# Procedural first

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Many phonological phenomena are conditioned by extra-phonological, especially morpho-syntactic information. The goal of this talk is to suggest that whenever there are concurrent representational and procedural solutions for the transmission of morpho-syntactic information, advantage is to be given to the latter. Indeed, we argue that procedural analyses allow for a control outside of the phonology since they make predictions on the morpho-syntactic side, while representational analyses by definition never engage any morpho-syntactic property. In short, thus, we propose that the most convincing argument for or against an analysis that involves phonological interface phenomena will be extra-phonological.

Since SPE and in all subsequent interface theories, morpho-syntax may use two means of talking to the phonology: representational (boundaries such as "#" in SPE, the Prosodic Hierarchy later on) and procedural (the transformational cycle in SPE, today known as phase theory, Chomsky 2001). Is there a way to determine exactly which phenomenon can/must be handled procedurally or representationally? As far as we can see, this question has never been addressed, probably because the minimal tool required is not available: an exhaustive classification of interface phenomena. On the basis of Kenstowicz & Kisseberth (1977:83ss), we build such a typology: given two morphemes M1 and M2, their concatenation may either block or trigger a process that would apply if the morpho-syntactic division were not there. Classical cases such as English nasal assimilation (iM-possible vs. uN-predictable) fall into the former (blocking, which we call type A), others such as English angma (sing, sing-er [ŋ] vs. finger, long-er [ŋg]) fall into the latter (triggering, type B). Both govern the *applicability* of a phonological process (which does or does not go into effect). Another class, typically involving stress (párent, parént-al vs. párent-hood), has a morpho-syntactic conditioning that determines *how* the process applies (rather than whether it applies): stress is always placed, but differently according to extra-phonological information (type C process).

This typology addresses a class of phonological processes that has traditionally given rise to procedural treatments: so-called stratal phenomena (i.e involving different affix classes). Importantly, all stratal phenomena fall into either of the three classes. From a more general perspective, however, there are also phonological processes that are sensitive to extra-phonological information which lie outside of the stratal realm. All processes that make reference to edges fall into this category (i.e. final devoicing, restrictions on word-initial clusters etc.). These non-stratal phenomena are handled representationally: nobody has ever tried to define the "end of the word" procedurally. Above the word level, i.e. where syntax conditions phonology, the same holds true: only the Prosodic Hierarchy, a representational device, is used. Except for intonation, which requires procedural (and recursive) treatment.

The overall situation is thus is as follows: intonation is only procedural, all other non-stratal phenomena are undisputedly representational, while both representational and procedural solutions have been proposed for stratal phenomena. We review the treatment of the latter in various interface theories: SPE, Lexical Phonology and OTed versions thereof (Stratal OT, DOT, in the sense that they take over level ordering), Prosodic Phonology and its incarnations in OT, Government Phonology and Distributed Morphology. We then show that all types (A, B, C) can be done purely procedurally, but not purely representationally.

The only category that seems to resist this generalisation is a sub-class of type A, i.e. where a phonological process is blocked but applies to an affix (rather than to a stem). The aforementioned nasal assimilation is a case in point. On the classical representational analysis, *un-* is mapped into a Prosodic Word (PW) of its own ([un]$_{pw}$[predictable]$_{pw}$), while *in-* is merged with the PW of the stem ([in-possible]$_{pw}$). The assimilation rule, then, applies only within a PW. On the other hand, the only way to prevent a process from applying when using only the tools of phase theory is through phase

impenetrability (the following is a strong version): a string already interpreted on a previous phase cannot be modified upon later interpretation. In our example, the fact that *un-* does not assimilate thus means that it must already have been interpreted at PF by the time it is sent off for interpretation together with the stem. In other words, *un-*, but not *in-*, sits in a phase of its own. [Note that there is an alternative procedural analysis that relies on selective rule application, i.e. the classical Lexical Phonology stance whereby different rules apply at different levels (phases). We reject selective rule application on independent grounds, to be made explicit.] The trouble with the claim that *un-* is spelled out alone before it is interpreted together with its stem is that on regular grounds this would mean that it is lower in the tree than its stem - an absurd claim.

However, the PW analysis makes no claim regarding the morpho-syntactic properties of the affixes involved; it can run with any derivational history of *in-* and *un-*. Any morpho-syntactic contrast between both affixes is thus unexpected and unexplained. Contrary to that scenario, *un-*, but not *in-*, is invisible for comparative allomorphy selection, allowing for *unlikelier (likelier)*, vs. *\*impoliter (politer, more impolite)*. Hence not trying to derive the phonological contrast from the morpho-syntactic properties of the affixes is missing a generalisation that representational solutions by definition are unable to offer a unified treatment of.

The procedural alternative not only can derive all effects from one single source; it also makes a prediction: recent work on the syntax-phonology interface suggests that the status of a phrase as an adjunct (or subject) entails interpretation at PF prior to merger into the core syntactic tree (e.g. Uriagereka 1999, Stepanov 2001). Adjuncts are therefore a separate phase, in the terminology of Chomsky (1995 and subsequent work). This is precisely the situation that we have described for *un-*, which thus turns out to be a (morphological) adjunct. Hence its spellout prior to PF interpretation together with the stem is not obnoxious anymore.

We show that this insight prompts several independent benefits. For one thing, it offers a solution for the well-known bracketing paradox of the aforementioned *unlikelier*: *-er*, which selects maximally bisyllabic stems, can attach because *un-* is absent when suffixation takes place. This is because *un-*, like phrasal adjuncts (Lebeaux 1988, Stepanov 2001), is merged counter-cyclically. By contrast, *in-* is present upon suffixation and thus blocks the derivation.

That this derivation is not possible with *in-* tracks other differences between the two affixes, namely category selection. *Un-*, as opposed to *in-*, adjoins to various syntactic categories: verbs (*unlock, \*inlock*), nouns used as adjectives (*unBob* ('That was so unBob of Bob' *\*inBob)* and adjectives (*unhappy, intolerable)*, while *in-* only merges with adjectives. This follows from the fact that *in-*, being a non-adjunct, projects adjectival features, while *un-*, being an adjunct, extends the base to which it attaches.

Other morphological adjunction phenomena such as double affixation in cases like *eater upper* (vs. *\*eater up*, *\*eat upper*) are covered by the same analysis. Here the particle is argued to adjoin counter-cyclically. The derivation therefore includes an interruption of the one-to-one mapping between linear proximity and hierarchical structure of affixes, inducing re-spellout of the agentive morpheme.

Finally, we address a number of objections that may be raised. 1) Counter-cyclic merger is contra the widely held Extension Condition (Chomsky 1995). However, it has been argued by many (Lebeaux 1988, Stepanov 2001, among others) to account for adjunction anomalies in a uniform manner; we are therefore inclined to consider it as a principled exception to merger at the root node of a syntactic tree. 2) Also, it can be argued that in fact there are two distinct *un-*'s: *un-* appears to be negative when combined with an adjective, but reversative when combined with a verb. We argue that the meaning of *un-* is reversative even in combination with an adjectival host (Kennedy 1997). Therefore all instances of *un-* are one and the same.

In sum, the procedural account makes morpho-syntactic predictions, which turn out to be beneficial on purely morpho-syntactic grounds, in addition to giving a principled explanation of the phonological facts. Therefore the referee for interface phenomena should always be sought outside of the phonology.

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