

The too-many-solutions problem in OT in a representational perspective

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IV Metaphony

Goal of this meeting

To show that, sometimes, the too-many-solutions problem can be solved with representations. Specifically, I will show that the grid, motivated in the preceding meeting, can help us solving a problematic aspect of metaphony.

Steps in the presentation

- What is metaphony, and what does it have to do with the too-many-solutions problem?
- A representation of stress and how vowels fit in.

What is Italian metaphony, and what does it have to do with it?

A high post-tonic vowel triggers raising of a stressed mid vowel. Metaphony patterns occur in many Italian and Spanish dialects.

Here I will only discuss the ‘core pattern’. I will neglect important issues like:

Optional/variable Long distance effects (Walker 2005),

Interaction with ATR/RTR (Calabrese 1988),

Diphthongization (Kaze 1989, 1991),

The influence of morphology (Maiden 1991, Sluyters 1988),

The role of contrast (Dyck 1995),

Spanish dialects (Penny 2000, McCarthy 1984, Hualde 1989).

It is a type of harmony controlled by a vowel in a weak position. I refer to the work by Walker for attempts to fit this type of harmony into the overall typology of vowel harmony. See also Majors (1998) for many cases where the vowel in a strong position controls harmony.

The following data are from Walker (2005). The examples are from the dialect of Central Veneto.

(1) bév-o	bív-i	‘drink (1sg/2sg)’
g-é-va	g-í-vi-mo	‘had (3sg/1pl impf ind)’
fas-é-a	fas-í-vi-mo	‘did (1sg/1pl impf ind)’
kant-é-se	kant-í-si-mo	‘sing (1sg/1pl impf subj)’
kals-ét-o	kals-ít-i	‘sock (m sg/pl)’
móv-o	múv-i	‘move (1sg/2sg)’
skólt-o	skúlt-i	‘listen (1sg/2sg)’
órden-o	úrdin-i	‘order (1sg/2sg)’
óv-o	úv-i	‘egg (m sg/pl)’
kantór	kantúr-i	‘choir singer (m sg/pl)’

Walker proposes an analysis with positional markedness constraints (Zoll 1997, 1998; Walker 2001ab; Smith 2002).

(2) LICENSE(F, S-Pos): ‘Feature [F] is licensed by association to strong position S.’

- Let: i. f be an occurrence of feature [F] in an output O (optional restrictions: (a) f is limited to a specification that is perceptually difficult, (b) f belongs to a prosodically weak position, (c) f occurs in a perceptually difficult feature combination),
- ii. s be a structural element (e.g. σ , μ , segment root) belonging to a perceptually strong position S in O,
- iii. and $s\delta f$ mean that s dominates f ,

Then $(\forall f) (\exists s)[s\delta f]$.

The particular constraint of this family she needs is the following:

(3) LICENSE([+high]_{post-tonic}, $\acute{\sigma}$)
 [+high] in a post-tonic syllable must be associated with a stressed syllable.

Unstressed high vowels are perceptually weak (difficult to identify). They are therefore subject to positional licensing. Whether it can take effect depends on ranking, of course.

(4)	OK	not OK
	$\acute{\sigma}$ σ	$\acute{\sigma}$ σ
	\ /	
	[+high]	[+high]

What is the problem?

First let us have a look at sonority-driven stress (Cohn and McCarthy 1994; Kenstowicz 1996; Broselow 1999; Gordon 1999, 2002; Zec 2000; de Lacey 2002).

High vowels ‘avoid’ stress; it is better to stress a mid vowel or a low vowel than a high vowel.

(5) Nganasan (data from de Lacey 2002:57-66).

[kuhúmi] ‘our (dual) skin’

[kóntuʃa] ‘carries’

[báruʃi] ‘devil’

We can see that the default stress rule can be overruled by a constraint requiring absence of stress on high vowels if a mid or low vowel is around. Therefore, stress can move in order to satisfy some constraint. *Stress shift, in other words, is a possible repair.* Of course, we have seen this before in the preceding sessions.

Now the important question: If stress shift is a possible repair, then it is expected to become active in order to satisfy LICENSE([+high]_{post-tonic}, σ̇). This would happen under the ranking:

(6) LICENSE([+high]_{post-tonic}, σ̇, IDENT[+high]) » DEFAULTSTRESS, AVOIDSTRONHIGHV,

This ranking would yield a system where *high vowels attract stress from non-high vowels*. Such a system has never been attested!

Again this is an instance of the too-many-solutions problem. The relevant target (high vowels in unstressed position) is never repaired in such a way that stress moves to it.

Walker herself admits that this is a problem (p. 57): ‘Within OT, a stress shift to a syllable containing weak structure could be attained under a ranking where the licensing constraint and IDENT-IO(high) supersede the constraints responsible for locating stress. Nevertheless, the problem of theoretically excluding such a pattern is not specific to the OT framework. It would likewise confront a rule-based approach to the range of patterns examined in this section. *Something must exist in the theory to prevent a rule or constraint ranking that will shift stress under these circumstances* (my emphasis (BH)). How this generalization is to be captured, in an OT framework or otherwise, remains an open question for further investigation. Wilson (2000) directs recent research towards the problem of ‘too many solutions’ This approach might prove fruitful in addressing this issue’.

A representation of stress and how vowels fit in

I assume that stress consists of two dimensions, foot structure and the grid (Lieberman and Prince 1977; recently also Hyde 2001). Following the latter I assume:

(7) $\mu \rightarrow *$

A mora must ‘correspond’ to a * (position on the grid = gridmark)

Also in the spirit of Hyde I assume:

(8) $\mu_H > \mu_D$

The head mora of a constituent must be ‘stronger’ on the grid than a dependent mora in the same constituent.

It is well known that moras favor relatively sonorous segments (Morén 1997; Zec 1995, 2000). We express this as a constraint on the relation between gridmarks and their moras. For our purposes the following constraint will be sufficient:

(9) $* \rightarrow \text{Open}$

If a gridmark corresponds to a mora that mora must contain Open.

High vowels are characterized by the feature Closed; low vowels are characterized by the feature Open; mid vowels are characterized by both Open and Closed (Morén 2003, forthcoming).

Ranking decides how a high vowel is represented on the grid.
 A high vowel without a gridmark:

(10) DEP(OPEN), * → Open » μ → *

μ Closed	DEP(OPEN)	* → Open	μ → *
μ Closed			*
* μ Closed		*!	
* μ Closed Open	*!		

A high vowel with a gridmark:

(11) μ → *, DEP(OPEN) » * → Open

μ Closed	μ → *	DEP(OPEN)	* → Open
μ Closed	*!		
* μ Closed			*
* μ Closed Open		*!	

Constituents with more than 1 mora will always contain a gridmark. This is a consequence of $\mu_H > \mu_D$. Consider the structure of a long, high vowel in a language where high vowels shun a gridmark.

(12) $\mu_H > \mu_D$, DEP(OPEN) » * \rightarrow Open » $\mu \rightarrow$ *

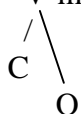
$\mu \mu$ Closed	$\mu_H > \mu_D$	DEP(OPEN)	* \rightarrow Open	$\mu \rightarrow$ *
$\mu \mu$ Closed	*!			**
* $\mu \mu$ Closed			*	*
* * $\mu \mu$ Closed	*!		**	
* * * $\mu \mu$ Closed			**!*	
* $\mu \mu$ Closed Open		*!		*

Let us first consider forms where the stressed vowel is high, and the post-tonic vowel is not. The following examples are again from Walker's paper.

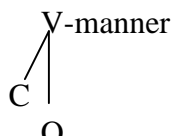
(13) deslíg-o 'untie (1sg)'
obedís-o 'I obey (1sg)'

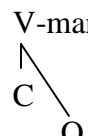
These forms can be explained with the ranking just given. However, we must explain why Open cannot spread from the unstressed mid vowel to the stressed high vowel (lowering the stressed vowel).

Consider the representation of a mid vowel:

(14) V-manner


One of the two features must be the head. I propose that C is the head in an unstressed syllable and O is the head in a stressed syllable.

(15) stressed mid vowel


unstressed mid vowel


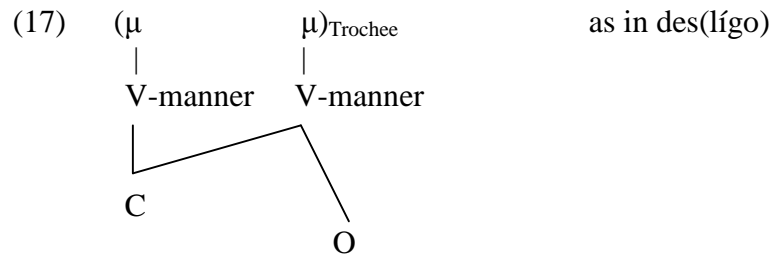
Now assume the following constraint:

(16) HEADUNIFORMITY

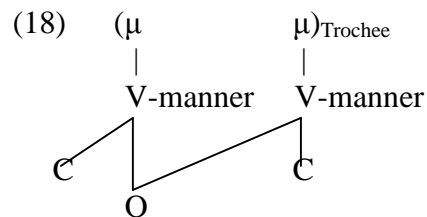
If a feature is a head in some segment,
then it is a head in all segments over which it creates a span

The effect of this constraint is that it blocks the spreading of *Open* from the unstressed mid vowel, where it is NOT a head, to the stressed syllable, which it IS a head.

In principle, it is possible to spread *Closed* from a stressed high vowel, to an unstressed mid vowel. This would not create a violation of HEADUNIFORMITY, because in both segments *Closed* is the head of V-manner.



However, *Open* cannot spread from a stressed mid vowel, where it IS a head, to a high unstressed vowel, where it is NOT a head.



(19) $\mu_H > \mu_D$, DEP(OPEN), UNIFORMITY » * \rightarrow Open » $\mu \rightarrow$ * ; as in des(lígo)

$\mu \mu$ C C O	$\mu_H > \mu_D$	DEP(OPEN)	UNIFORMITY	* \rightarrow Open	$\mu \rightarrow$ *
* * * ($\mu \mu$) C C O				**!	
* ($\mu \mu$) C C O	*!				*
* ☞ ($\mu \mu$) C C O				*	*
* * * ($\mu \mu$) C C O			*!		
* * * ($\mu \mu$) C C O O		*!			

To explain metaphony I propose the following constraint:

(20) LICENSE(VOWEL)

There must be a 'proper' path from a *vowel* to a mora that corresponds to *

'Proper' means that only V-manner and its features Closed and Open can constitute a licensing path. The effect is that these are the only features that enable a *vowel* to be licensed by a gridmark. This is the path of Head-positions in a segment; they constitute a segment's projection line.

Now consider /mov-i/

(21) With the ranking LICENSE(VOWEL) » MAX(Open), * \rightarrow Open we get metaphony.

(22) LICENSE(VOWEL) » MAX(Open), * → Open; as in /mov-i/ > [muvi]

μ μ C C O	LIC(VOWEL)	MAX(Open)	* → Open
* ☞ (μ μ) C		*	*
* (μ μ) C C O	*!		

(23) Spreading of Open is not allowed due to HEADUNIFORMITY. It would only be possible if Closed would be removed from the unstressed syllable. To block that we have to rank MAX(Closed) » MAX(Open).

(24) Now it is very important that in cases where a stressed high vowel is followed by an unstressed mid vowel the feature Closed does spread from the stressed to the unstressed vowel. Due to spreading of Closed the unstressed mid vowel is now licensed. Recall from (17) that spreading of Closed in this environment is not a violation of HEADUNIFORMITY.

(25) *Now back to the Too-many-solutions problem:*

In the system proposed here high vowels can never attract stress. Even if LICENSE(VOWEL) is very highly ranked, together with Faithfulness and anti-spreading constraints, it makes no sense to move stress to the high vowel. The only thing that could happen is that a gridmark is inserted over the high vowel. But just a single gridmark does not mean stress!

Consider /movi/ in a dialect with the grammar just sketched in (25). We would then get:

(26)

*

* *

(μ μ)

C C

O

Here the high vowel in the *unstressed* syllable is licensed by the gridmark of its own mora.

Why can't the stress move? The crucial factor triggering metaphony is the ranking * → Open » μ → *. This is the ranking in languages where high vowels are not represented on the grid. If in a language spreading is not possible to satisfy LICENSE(VOWEL), then it still does not make sense to move the stress to the high vowel. After stress has moved to the high vowel the situation is not improved at all. Presence of stress entails presence of gridmarks. Suppose that in /movi/ the stress would move to the high vowel. The minimal amount of gridmarks necessary to assign the high vowel stress would be:

(27)

*

* *

 μ (μ)

C C

O

The stressed syllable minimally needs two gridmarks, because it must be the most prominent syllable of the word. Since the mid vowel can freely accept a gridmark, the high vowel needs two gridmarks. This, however, is appalling from the point of view of the ranking $* \rightarrow \text{Open} \gg \mu \rightarrow *$. Presence of two gridmarks entails that $* \rightarrow \text{Open}$ is violated twice. It is better, then, to insert just one gridmark over a high vowel, as in (26). In other words, the candidate *without* stress shift to the high vowel harmonically bounds the candidate *with* stress shift to the high vowel. This means that there cannot be a language where stress moves to the high vowel in order to satisfy the requirements of LICENSE(VOWEL), not even if spreading is impossible.

Conclusions:

- i. Metaphony is what you get when a language avoids gridmarks on high vowels, but where licensing of vowels (= access to a gridmark) is required and spreading is low ranked.
- ii. In a language with this ranking constellation, but with the added requirement that there cannot be any spreading, it still does not make any sense to move the stress to the high vowel. In such a language it is sufficient to insert a gridmark at the basic (syllable) level.
- iii. We might have an answer to the question why there are no languages where stress shifts to a high vowel.