

The too-many-solutions problem in OT; solutions on the market

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Fourth approach: Blumenfeld's (2006) Implicational Constraint Principle

Goal of this meeting

We will discuss another approach to the Too-many-solutions problem: Blumenfeld's (2006) *Implicational Constraint Principle*. The ICP states that certain constraints assign extra violation marks to candidates that involve a process affecting the property mentioned in the antecedent.

Steps in the presentation

- Blumenfeld's approach
- An inventory of cases
- The beginning of a possible answer to some of Blumenfeld's questions.

Blumenfeld's approach

Blumenfeld phrases the Too-many-solutions problem in the following way (p. 2): 'It has become clear in recent years that Kisseberth's original argument in favour of surface conspiracies can be turned around as an argument against the radical surface orientation of OT'. Also, (p. 2): 'It appears that surface-oriented constraints *conspire* to produce *some* input-output mappings *but not others* (my emphasis (BH)). This general challenge for OT has come to be known as the TOO-MANY-SOLUTIONS problem'.

Blumenfeld attempts to solve the too-many-solutions problem by introducing 'procedural constraints'.

Here we go:

T-CORRESPONDENCE (Definition) (McCarthy 2003a:8)

Let *cand1* and *cand2* be two candidates from input *inp*. Let *s1* be a segment (or other corresponding element) in *cand1* and *s2* be a segment in *cand2*. Then *s1* t-corresponds to *s2* iff *s1* corresponds to some segment *s-inp* in *inp* and *s2* also corresponds to *s-inp*.

THE DESIGNATED STATE (LOCUS) (Definition) (p. 82)

Let there be a grammar *G*, a constraint *C*, an input /i/ and its output [o] in *G*, and a phonological object *p* in [o]. Then the DESIGNATED STATE (or DESIGNATED LOCUS) of *p* for /i/ and *C* in *G* is *p*'s t-correspondent in the optimal candidate in the grammar *G*' that is identical to *G* except that *C* has been removed.

PROCESS (Definition) (p. 84)

For a grammar G , a constraint C , an input /i/ and its output [o] in G , and a phonological object p , the constraint C is said to affect p if p is not identical to its designated state as to location or value. C is then said to force a PROCESS affecting p .

The Implicational Constraint Principle (ICP) (p. 88)

A candidate c violates a procedural constraint ‘ \blacklozenge If P has property x , then Q has property y ’ iff:

- a. In c , P has property x , and Q does not have property y , **OR**
- b. The constraint forces a process affecting x in c .

When a constraint affects x in a candidate, the actual state of x differs from the designated state of x . The designated state, in turn, is the location (and value, if it is a feature) of x 's t-correspondent in the optimal candidate in the grammar with the implicational constraint taken out of the ranking. ‘In other words, what the ICP says is that an implicational constraint is violated not only by those candidates where the implicational statement is false, but also by candidates in which the antecedent property mentioned in the constraint is not in its designated state.’ (p. 88).

Exemplification

(1) **Tudanca Spanish** (Blumenfeld, chapter 3, Flemming 1994);

- | | | | | | |
|----|------------|--------------|----|----------|---------------|
| a. | (píntu) | ‘male calf’ | b. | (pínta) | ‘female calf’ |
| | (číku) | ‘boy’ | | (číka) | ‘girl’ |
| | se(káru) | ‘to dry him’ | | se(kálo) | ‘to dry it’ |
| | | | | | |
| c. | o(réganu) | ‘oregano’ | | | |
| | (pórtiku) | ‘portico’ | | | |
| | ra(kítiku) | ‘rachitic’ | | | |

In Tudanca Spanish final high vowels are lax, and laxness spreads leftward until it reaches the stressed syllable.

The problem: (p. 92) the constraint driving laxness harmony within the stress foot can be satisfied either by violating the segmental faithfulness constraint – i.e. by applying harmony – or by violating a prosodic constraint by moving the prosodic domain boundary to accommodate the segments. This is the usual situation where at least two repairs are predicted to exist, given a constraint that mentions two categories (a prosodic and a segmental one).

This is an instance of the Too-many-solutions problem. Why doesn't stress shift apply to accommodate the segmental requirements? After all, stress shift IS a possible repair, as we have seen before (first session).

Final high vowel

/sekalu/	STRESS	AGREE[tense] _φ	*[+high,+tense]#	IDENT[tense]
se(kálu)			*!	
seka(ló)	*!			*
se(kálu)		*!		*
☞ se(kálu)				**

Final non-high vowel

/sekalo/	STRESS	AGREE[tense] _φ	*[+high,+tense]#	IDENT[tense]
☞ se(kálo)				
seka(ló)	*!			*
se(kálo)		*!		*
se(kálo)				*!*

Let us imagine a similar system, but with one difference: low ranking of STRESS.

Pseudo-Tudanca Spanish

Final high vowel

/sekalu/	AGREE[tense] _φ	*[+high,+tense]#	IDENT[tense]#	STRESS
se(kálu)		*!		
☞ seka(ló)			*	*
se(kálu)	*!		*	
se(kálu)			**!	

Final non-high vowel

/sekalo/	AGREE[tense] _φ	*[+high,+tense]#	IDENT[tense]#	STRESS
☞ se(kálo)				
seka(ló)			*!	*
se(kálo)	*!		*	
se(kálo)			*!*	

It turns out that stress is moved to the right if the word ends in a final high vowel. In words with a final non-high vowel stress is in the ‘regular’ position. Systems of this type are unattested.

‘The solution is to make AGREE a procedural constraint whose only job is to enforce harmony’ (p. 93).

◆ AGREE[tense]_φ (p. 93)

If V₁ and V₂ are in the same foot, then they have the same value for [tense]

The antecedent property mentioned in this constraint is ‘being in the same foot’: this is the property which the constraint ◆AGREE[tense]_φ cannot force to change. By the ICP, the constraint ◆AGREE[tense]_φ is violated not only in candidates where there is no agreement within the stress foot, but also by any candidate where foot boundaries are not in their ‘designated state’.

Here is an informal description of how procedural constraints work:

In order to determine the designated locus of feet, we take the constraint \blacklozenge AGREE[tense] $_{\emptyset}$ out of the ranking. This is shown in the following tableaux:

Final high vowel

/sekalu/	AGREE[tense] $_{\emptyset}$	*[+high,+tense]#	IDENT[tense]#	STRESS
se(kálu)		*!		
seka(ló)			*	*!
\emptyset se(kálu)			*	
se(kálu)			**!	

Final non-high vowel

/sekalo/	AGREE[tense] $_{\emptyset}$	*[+high,+tense]#	IDENT[tense]#	STRESS
\emptyset se(kálo)				
seka(ló)			*!	*
se(kálo)			*!	
se(kálo)			*!*	

(p. 94): ‘The vowels *a* and *u* are not in the same foot in [seka(ló)], while their t-correspondents *a* and *u* in [se(kálu)] are. The designate state of these two vowels is ‘being in the same foot’; any candidate where these two vowels are separated by a foot boundary thus incurs a \blacklozenge violation by the ICP (as would any other candidate whose footing pattern differs from the designated state). Now, using this information, we can assign violation marks to the constraint \blacklozenge AGREE[tense] $_{\emptyset}$.’ This is shown in the following tableau:

/sekalu/	AGREE[tense] $_{\emptyset}$	*[+high,+tense]#	IDENT[tense]#	STRESS
se(kálu)		*!		
seka(ló)	\blacklozenge !		*	*
se(kálu)	*!		*	
\emptyset se(kálu)			**	

An inventory of cases (many are schematic)

Aspiration (pp. 17 – 19).

ASPIRATE/ó

Onsets of stressed syllables are aspirated.

/pita/	ASPIRATE/ó	DEP-h	STRESSINITIAL	MAX-h
pít ^h a	*!	*		
pit ^h á		*	*!	
\emptyset p ^h íta		*		
Pita	*!			

/pit ^h a/	ASPIRATE/σ	DEP-h	STRESSINITIAL	MAX-h
pít ^h a	*!			
☞ pit ^h á			*!	
p ^h íta		*!		*
Pita	*!			*

Nasal harmonyI

AGREE[nas]_φ

All segments within a foot have the same value of the feature [nas]

Stress in a language with high-ranking AGREE[nas]_φ and a prosodic repair (p. 20)

(2)

a. Default penultimate

/ara/ → ára

/ãrã/ → ãrã

b. Final in forms where harmony would otherwise apply

/arã/ → arã

/ãra/ → ãrá

Nasal harmonyII (p. 143)

(3)

a. Nasal harmony if there is no blocker

/ãwa/ → ãwã

b. Denasalisation if there is a blocker

/ãsa/ → asa

/ãwa/	*š	AGREE	MAX[nas]	DEP[nas]
ãwa		*!		
☞ ãwã				**
awa			*!	

/ãsa/	*š	AGREE	MAX[nas]	DEP[nas]
ãsa		*!		
ãsã	*!			**
☞ asa			*	

Voice/Coda

*[+voi]/CODA (pp. 20-22)

(4)

a. /apra/ → ap.ra

b. /abra/ → a.bra

problems, problems, problems

‘In the general case, standard OT is plagued by a systematic too-many-solutions problem in the case of prosody-segmental interaction. The theory cannot account for any case of asymmetry between the ability of stress to condition the distribution of some segmental feature and its inability to be sensitive to that feature. OT predicts there to be systems with aspiration-driven stress, flap-driven stress, fricative-driven stress, glottalization-driven stress, and so forth’ (p. 20).

Epenthesis (Blumenfeld, chapter 4)

Epenthesis is universally used to resolve syllable structure markedness that has to do with sonority sequencing, syllable contact, complexity of syllable margins, etc. Among metrical factors, only one may play a role in epenthesis, viz. word minimality. No other constraint can force vowel insertion. Epenthesis cannot be used as a repair strategy for violations of purely metrical constraints such as *CLASH, *LAPSE, *NON-FINALITY, and so forth.

Epenthesis as an (illicit) resolution to *NON-FINALITY (*Take I*)

/pátak/	MAXPROM	NON-FIN	DEP-V
☞ pátak			
pátakə			*!

/paták/	MAXPROM	NON-FIN	DEP-V
paták		*!	
☞ patákə			*!
pátak	*!		

Epenthesis as an (illicit) resolution to *NON-FINALITY (*Take II*)

/patak/	NON-FIN	SWP	DEP-V
pa(ták)	*!		
☞ (pátak)		*	
(páta)kə		*	*!
pa(tákə)		*	*!

/patāk/	NON-FIN	SWP	DEP-V
pa(tāk)	*!		
(pātāk)		*!	
(pātā)kə		*!	*
☞ pa(tā)kə			*

Epenthesis as an (illicit) resolution to *CLASH

abracadabra	WSP	*CLASH	*LAPSE	DEP
áb.ra.ca.dáb.ra			*!	
áb.rá.ca.dáb.ra		*		
ab.rá.ca.dáb.ra	*!			
☞ áb.ra.cá.ʔə.dáb.ra				*

Procedural constraints:

◆NON-FIN

If x is a word-final syllable, x is not stressed.

◆*CLASH

If σ_1 and σ_2 are adjacent syllables, they are not both stressed.

◆*LAPSE

If σ_1 and σ_2 are adjacent syllables, they are not both unstressed.

Illustrating the effects of ◆*LAPSE

abracadabra	◆WSP	◆*LAPSE	◆*CLASH	DEP
áb.ra.ca.dáb.ra		*!		
☞ áb.rá.ca.dáb.ra			*	
ab.rá.ca.dáb.ra	*!			
áb.ra.cá.ʔə.dáb.ra		◆!	◆	*

Syncope (very briefly)

Blumenfeld's claim: 'OT has quietly set aside the claim of previous theories that syncope does not apply to stressed vowels' (p. 171).

Blumenfeld is aware of the fact that *Old Russian* is problematic for this claim. Here, the yer in the initial syllable is not protected from syncope by the default initial prominence assigned to phonologically unaccented forms. The following examples are from p. 193.

(5)	OR	ModernR		OR	ModernR	
	žigu	žgu	'burn'	mīru	-mru	'die'
	židu	ždu	'wait'	zír ¹ u	zr ¹ u	'see'
	čitu	čtu	'honour'	mūču	mču	'hurry'
	rūvu	rvu	'tear'	mīn ¹ u	mnu	'crumple'
	pīnu	pnu	'kick'	sūpl ¹ u	spl ¹ u	'sleep'
	vīru	vrū	'lie'	līšču	lšču	'flatter'
	žīru	žru	'devour'	mīšču	mšču	'avenge'

I present these facts, not only to show that they are a problem for Blumenfeld's claim, but also because they might corroborate our view of the representation of stress, to be developed later. A modest first step we will make already in the next section. On the representation of yers, cf. in particular Sheer (2004).

The beginning of an answer to some of these problems

I propose to reintroduce the grid, following Hyde (2001). The grid has participated in the representation of stress ever since people started to take the study of stress serious. Think of the relation between an element on the grid (gridmark) and elements on the segmental dimension as a kind of correspondence relation. One rule ‘projecting’ a gridmark is the following:

$V(\text{Root}) \rightarrow *$

A vowel must ‘have’ a gridmark

In principle, every vowel receives a corresponding gridmark. However, there are constraints acting against V-to-Grid. We will come back to this in the next course. For the time being, we will just discuss the following one:

$V_{\text{DEP}} \rightarrow \text{NO}*$

A vowel in a dependent (unstressed) syllable may not have a gridmark

The two opposing constraints can be freely ranked, in the spirit of standard OT. Both of them can interact with foot structure constraints. We thus get various possibilities.

Boring foot

*

* *

(CV CV)

In this foot, all vowels neatly project to the grid. This is a foot where segmental structure is not affected at all.

Another imaginable foot type is the following:

Exiting foot

*

(CV CV)

In this exiting foot a lot can happen. Vowel reduction can apply, and also the consonant can undergo various weakening effects. Why the latter (we will talk a bit about the former in the next class)?

An Onset must be licensed by a Nucleus. However, a nucleus can only license an onset if it has a gridmark. Since, this is not the case in the *Exiting Foot*, the Onset-consonant must go to the stressed syllable; it can spread its *C(int)* to the *V(root)*. I propose that this is the representation of a ‘flap’. Flapping, then, is a process whereby an onset consonant is multiply linked to the onset AND to the vowel of the strong syllable.

NZE Basilect flapping (Bye and de Lacy, p. 25)

(6)

a. flapping intervocalically and in unstressed syllable

[hæ:rə]	‘hatter’	[bá:rə]	‘barter’
[bá:rə]	‘biting’	[hóspərɯ]	‘hospital’
[rəpérərəv]	‘repetitive’	[grəmæ̀rəkæ̀ləri]	‘grammaticality’

b. no flapping before or after a consonant

[wíntə]	‘winter’	[sístə]	‘sister’
[ʔæktə]	‘actor’	[tʃátni]	‘chutney’
[ʔætlə]	‘atlas’	[tʰéntərəv]	‘tentative’

c. no flapping intervocalically in stressed syllable onset

[ʔətʰæ̀k]	‘attack’	[ʔətʰɛ̀njuwéɪŋ]	‘attenuation’
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Notice that it makes no sense to move the stress to the syllable with the flap (Blumenfeld’s point). Why not? Answer: because flapping is the result of the absence of a gridmark at the basic level. If there is no gridmark at the basic level, then it is impossible to assign stress there, because stress is a gridmark on top of the gridmark at the basic level.

A priori we expect that both constraints can be high ranked, and that the foot structure constraints adapt. This would give a situation where a syllable avoids to be parsed in a foot (if it would be parsed there, then it would not be granted a gridmark). We would thus expect the existence of a foot of the following structure:

OSL-foot

* *

(CV) CV

Is this a bad result? *Well, not at all!* Notice that in this representation FOOTBINARITY is violated. We thus expect that in an OSL-foot something happens to make the foot binary. One of the possibilities is lengthening of the vowel. This process is known as *Open Syllable Lengthening*, a process widely recognized to exist, but basically puzzling. Our proposal here is that OSL is the result of high ranking V(Root) → *, high ranking V_{DEP} → NO* and high ranking FOOTBINARITY. Of course, another possibility is to geminate the onset consonant. Some languages even have both strategies, as we have seen earlier in this class.

Our strategy, then, is to develop a representation of stress, which involves an extra layer, the grid. With the grid it is possible to eliminate some instances of the too-many-solutions problem, like shifting the stress to a syllable with a flap/aspirate in the onset.

But what about all these other cases? Recall that there is no epenthesis as a resolution to *CLASH, *LAPSE, *NON-FINALITY (Blumenfeld’s chapter 4).

Here we must resort to the idea that an element on the grid entertains an I-O-relation with its segment. This is not so much a constraint in the usual sense. It rather is a condition holding on the correspondence relation between a gridmark and its segment.

Condition on Correspondence

A segment can only correspond to a gridmark
if it corresponds to a segment in the input.

As a consequence of this condition, epenthetic vowels are absent on the grid! This, by the way, explains why epenthetic vowels are often transparent to stress, as has been noted very often (Alderete (1995). Since they are not present on the grid, they cannot interact with constraints that deal with this dimension. These are precisely the constraints mentioned in Blumenfeld's chapter 4.

Consider the structure of a clash:

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CLASH
*  *
*  *
CV CV
```

If an epenthetic vowel is not projected on the grid, then it does not make much sense to insert a vowel in order to alleviate the clash.

```
CLASH
*      *
*      *
CV CV CV
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There is still a clash after the insertion of the vowel!

*Our strategy, then, is to develop a representation of stress, which involves an extra layer, the grid. With the grid it is possible to eliminate some instances of the too-many-solutions problem, like inserting a vowel to eliminate violations of *CLASH, *LAPSE, *NON-FINALITY. The idea is that epenthetic material is not present on the grid. This is necessary anyway in order to explain why epenthetic vowels are often transparent to stress.*

Conclusion/remarks

Blumenfeld distinguishes two types of constraints. There is no criterion deciding which constraint belongs to which type. Also, the apparatus is extremely complex. But the thesis is very important because it presents a catalogue of relevant cases. Perhaps some of these cases can be solved if we take the representation of stress seriously. In case you get intrigued, more on this in my class next week.