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Metaphony as magnetism

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Metaphony in Romance poses a well-known problem for Element Theory, as it seems to involve lowering. [D'Alessandro and van Oostendorp (2016)] propose to solve this by assuming some suffixes are ' |A| Eaters', absorbing the |A| element from the stem vowel without getting phonetically realized themselves. This paper points to some problems with this analysis, and shows that Magnetic Grammar, a framework in which all linguistic variation is encoded in features, might help to solve them.

1.   Introduction

The literature on the phonology of many languages knows a few classics: topics to which every student of the language will one day turn. For the languages of Italy, metaphony is clearly such a topic [Savoia (2005), Savoia (2015), Calabrese (2011), Torres-Tamarit et al.(2016)]. Metaphony is a phenomenon that is found in a rather large number of varieties (also in some Romance varieties of the Iberian peninsula, as well as, depending on one's definitions, in southern French). In those dialects, it shows a bewildering amount of variation; it is hardly an exaggeration to say that no two dialects have the same system of metaphony.

Furthermore, the process works at the interface of several modules: it is partly morphological, or even lexical, in at least some dialects, but it clearly works with phonological objects such as vocalic height, as descriptively metaphony involves vowel raising. The precise way in which raising works out can also differ from one dialect to the next. For instance, in some dialects low mid vowels /ɛ/ raise to [e], while in others they raise to [i]. And finally, subsegmental phonology also interacts with prosody in an interesting way: it is the stressed vowel of the stem that typically undergoes metaphony, sometimes skipping unstressed vowels in between the apparent trigger (the suffix vowel) and its target [Walker (2014), Mascaró, 2015)].

We do not think that anybody can claim to have a complete theory covering all cases of metaphony, if only because not all cases have been adequately described yet. In this short squib, we do not aim to solve the puzzle either, but wish to show how it is relevant for some current thinking about the structure and status of the primitives of our representations: features or elements. We argue that metaphony does not just act as a magnet on researchers, it is indeed itself a result of grammatical magnetism.

2.   Metaphony and the |A| eater

[D'Alessandro and van Oostendorp (2016)] discuss a puzzle for standard Element Theory [Backley (2011)]: how to represent metaphony in Italo-Romance [Savoia and Maiden (1997)]. The general problem here is that metaphony involves a morphological process that raises (stressed) vowels in certain morphological contexts, e.g. in the plural of nouns. E.g. in Grado [Walker (2005)], we find alternations such as the following:

(1)   a.   *tempo* 'time', *timpi* 'times'
      b.   *fjor* 'flower', *fjuri* 'flowers'

Plural formation thus consists of two parts: a suffix is added which in this case is *-i*, and metaphony is applied to the root vowel, so that [e] turns into [i] and [o] into [u]. The problem is that such changes cannot easily be described in terms of Element Theory, which has no primitive corresponding to 'high vowel'. The full representation of [i] is |I|, and the full representation of [u] is |U| and these two have nothing in common, so there is nothing which could, for instance, 'spread' from the suffix to the stem vowel to get the required result.

The problem is particularly salient in dialects such as that spoken in Arielli (Abruzzese) in which metaphony is triggered in forms which have no clear suffix marking at all. The following are all masculine nouns – metaphony does not apply in the feminine:

(2)   a > i lu canə   li chinə   'the dog/s'
      e > i lu velə   li vilə   'the veil/s'
      ɛ > i lu martɛllə li martillə the hammer/s
      ɔ > u lu nəpɔtə   li nəputə   'the nephew'
      o > u lu waʎ:onə li waʎ:unə 'the young boys'

All round vowels turn to [u] in the plural, all other vowels turn to [i]. We find similar alternations also in adjectives, as well as in verbs (e.g. in the second person singular).

Within Element Theory, one needs to say that metaphony somehow subtracts the |A| element. Arielli shows this cannot plausibly be the result of any overt phonological material present in the suffixes involved: as a result of historical reduction, the singular and plural forms all end in a schwa. Metaphony thus is the only exponent of plurality for these masculine nouns.

[D'Alessandro and van Oostendorp (2016)] present an analysis of this fact in terms of what they call an ' |A| Eater': an empty mora which is an exponent of the plural and which is suffixed to the word. The A element of the root is then shifted to this mora, but the mora itself is not linked to any higher-order structure. Because only material that is linked to the phonological word is pronounced, the mora is not and neither is the |A| element linked under it. We use σ as the shorthand for whatever the syllabic constituency is:

(3)
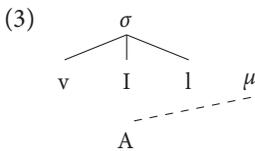
This analysis sees metaphony thus as a kind of truncation (of the |A| element), and analyses this in line with [Trommer and Zimmermann (2014), Zimmermann (2017)]'s view on this phenomenon in such a way that it fits an Items-and-Arrangement view of morphology [Hockett (1958)]: a morphologically more complex form (such as the plural) always has more phonological structure than a simpler form (such as the singular). It may look as if the plural is really missing something (the |A| element), but as a matter of fact it has something extra (the mora that is eating the |A| element).

[D'Alessandro and van Oostendorp (2016)] point to an interesting piece of evidence for the |A| Eater: it shows up in certain phrasal contexts, for instance before postnominal adjectives:

(4) a. *lu canə* 'the dog'
     b. *li chinə* 'the dogs'
     c. *lu canə cioppə* 'the lame dog' (* *lu cana cioppə*)
     d. *li china ciuppə* 'the lame dogs'

(4d) has an [a] that is not etymological. The question is where it is coming from, and [D'Alessandro and van Oostendorp (2016)] argue that it is an overt manifestation of the |A| Eater, which stays uninterpreted at edges of constituents, but can make it to the surface when it is followed by other material.

[D'Alessandro and van Oostendorp (2016)] thus give a nice analysis of Arielli metaphony, but there are some problems with the precise representation of the

|A| Eater. If this is an empty mora, the question is whether all empty moras will always show |A| -eating behaviour. An implicit answer in [D'Alessandro and van Oostendorp (2016)] is that this is under grammatical control (the analysis is more or less set in an OT frame where some constraint could be made responsible for this), but that is obviously not directly in line with the assumptions of Government Theory which would say that similar representations should trigger similar behaviour in different languages.

This first problem may still be solved, but more serious is the question how we would represent metaphony in those Italian dialects in which the ending triggering metaphony is not reduced, but rather a full vowel, such as in the Grado dialect. [D'Alessandro and van Oostendorp (2016)] suggest that the emptiness of the suffix in Arielli is a key factor in its attracting an element from the root: empty vowels are not allowed. The ending here cannot be an empty mora, since it is a full vowel [i]. Still, this suffix must somehow be able to attract the |A| element.

Finally, there is another problem left explicitly unsolved in [D'Alessandro and van Oostendorp (2016)]: why the plural of *cane* is *chine* with an [i]. The latter vowel apparently comes out of nowhere. [D'Alessandro and van Oostendorp (2016)] note that it may be the default epenthetic vowel: since stressed schwa is not allowed, the language fills in an |I| element by default. It is however hard to come by evidence that the |I| has this epenthetic function also elsewhere in the language.

3.   Magnetic grammar

[D'Alessandro and van Oostendorp (2017)] argue for a view of variation in grammar which is based purely on features and elements, which they call Magnetic Grammar (MG). The assumption is that all variation between languages is in the representation of the primitives. These are assumed to be (monovalent) features, but the actual content of the primitives is irrelevant, so that the idea would work as well for elements.

The idea is that languages, first, obviously choose a set of such primitives from a universal set. A language that has no voiced consonants and no low tones does not use the |L| element; this is something which the language-learning child has to learn – learning that one's language does not have contrastive voicing or contrastive tone *equals* learning that there is never an |L| element in any representation. This assumption is probably shared by all versions of feature and element theory.

Also the assumption that features can be combined in a language-specific way is not unique to MG. A language that does not allow for front rounded vowels, does not allow a combination of |I| and |U|; this is usually called a (parametrized) 'licensing constraint' in the literature on Element Theory [Charette and Göksel

(1996)]. Magnetic Grammar proposes, however, that the combinability of an element with another element is not somewhere in the grammar, but rather a language-specific property of the elements itself. If a language does not have front rounded vowels, its |I| has a diacritic indicating that it cannot be combined with U: $|I|_{*U}$ (the language may also have |U| diacriticed as $|U|_{*I}$; the difference between those options will follow from other considerations about the language).

We read the diacritic X_{*Y} as 'X repels Y'. Next to repulsion, we assume there can also be a force of attraction between two elements. For any element X in a language that also has an element Y, there are thus three possibilities:

(5) a. X_{*Y}: X repels Y, a representation is ill-formed if X and Y occur in the same domain
   b. $X_{\supset Y}$: X attracts Y, a representation is ill-formed if X and Y do not occur in the same domain
   c.   X: there is no relation from X and Y, a representation which is well-formed regardless of whether X and Y occur in the same domain (modulo possible attracting or repelling properties of Y or other elements)

MG has it that phonological (and syntactic) representations consist of such primitives, which are combined in higher-order consitituents (segments, syllabic constituency in the case of phonology, phrase structure in the case of syntax); the (only) difference between languages is the set of primitives, including their diacritics on combinability.

In line with the work of (among others) [Charette and Goksel(1996)], MG holds that these properties do not just govern static inventories of segments, but also 'active' phonological processes. For instance, Turkish has an eight vowel system, which can of course be easily described if we assume that the three vowel primitives can be freely combined (and all of them are combinable with the basic vocalic primitive, which we will write here as |@|.).

(6) ɪ i u y
  @ @ @ @
     I   I
        U U
  a e o ø
  @ @ @ @
     I   I
        U U
  A A A A

This gives us initially, the following view on the Element inventory:

(7)   @, I, U, A

As is well-known, Turkish has front harmony, meaning that suffix vowels (and other unspecified vowels, such as those that are the result of epenthesis) will be front after a stem ending in a front vowel. (Vowel harmony is of course much more complicated: it also involves roundedness harmony and all kinds of restrictions of application, which we will not discuss here, as we introduce the phenomenon here merely for illustrative purposes; see [Kabak (2011)]).

We can solve this by assuming that the |@| element attracts frontness (at least when it occurs in a suffix):

(8) $@_{\supset I}$

This means that the representations for {ı, a, u, o} are all insufficient as they are lacking an |I| element. Grammar provides two ways to solve this: by spreading an |I| from a neighbouring segment, or by inserting a new |I| element. If the stem does not contain a front vowel, the former option is not possible, and hence the only possibility would be to insert an |I| element.

Yet this, in turn, is apparently not allowed in Turkish: a back vowel only turns front if there is another front vowel in the word [the following examples are from Kabak:2011]

(9)   a.   *janlu*ʃ 'wrong' (* janliʃ, * jenluʃ)
      b.   *josun* 'moss' (*josyn, * jøsun)
      c.   *zengin* 'rich' (* zengyn, *zangin)
      d.   *kømyr* 'coal' (*komyr, *kømur)

This means that 'epenthetic' elements are not allowed. That may be a language-specific property, in which case we have to represent it in some way. One way to do it is to say that an element has to be linked to a lexical category:

(10) $I_{\supset X}$, where X is a categorial feature such as N, V.

If a vowel belongs to the phonological exponence of a noun, all of its elements will be inherently linked to the categorial (and other morphosyntactic) features of that noun, and therefore satisfy this condition. However an epenthetic vowel has no connection to any morphosyntactic feature, and therefore will not satisfy this condition. In this way, we thus implement the ideas of Coloured Containment [van Oostendorp (2007)] in Magnetic Grammar.

We thus can revise (7) to the following:

(11) $@_{\supset P}$, $I_{\supset N}$, U, A

It should be noted that the requirements on |@| and |I| are in conflict if the nominal stem does not contain an underlying |I| element. In that case, apparently in Turkish the requirement on |I| 'wins', in the sense that we end up having non-fronted vowels, so that $@_{\supset I}$ stays unsatisfied. Our suggestion is that only the 'weak' 'default' element |@| (the 'cold vowel') can have such a weak requirement that is not fulfilled if it conflicts with the requirements of other elements. We thus do not need the kind of language-specific ranking of constraints that is so well-known from Optimality Theory, although we have something that is minimally equivalent: first, there is only a difference between 'weak' elements and 'strong elements', not a complete ranking of all elements; and secondly we expect properties of e.g. |@| always to be 'weak' as this element is also weak in other ways (it does not influence the phonetic profile of the vowel involved, for instance).

4.   Metaphony in magnetic grammar

Since metaphony is sometimes compared to vowel harmony, one could expect it to be represented in a similar way. Of course the restrictions of Element Theory still apply: we cannot say that the stressed stem vowels undergo metaphony because they attract some feature from the suffix, since the suffix does not have such a feature (at least in Arielli, where it is schwa = |@|, which is already contained in the other vowels by definition), and because the result of metaphony is still *subtraction* of the |A| element. It also cannot be a floating element, as there simply is not element which corresponds to the valued feature [−high] .

The MC framework provides us with a way to improve on [D'Alessandro and van Oostendorp (2016)]'s implementation of the |A| Eater. We no longer need to say that a suffix has to be empty to 'eat' an A element; it needs to be merely attracting it. In other words, the suffix can consist of a vowel that attracts an A. This could be the schwa element:

(12) $@_{\supset A}$

We then get an analysis that is exactly parallel to the one in [D'Alessandro and van Oostendorp (2016)], but with the advantage that we have given a clearer representational reason why the plural affix can behave in this way, without having to introduce a constraint ranking or some other grammatical device that is specific to this morpheme. Like in the previous account, we still need to understand why the suffix [a] which is formed in this way only shows up if it is not peripheral, but we can account for this by relying on general phonotactic considerations of the language: also etymological [a] only shows up under those conditions [Passino(2016)].

This is of course the same kind of representation we have given to harmony, albeit that in this case it is the apparent *trigger* of the harmony (the suffix) that has the specification to attract the |A| element. This is again the weak cold vowel |@|, so that if there is no |A| present in the environment, the attraction property stays unsatisfied.

Notice that this schwa element can in principle be part of a larger structure. In particular, it can be combined with an |I| element. This means that in isolation, it would be pronounced as an [i] vowel, just like it is pronounced in a northern dialect like Grado. Given the fact that southern dialects like Arielli have a general reduction of final vowels, probably also as an active synchronic process, the |I| element will not be pronounced in this dialect, so that we as a matter of fact could posit a uniform representation for the exponence of plural suffix in both (groups of) dialects:

(13)   + PLURAL ⇔ | @$_{\supset A}$ I | (to be revised in (14))

However, this representation still faces the problem that after metaphony, the vowel never shows up as a combination of |I,A|, i.e. as *e*. In Grado, only the |I| shows up (*fjuri*), whereas in Arielli only the |A| surfaces, under the right conditions (*china ciupp*).

We propose that the reason is that the |@| element is not just attracting |A|, but also repelling |I|, in both dialects.

(14)   + PLURAL ⇔ | @$_{\supset A, *I}$ I |

Since the |I| cannot be realized in the same position as the schwa, it needs to find a different position. Given the workings of grammar, this position needs to be as close as possible. Grado chooses a position immediately adjacent to the suffix. Because the suffix is itself not realized, it looks as if [i] itself is the suffix:

(15)

$$\sigma$$

f   j   U   r   I   @$_{\supset A, *I}$

A
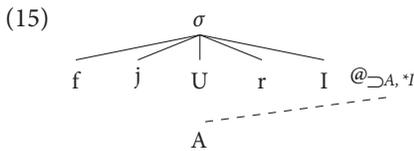
The reason why the I is pronounced rather than the schwa (and the A attached to it) may be, again, that schwa is too weak. In Arielli, this solution is not possible, as the final position only allows schwa. For this reason, it is the |I| which is left floating, giving a picture that is similar to (3):

(16)
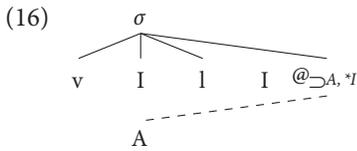
Now the fact that it is an [i] that surfaces in the plural of *cane* (*chine*) falls into place. Since stressed schwas are not allowed in Arielli, the position needs to be filled by the only element that is free:

(17)
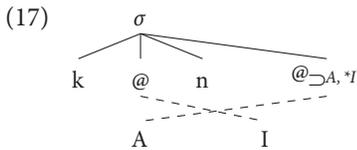
The |I| only moves to the stressed position when it is not already filled, possibly because the accent is marked in Arielli (as in most languages of Italy) as attracting elements that are not the cold vowel.

The |A| Eater now has become a rather terroristic morpheme: it grabs an |A| from the context when it can, but it also tries to get rid of its |I| element, either making it masquerade as a suffix (in Grado) or intrude into the root (in Arielli). It is this disruptive behaviour, we propose, which makes it into such an interesting topic of study.

5. Conclusion

The idea that grammar is organized by forces of magnetic attraction and repulsion is currently a programme rather than a fully worked-out proposal. In this short contribution we have studied one of its implications: it allows us to give representations of inflectional endings exactly the force they seem to need in order to account for the behaviour of metaphony, including even the promise that different dialects might have a very similar representation of metaphony-triggering suffixes after all.

This then allows us to give a phonological analysis of metaphony. Morphology does nothing special, except filling in the slot for (e.g.) plurality with a phonological representation which then starts interacting with its phonological context. It is not necessary to take resort to extra-phonological devices and still account for the apparently rather strange behaviour of 'raising' suffixes which furthermore are not high themselves.

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