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Spell-out, post-phonological

At the interface of morpho-syntax with phonology, lexical insertion converts (portions of) the hierarchical morpho-syntactic structure into phonological material. In current syntactic theory, this operation is called spell-out and implies a lexical access: the phonological material inserted is stored in the lexicon (long-term memory), and the units stored are morphemes. The assignment of a morpheme to a portion of the morpho-syntactic structure depends on its morpho-syntactic properties, but on account of its phonological characteristics is unpredictable and arbitrary: there is no reason why, say, *-ed* realizes past tense in English (rather than, say, *-eg* or *-a*). This is because *-ed* is a lexically stored item, and lexical properties are arbitrary.

The talk explores how the general workings of intermodular communication can be applied to the other interface that phonology is involved in, i.e. with phonetics. The goal is to construe a consistent global picture where all interfaces respond to the same (modular) logic. On the assumption that language is modular, i.e. made of a number of distinct computational systems that are non-teleological and symbolic (Fodor 1983, Coltheart 1999, Gerrans, the inverted T model in Chomsky 1965: 15ff), intermodular communication requires translation from one domain-specific vocabulary into another (at the upper interface: tense, aspect, person etc. into labiality, occlusion etc.). In order to apply the workings of the upper interface to the relationship between phonology and phonetics, the latter need to be understood as two distinct computational systems: otherwise there is no interface in the first place. The question whether phonetics is just low-level phonology or ontologically distinct is the subject of a long-standing debate (see the overview by Kingston 2007 especially regarding OT, where both options are entertained). It will be assumed here that they are distinct computational systems.

In this frame, then, there must be a spell-out operation that converts the output of phonology into units of the phonetic vocabulary. In Government Phonology, this is called phonetic interpretation, (Harris & Lindsey 1995: 46ff, Gussmann 2007: 25ff). The properties of post-phonological spell-out may be inspected when looking at the interface with morpho-syntax. The talk is concerned with two of them:

1. **Lexical access: list-type conversion**. The match between phonological structure and phonetic exponents thereof is done through a lexical access. That is, the conversion is list-type, or one-to-one (rather than computational, i.e. implying an input-output relation): a phonetic item X is assigned to a phonological item A. The dictionary-type list in question is hard-wired, i.e. stored in long-term memory and not subject to any influence from (phonological or any other) computation. As all other lexical information, though, it does undergo diachronic change.
2. **The match is arbitrary**. This follows from the fact that translation is list-based: it was mentioned that there is no reason why past tense is realized by *-ed*, rather than by anything else.

A pattern covered by post-phonological spell-out is so-called virtual length. The length of phonologically long vowels and phonological geminates may be marked in the phonetic signal by duration, but also by other means: there is no reason why phonological length should always be signalled by duration. For example, vowel length has been found to be expressed by vowel reduction in Semitic (Lowenstamm 1991, 2011) and Kabyle Berber (Bendjaballah 2001, Ben Si Saïd 2011); in the same way, phonological geminates may be expressed by the length of the preceding vowel e.g. in English (Hammond 2007, who argues that the t in *city* is a geminate). Earlier accounts of the English pattern (since Kahn 1976) tried to maintain a one-to-one relationship between phonetics and phonology: something that is not long in the former cannot be long in the latter. Hence ambisyllabic consonants belong to two constituents (coda and onset) but have only one timing slot. Post-phonological spell-out does away with the idea that properties of the phonetic exponent imply any properties of the phonological item it realizes: the match is arbitrary.

This position is in fact strongly counter-intuitive: it implies that, say, a three-vowel system [i], [a], [u] may in fact be flip-flop: [i] may realize /u/, [u] may represent /a/ and [a] may be the exponent of /i/. Is it reasonable to assume that this kind of system can exist? Phenomena like the

one that is sociologically affiliated to South-East British posh girls support this view. Uffmann (2010) reports that in the speech of this group, "vowels are currently shifting quite dramatically, with back/high vowels fronting and unrounding, and a counter-clockwise rotation of most of the remainder of the system, leading not only to vowel realisations that are quite distinct from traditional Received Pronunciation, but also, at least for some speakers, to near-merger situations (e.g. /i:-u:, ey-ow, e-æ/)". Hence the posh girls in question will pronounce "boot" as [biit].

A better known example that has baffled phonologists for quite some time is the fact that in some languages the sonorant r is pronounced as a uvular fricative [□, □] or trill [R]. French, German, Norwegian and Sorbian are cases in point. In these languages, like all other obstruents [□] undergoes final devoicing (if present in the grammar) and voice assimilation. Phonologically, however, it "continues" to behave like a sonorant: only sonorants can engage in branching onsets, but the uvular fricative or trill does so jollily. When looked at through the lens of post-phonological spell-out, there is nothing wrong with this situation: for some reason the languages in question have decided to pronounce the phonological item /r/ as a uvular.

Given this overall picture, an obvious fact begs the question: if cases can indeed be found where the phonetic and phonological identities of an item are (dramatically) distant, it is true nevertheless that in the overwhelming majority of cases they are not. This is precisely why these few incongruent cases are so baffling. This situation at the lower end of phonology stands in sharp contrast with the properties of the same spell-out mechanism at its upper end: the relationship between morpho-syntactic structure and its exponent phonological material is 100% unrelated. At first sight, this dramatic difference does not speak in favour of the idea that both translating devices are identical, and that the only difference is the nature of the items involved.

The key to the problem lies precisely in the kind of vocabulary manipulated. When items such as gender, tense, number, person etc. are mapped onto items such as labial, occlusion, palatal etc., the relationship cannot be anything but 100% arbitrary. It is not even obvious how the degree of kinship between any item of one pool and any item of the other pool could be calculated: any match is as unmotivated as any other. By contrast, phonology and phonetics share a number of categories (which does not mean that the vocabulary items are identical). For example, labiality is certainly relevant on both sides. Therefore the calculus of a greater or lesser distance between phonological structure and its phonetic exponent is immediate and quite intuitive.

The reason for this situation is the ontological setup of grammar. Grammar is a cognitive system that codes real-world properties through a process known as grammaticalization (Anderson 2011). The real-world properties in question are of two kinds: semantic (eventually pragmatic) and phonetic. The symbolic vocabulary of morpho-syntax and semantics is the grammaticalized version of real-world experiences such as time, speakers etc. On the other hand, phonetic categories are grammaticalized in terms of phonological vocabulary. It is therefore unsurprising that the output of the grammaticalization process that turns phonetic into phonological items is akin to the phonetic input, and also uses the same broad categories. At this interface, the output of grammaticalization is thus complete identity. By contrast, the match between morpho-syntactic and phonological categories is purely grammar-internal: neither phonetics nor semantics (or any grammaticalization for that matter) are involved.

What it takes for the transparent output of grammaticalization to become opaque, then, is historical accident and telescoping. Alternations are regular and follow a clear causal pattern at birth: k → t⇌□ / __i is a possible product of grammaticalization, but k → t⇌□ / __u is not. Alternations that are phonetically plausible may undergo modifications in further evolution of the language, and after some time look quite outlandish, or even crazy. This is the insight formulated by Bach & Harms (1972): yes there are crazy rules, but they are not born crazy – they have become crazy through aging. For example, a context-free change that turns all i's of a language into u's may transform our phonetically transparent rule k → t⇌□ / __i into the crazy rule k → t⇌□ / __u.

It takes this kind of historical accident and telescoping in order to produce the distance between a phonological item and its phonetic realization that baffles phonologists. Mapping rela-

tions between phonology and phonetics are not born crazy – but they may become crazy through aging. Most of them do not, though, and this is why the overwhelming majority of mapping relations show little slack.

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