, but linear precedence is a primitive in phonology.
- Since phonology lacks Merge, it also follows that it lacks internal movement, which is a subspecies of Merge (Chomsky 2004).
- Merge allows underspecification to be repaired

$$\text{sap - l}_r \text{- n} + \text{SEARCH into root + COPY to affixes } \rightarrow [\text{saplain}]$$
Samuels (In progress): phonology is cyclic; this is the *direct consequence* of cyclicity (=phases) in syntax. This is the “best-case scenario” (Chomsky 2004:107):

“Assume that all three components [syntax, semantics, & phonology] are cyclic, a very natural optimality requirement and fairly conventional. [...] In the best case, there is a single cycle only.”

Not only may this solution be computationally efficient, it also allows us to recognize the important contributions of cyclic models of phonology since Chomsky et al. (1956).
Marvin (2002:74): “If we think of levels in the lexicon as levels of syntactic attachment of affixes, we can actually say that Lexical Phonology suggests that phonological rules are limited by syntactic domains, possibly phases.”

Strong claim: morpheme-level phases replace LPM’s hierarchy of strata; clause-level phases replace the prosodic hierarchy

**Phase Impenetrability Condition (Chomsky 2001)**

For \([ZP Z \ldots [HP \alpha [H YP]]]]\): The domain of \(H\) is not accessible to operations at \(ZP\), but only \(H\) and its edge.
If all terminals (i.e., n, a, v) are phase heads and the PIC holds:

1. Merge (β, α): α accessible to β.
2. Merge (γ, βP): β accessible to γ. α transferred.

⇒ domains of lexical rule application
If $\gamma$ and $\epsilon$ (i.e., C, D, $\nu$) are phase heads and the PIC holds:

```
\epsilon P
```

$\epsilon$ \gamma P

$\delta$ \gamma

$\gamma$ $\beta$ P

$\beta$ $\alpha$

1. Merge ($\beta, \alpha$): $\alpha$ accessible to $\beta$.
2. Merge ($\gamma, \beta$ P): $\beta$, $\alpha$ accessible to $\gamma$.
3. Merge ($\delta, \gamma'$): $\gamma$ accessible to $\delta$.
4. Merge ($\epsilon, \gamma$ P): $\delta$, $\gamma$ accessible to $\epsilon$. $\beta$ P transferred.

$\Rightarrow$ domains of post-lexical rule application
To illustrate, consider obligatory I-Phrase domains (Selkirk 2005):

- appositive
- parenthetical
- adjunct
- non-restrictive relative clause
- conjoined clause
- heavy fronted constituent
- focused element

pair Merge
pair Merge
pair Merge
pair Merge
pair Merge
higher than C
higher than C
I-phrase (= clause-level phase) domains are relevant for
- Nuclear stress assignment (Kahnemuyipour 2004)
- Post-lexical segmental rules (Seidl 2000, 2001)
- Tone sandhi rules & boundary tones
- Clitic placement
- Viability of null-C clauses (An 2007a,b)
Morpheme-level phase domains are relevant for

- Semantic interpretation (Marantz 2001, Embick 2008)
- Allomorphy & suppletion (Embick 2008)
- Stress placement within words (Marvin 2002, Newell 2008)
- Lexical rule application (Pak 2008)

**Prediction:** If no derivational morphology, then no lexical phonology. This appears to be borne out by Al-Sayyid Bedouin SL (Sandler 2008)
Conclusions

- Lack of Merge outside of syntax explains why phonology is ‘flat’
- Still, phonology does not escape Merge’s effects
- Merge allows underspecification to be repaired
- Phonology & syntax are linked by the phase cycle
  \[ \Rightarrow \] no prosodic structure building at PF (direct reference)
- Q: If phonology is just search, copy, delete, concatenate, animals can do all this (Samuels 2008).
  What is the difference between that system and that + syntax?


