

# A Theory of Syntax-Phonology Correspondence

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Prosodia e sintassi in ambito italo-tedesco

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## 1 Introduction

### 1.1 Focus Realization

Broad(er) foci routinely contain several stresses (and hence pitch accents) roughly one on every (non-given) content word:

- (1) Was hast du beobachtet?  
[Ein Mann hat in einem Park ein Buch gelesen]<sub>F</sub>
- (2) Was geschah damals?  
[Ein Mann hat in einem Park gelesen]<sub>F</sub>

The last of those is the *nuclear stress* and *nuclear pitch accents* (cf. ‘Endakzentverstärkung’ in Uhmann, 1991; Selkirk, 1995).

### 1.2 Integration

Integration: Sentence-final verbs/predicates cannot bear an accent in wide focus sentences. . .

- (3) Ein Mann hat ein Buch gelesen  
*argument*      *argument predicate*

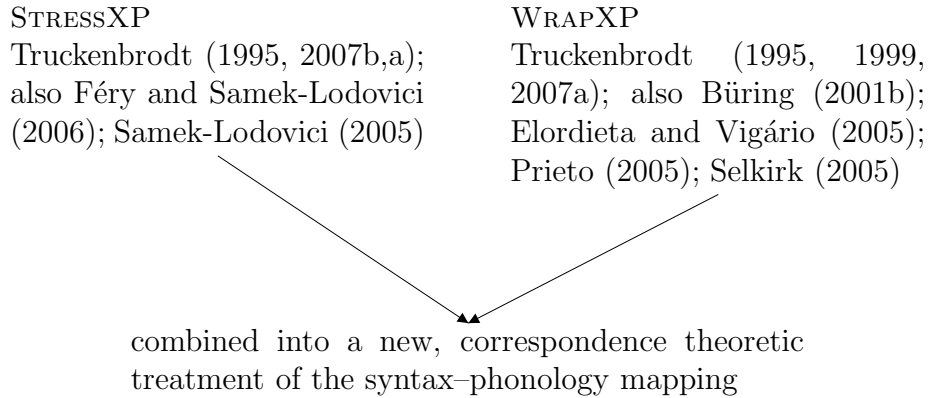
. . . if preceded by an accented argument. They have to bear an accent if preceded by a modifier:

- (4) Ein Mann hat in einem Park gelesen.  
*argument*      *modifier*      *predicate*

Similarly in intransitive sentences:

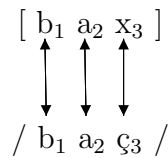
(5) A train arrived.

### Our Pedigree



## 2 Syntax–Phonology Correspondence: Basics

### 2.1 Correspondence Theory



**Max(Segment):** Each segment in the input has a correspondence in the output.

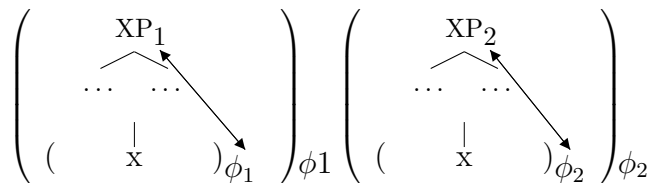
**Dep(Segment):** Each segment in the output has a correspondent in the input.

**Ident(continuous):** correspondences have the same value for  $[\pm\text{cont}]$

**Ident(back):** correspondents have the same value for  $[\pm\text{back}]$

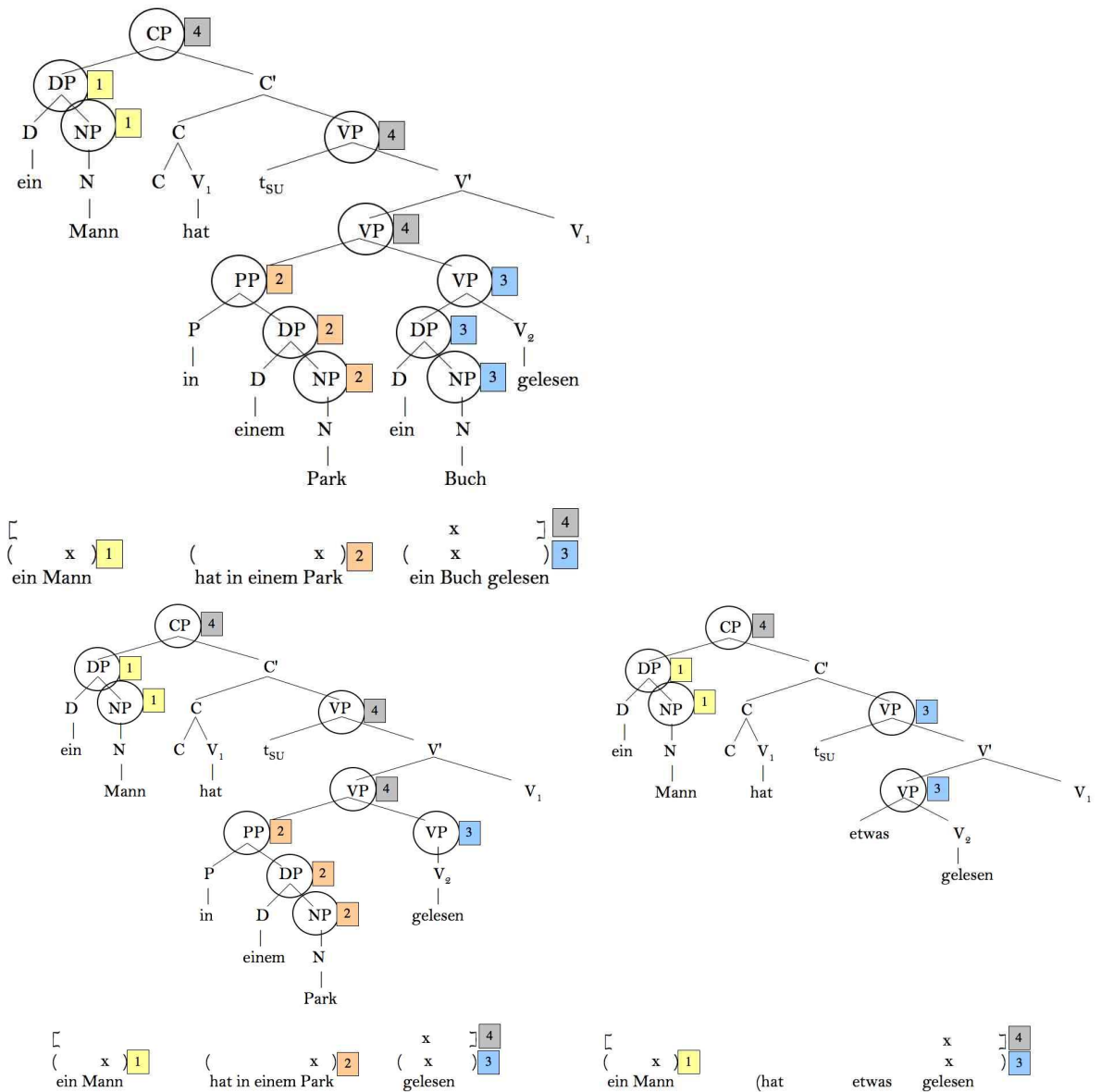
### 2.2 Syntax-Phonology Correspondence Constraints

Let  $\phi$  be a prosodic constituent (accent phrase, phonological phrase, intonational phrase...), XP a syntactic phrase:



- $\text{MAX}(\text{PHRASE})$ : Each XP has a corresponding  $\phi$ .
- $\text{DEP}(\text{PHRASE})$ : Each  $\phi$  has a corresponding XP.
- $\text{IDENT}(\text{STRESS})$  ( $\text{ID}(\text{STRESS})$ ): The strongest stress on  $\phi$  is within its corresponding XP.
- $\text{IDENT}(\text{CONTENT})$ - $(\text{XP})_\phi$  ( $\text{ID}(\text{XP})_\phi$ ): All elements in XP are contained in its corresponding  $\phi$ .

### Demonstration



## 2.3 Prosodic Constraints: Head Right

- (6) Ein Mann hat in einem Park ein Buch gelesen.
- (7) Ein Mann hat in einem Park gelesen.
- (8) Ein Mann hat etwas gelesen.
- (9) HEAD-RIGHT (HDRIGHT)  
Among sister  $\phi$ s, the rightmost one is the head of its mother.

$$(10) \quad \left( \begin{array}{c} \left( \begin{array}{c} \left( \begin{array}{c} \text{ein Mann} \\ \text{hat} \end{array} \right)_{\phi} \left( \begin{array}{c} \text{[in einem Park]} \\ \text{ein Buch} \end{array} \right)_{\phi} \left( \begin{array}{c} \text{gelesen} \end{array} \right)_{\phi} \end{array} \right)_{\phi} \end{array} \right)_{\phi_{1,2}}$$

### Outlook on Rest of the Talk

Our correspondence theory is a development of theories of German and English prosody. Things we aim to capture:

- Interaction of stress and movement
- Asymmetries in optional accenting of predicates
- Asymmetries in optional accenting of Given constituents.

## 3 Advances: Prosody and Movement

### 3.1 Wh-Movement

- (11) (Ob ein Spieler eine Prämie bekommen, hängt davon ab,) wieviele Häuser er besitzt. (Bresnan, 1971; Gussenhoven, 1983)

$$(12) \quad \left( \left[ \text{CP} \left[ \text{DP} \begin{array}{c} \text{wieviele} \\ \text{Häuser} \end{array} \right]_1 \left[ \text{TP} \text{er} \left[ \text{VP} t_{er} \left[ \text{VP} t_{wv} \text{Häuser} \text{ besitzt} \right]_2 \right]_3 \right] \right] \right)_{\phi_{1,2,3}}$$

- *Crucial*: A moved/copied element is contained in any constituent that contains a member of its chain.

$\Rightarrow$  moved objects can behave like *in situ* objects

- (13) Den Garaus haben sie ihm gemacht.

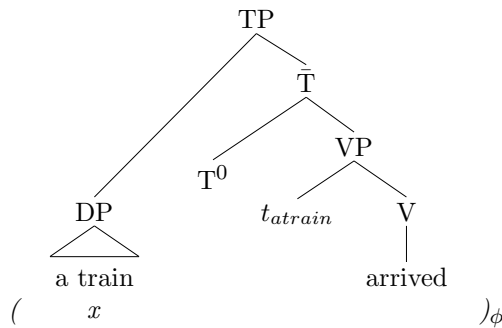
NB: Weak pronouns and function words (like *er*) —although phrasal— are prevented from forming  $\phi$ s on their own by some constraint that requires a  $\phi$  to contain at least one prosodic word.

	[wieviele [Häuser] <sub>1</sub> ] <sub>2</sub> er besitzt] <sub>VP=3</sub>	Head-R,N	Id(cont)	Id(stress)	Max	Dep
a.	( x ) <sub>1,2,3</sub>					
b.	( x ) <sub>1,2</sub> ( x ) <sub>3</sub>					*!

TABLEAU 1: *wh*-movement

### 3.2 Subject Raising

- (14) a. A TRAIN arrived.  
 b. Our DOG disappeared.



⇒ intransitive subjects behave like transitive objects

### 3.3 Intervention

- (15) (Ob ein Spieler ein Prämie bekommt, hängt davon ab,) wieviele Hotels sein Gegenspieler verkauft hat.  
 a. #...wieviele Hotels sein Gegenspieler verkauft hat.  
 b. #...wieviele Hotels sein Gegenspieler verkauft hat.

$$(16) \# \left[ \left( \begin{array}{c} * \\ \text{[wiev.Hotels]}_1 \end{array} \right) \left( \begin{array}{c} * \\ \text{[s.Gegenspieler]}_4 \end{array} \right) \left( \begin{array}{c} * \\ \text{[vpt}_S \text{ [vpt}_O \text{ verkauft hat]}_2 \end{array} \right) \right]_3 \phi^{1,2,3,4}$$

$$(17) \# \left[ \left( \begin{array}{c} * \\ \text{[wiev.Hotels]}_1 \end{array} \right) \left( \begin{array}{c} * \\ \text{[s.Gegenspieler]}_4 \end{array} \right) \left( \begin{array}{c} * \\ \text{[vpt}_S \text{ [vpt}_O \text{ verkauft hat]}_2 \end{array} \right) \right]_3 \phi^4$$

$$(18) \# \left[ \left( \begin{array}{c} * \\ \text{[wiev.Hotels]}_1 \end{array} \right) \left( \begin{array}{c} * \\ \text{[s.Gegenspieler]}_4 \end{array} \right) \left( \begin{array}{c} * \\ \text{[vpt}_S \text{ [vpt}_O \text{ verkauft hat]}_2 \end{array} \right) \right]_3 \phi^4$$

$$(19) \left( \begin{array}{c} * \\ \text{[wiev.Hotels]}_1 \end{array} \right)_{\phi 2} \left( \begin{array}{c} * \\ \text{[s.Gegenspieler]}_4 \end{array} \right)_{\phi 4} \left( \begin{array}{c} * \\ \text{[vpt}_S \text{ [vpt}_O \text{ verkauft hat]}_2 \end{array} \right)_{\phi 3}$$

MAX(PHRASE)  
 HD(RIGHT)  
 ID-(XP)<sub>φ</sub>  
 ID(STRESS)  
 |  
 DEP(PHRASE)

	[wiev. [Häuser] <sub>1</sub> ] <sub>2</sub> [Geg.] <sub>4</sub> verkauft] <sub>VP=3</sub>	Head -R,N	Id (cont)	Id (stress)	Max	Dep- N	Dep
a.	( ( x ) <sub>1,2</sub> ( x ) <sub>4</sub> ) <sub>3</sub>				VP!		
b.	( ( x ) <sub>1,2</sub> ( x ) <sub>4</sub> ) <sub>3</sub>			VP!			
c.	( ( x ) <sub>1,2,3</sub> ( x ) <sub>4</sub> ) <sub>3</sub>		VP!				
d.	( ( x ) <sub>1,2</sub> ( x ) <sub>4</sub> ) <sub>3</sub>	*!					
e. √	( ( x ) <sub>1,2</sub> ( x ) <sub>4</sub> ( x ) ) <sub>3</sub>					*!	*

TABLEAU 2: *wh*-movement with intervention

## 4 Asymmetry 1: Head-Complement v. Complement-Head

### 4.1 Head-Complement v. Complement-Head

- (20) a. Er hat ein Buch gelesen.  
b. #Er hat ein Buch gelesen.
- (21) a. Er liest ein Buch.  
b. Er liest ein Buch.
- (22) a. He's having some carpets cleaned.  
b. #He's having some carpets cleaned.
- (23) a. He's cleaning his carpets.  
b. He's cleaning his carpets.
- (24) a. A train arrived.  
b. #A train arrived.

Generalization: V can bear stress, but not nuclear stress (see also Uhmann, 1991).

### 4.2 Modelling: Positional Faithfulness

- general optionality: a constraint that favors stressing heads is tied with DEP(PHRASE)

- (25) ADD-× (for the time being...)  
Lexical elements are stressed.

$$(26) \quad \begin{array}{l} \left( \begin{array}{c} \phantom{(*)} \\ \phantom{(*)} \end{array} \right) \phi_3 \\ \left( \begin{array}{c} (*) \\ \phantom{(*)} \end{array} \right) \phi_4 \left( \begin{array}{c} \phantom{(*)} \\ \phantom{(*)} \end{array} \right) \phi_{1,2} \\ \text{[Sue}_4 \quad \text{[ liest [VP [VP[DPein Buch]}_1\text{]}_2\text{]}_3\text{]} \end{array} \quad \text{liest violates ADD-}\times$$

$$(27) \quad \begin{array}{l} \left( \begin{array}{c} \phantom{(*)} \\ \phantom{(*)} \end{array} \right) \phi_{2,3} \\ \left( \begin{array}{c} (*) \\ \phantom{(*)} \end{array} \right) \phi_4 \left( \begin{array}{c} (*) \\ \phantom{(*)} \end{array} \right) \phi_5 \left( \begin{array}{c} \phantom{(*)} \\ \phantom{(*)} \end{array} \right) \phi_1 \\ \text{[Sue}_4 \quad \text{[ liest [VP [VP[DPein Buch]}_1\text{]}_2\text{]}_3\text{]} \end{array} \quad \phi_5 \text{ violates DEP(PHRASE)}$$

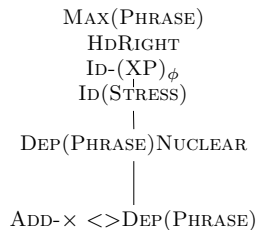
- no optional accent in nuclear position: DEP(PHRASE) is more important when regarding a prominent position.

$$(28) \quad \text{DEP(PHRASE)NUCLEAR} \\ \text{Each } \phi \text{ that is the head of a } \phi \text{ must have a corresponding XP.}$$

$$(29) \quad \begin{array}{l} \left( \begin{array}{c} \phantom{(*)} \\ \phantom{(*)} \end{array} \right) \phi_3 \\ \left( \begin{array}{c} (*) \\ \phantom{(*)} \end{array} \right) \phi_4 \left( \begin{array}{c} \phantom{(*)} \\ \phantom{(*)} \end{array} \right) \phi_{1,2} \\ \text{[Sue} \quad \text{[VP [VP[DPein Buch]}_1 \text{ liest]}_2\text{]}_3 \end{array} \quad \text{liest violates ADD-}\times$$

$$(30) \quad \begin{array}{l} * \left( \begin{array}{c} \phantom{(*)} \\ \phantom{(*)} \end{array} \right) \phi_{2,3} \\ \left( \begin{array}{c} (*) \\ \phantom{(*)} \end{array} \right) \phi_4 \left( \begin{array}{c} \phantom{(*)} \\ \phantom{(*)} \end{array} \right) \phi_1 \left( \begin{array}{c} (*) \\ \phantom{(*)} \end{array} \right) \phi_5 \\ \text{[Sue} \quad \text{[VP [VP[DPein Buch]}_1 \text{ liest]}_2\text{]}_3 \end{array} \quad \begin{array}{l} \phi_5 \text{ violates} \\ \text{DEP(PHRASE)NUCLEAR} \end{array}$$

$$(31) \quad \begin{array}{l} * \left( \begin{array}{c} \phantom{(*)} \\ \phantom{(*)} \end{array} \right) \phi_{2,3} \\ \left( \begin{array}{c} (*) \\ \phantom{(*)} \end{array} \right) \phi_4 \left( \begin{array}{c} \phantom{(*)} \\ \phantom{(*)} \end{array} \right) \phi_1 \left( \begin{array}{c} (*) \\ \phantom{(*)} \end{array} \right) \phi_5 \\ \text{[Sue} \quad \text{[VP [VP[DPein Buch]}_1 \text{ liest]}_2\text{]}_3 \end{array} \quad \begin{array}{l} \text{violates HDRIGHT} \\ \phi_5 \text{ violates DEP(PHRASE)} \end{array}$$



### 4.3 Positional Faithfulness

Beckman (1999): Faithfulness constraints (Max, Dep, Ident) have additional stronger versions in perceptually prominent positions (stressed positions, word-initial positions, syllable onset).

Examples:

- Stress: reduced vowel inventory in unstressed positions in English, Russian
- Initial: Turkish vowel harmony emanates from word-initial position

	[liest [ein [Buch] <sub>1</sub> ] <sub>2</sub> ] <sub>3</sub> ] <sub>4</sub>	Hd-R	Dep(Phrase)Nuclear	Add-x	Dep(Phrase)
a.	( x ) <sub>1,2,3,4</sub>			liest	
b. √	( x ) <sub>1,2</sub> ( x ) <sub>3,4</sub>				(liest)

	[liest [ein [Buch] <sub>1</sub> ] <sub>2</sub> ] <sub>3</sub> ] <sub>4</sub>	Hd-R	Dep(Phrase)Nuclear	Dep(Phrase)	Add-x
a. √	( x ) <sub>1,2,3,4</sub>				liest
b.	( x ) <sub>1,2</sub> ( x ) <sub>3,4</sub>			(liest)	

	[ein [Buch] <sub>1</sub> ] <sub>2</sub> liest] <sub>3</sub>	Hd-R	Dep(Phrase)Nuclear	Add-x	Dep(Phrase)
a. √	( x ) <sub>1,2,3</sub>			lesen	
b.	( x ) <sub>3</sub> ( x ) <sub>1,2</sub> ( x )	*!			(lesen)
c.	( x ) <sub>3</sub> ( x ) <sub>1,2</sub> ( x )		(lesen)!		(lesen)

TABLEAUX 3: head-complement v. complement-head

- Onset: German final devoicing

Example: Head-Dep from Alderete (1999) (see also Kager, 1999):

Yimas (Foley 1991)

a.	wáŋkaŋ	‘bird’	b.	/pkam/	→ píkám	‘skin of back’
	kúlanəŋ	‘walk’		/tmi/	→ tími	‘say’
	wúratákay	‘turtle’		/kcakk/	→ kícákík	‘cut’
	mámantàkarman	‘land crab’		/nmpanmara/	→ nimpánmara	‘stomach’

Stress-assignment on the first syllable as in (a). If the initial vowel is epenthetic, as in (b), stress is on the second syllable.

**DEP:** Every segment in the output has a correspondent in the input.

**HEAD-DEP:** Every segment in stressed position in the output has a correspondent in the input.

	/ p <sub>1</sub> k <sub>3</sub> a <sub>4</sub> m <sub>5</sub> /	HEAD-DEP	"stress is leftmost"
a.	p <sub>1</sub> í k <sub>3</sub> a <sub>4</sub> m <sub>5</sub>	*!	
b. √	p <sub>1</sub> i k <sub>3</sub> á <sub>4</sub> m <sub>5</sub>		*

TABLEAU 4: Yimas

The stressed vowel of candidate a has no input correspondent, and so violates Head-Dep

## 5 Asymmetry 2: Given-New v. New-Given

### 5.1 Preparation: Focus and Givenness

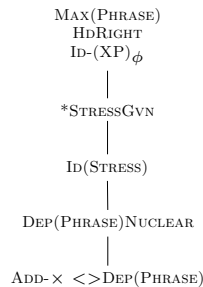
- Generalization (1st approximation, to be refined)

Given elements are unstressed.

⇒ Last (nuclear) stress will be on non-Given element

- ((non-crucial) assumption:) Focus ⇔ non-Given (e.g. Schwarzschild, 1999)

- (32) \*STRESSGVN  
A Given element does not bear phrasal stress.



### 5.2 Given-New v. New-Given

Generalization: Given constituents can bear stress, but not nuclear stress.

- (33) Peter langweilt sich.

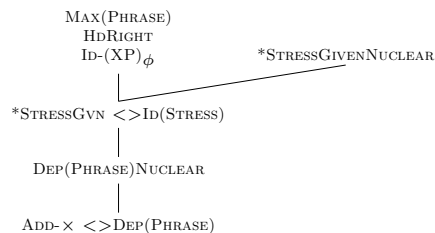
- Dann gib Peter die Zeitung.
- Dann gib Peter die Zeitung.

- (34) Was soll ich mit der Zeitung machen?

- Gib Peter die Zeitung.
- #Gib Peter die Zeitung.

(see tblx. 5)

### 5.3 Modelling: Positional Faithfulness



- Some constraint that favors stressing given phrases is tied with \*STRESSGVN.

- already in place: ID(STRESS)
- no optional accent in nuclear position:
  - \*STRESSGVN is more important when regarding a prominent position
- \*STRESSGIVENUCLEAR
  - Given constituents in nuclear position are destressed.

	[dem Peter] <sub>1,G</sub> [die Zeitung] <sub>2</sub>	Hd-R-N	*Stress- Given-N	*Stress- Given	Max
a.	(                    x                    ) <sub>2</sub>				*
b.	(    x    ) <sub>1</sub> (                    x                    ) <sub>2</sub>			*	
	[dem Peter] <sub>1</sub> [die Zeitung] <sub>2,G</sub>	Hd-R-N	*Stress- Given-N	*Stress- Given	Max
a.	(    x                                    ) <sub>2</sub>				*
b.	(    x                                    ) (    x    ) <sub>1</sub> (                    x                    ) <sub>2</sub>	*!		*	
c.	(                                    x                    ) (    x    ) <sub>1</sub> (                    x                    ) <sub>2</sub>		*!	*	

TABLEAUX 5: given–new, (33), v. new–given, (34)

## Summary of the Paper

- Redistributed work of Truckenbrodt’s constraints STRESSXP and WRAPXP onto DEP/MAX/IDENT constraints.
  - preserves reduction of integration facts to general phrase-structure mapping effects (*pace* Büring and Gutiérrez-Bravo, 2001; Büring, 2001a, in press; Gussenhoven, 1983, 1992; Selkirk, 1984, 1995, a.o.)
  - in line with faithfulness theories in segmental phonology
  - (given appropriate assumptions about containment/dominance) allows to handle previously problematic cases of stress/movement interactions
    - (not previously achieved in truly mono-stratal theories of prosody)
- Doubled constraints that penalize  $\phi$ -formation in ‘general’ flavor and ‘nuclear’ flavor.
  - in line with positional faithfulness ideas in segmental phonology
  - makes the right distinctions regarding optionality of accents and linear factors
    - (problematic for Gussenhoven, 1983, 1992; Selkirk, 1984, 1995; Truckenbrodt, 2006, a.o.)

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