

Please note:

1. This is the handout given at the Tilburg Conference on the Derivational Residues in Phonology.
2. Some typographical errors in the original handout have been corrected.
3. This handout does not contain all the ideas presented at the talk, nor has it incorporated responses from the audience. Contact the author for an updated draft.

Alignment and the Cycle Are Different

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1. Introduction¹

Prince and Smolensky (1993: Chapter 2) point out that Optimality Theory (OT) and parallelism are independent assumptions. However, it has been suggested recently that what are traditionally considered cyclic cases can be handled by Align(ment), and that OT, Align, and parallelism form a package (Cohen and McCarthy 1994, McCarthy and Prince 1995). In this paper I argue that the cycle must be retained in OT. The admission of the cycle in turn reduces the need for certain Align functions. I also argue that the Identity constraint, coupled with Align, cannot replace the cycle either.

I draw evidence from compound stress in Shanghai Chinese. In particular, Shanghai does not allow stress clash in compounds. When two stressed syllables occur during compounding, the stress on the right must be removed. In a compound with multiple underlying stresses, the surface stress pattern can be correctly obtained in a cyclic analysis (Duanmu 1995). In a one-step OT analysis that assumes Align and Identity, some of the patterns can be obtained and some cannot. On the other hand, in an analysis that assumes both OT and the cycle, problems of the one-step analysis can be avoided.

2. Compounding in Chinese (Fan 1958, Dai 1992, Duanmu 1994)

Two kinds of nominals (transcribed in Pinyin; tones omitted)

- | | | | | |
|-----|----|-----------------|----|--|
| (1) | a. | [M N] | b. | [M de N] |
| | | gao shan | | gao de shan |
| | | tall mountain | | tall DE mountain |
| | | 'tall mountain' | | 'tall mountain' or 'mountain that is tall' |

- | | | | |
|-----|------------------------|-------|----------|
| (2) | | [M N] | [M de N] |
| | productivity | no | yes |
| | conjunction reduction | no | yes |
| | adverbial modification | no | yes |

- | | | | | |
|------------------|----|-------------|----|--------------|
| (3) Productivity | a. | *[M N] | b. | [M de N] |
| | | *gao shu | | gao de shu |
| | | tall tree | | tall DE tree |
| | | 'tall tree' | | 'tall tree' |

- | | | | | |
|---------------------------|----|----------------------------------|----|----------------------------------|
| (4) Conjunction reduction | a. | *[M [N and N]] | b. | [M de [N and N]] |
| | | gao lou he shan | | gao de lou he shan |
| | | tall building and mountain | | tall DE building and mountain |
| | | '[tall building] and [mountain]' | | '[tall building] and [mountain]' |
| | | *'tall [building and mountain]' | | 'tall [building and mountain]' |

¹Since the submission of the abstract, my analysis has changed in several ways. I do not think it is necessary to assume different Gens. In addition, the Identity constraint can be used to solve some of the problems. However, I still hold the view that the cycle is necessary in OT.

(5) Adverbial modification

- | | | | |
|----|---|----|--|
| a. | *[[A M] N]
*hen/zui/bijiao gao shu
very/most/fairly tall tree
'very/most/fairly tall tree' | b. | [[A M] de N]
hen/zui/bijiao gao de shu
very/most/fairly tall DE tree
'very/most/fairly tall tree' |
|----|---|----|--|

- (6) [M N] is a compound (iterative: [[M N] N], [M [M N]], etc.)
[M de N] is a phrase

3. The data (Xu et al 1988, Duanmu 1995)

- (7) a. Every stress starts a tonal domain
b. Left-to-right trochee in single morphemes

- | | | |
|-----|------------|---|
| (8) | Underlying | Surface (stressed syllable underlined) |
| | S | (<u>S</u>) |
| | SS | (<u>SS</u>) |
| | SSS | (<u>SSS</u>) |
| | SSSS | (<u>SS</u>)(<u>SS</u>) |
| | SSSSS | (<u>SS</u>)(<u>SSS</u>) |
| | SSSSSS | (<u>SS</u>)(<u>SS</u>)(<u>SS</u>) |

- | | | |
|-----|---|------------------|
| (9) | (mo) | 'horse' |
| | (pa-li) | 'Paris' |
| | (lo'-se-t• i) | 'Los Angeles' |
| | (ya-lu)(-sa-l<) | 'Jerusalem' |
| | (ka-li)(-fo'-öi-ya) | 'California' |
| | (ẽ'e'-k ^h a')(sz-lu)(-va'-k ^h a') | 'Czechoslovakia' |

(10) Compounds (careful speech; fewer domains are possible in fast speech)

- | | Structure | Input | Surface |
|----|-------------------|------------------|------------|
| a. | [2 3] | [SS SSS] | (SS)(SSS) |
| b. | [3 2] | [SSS SS] | (SSS)(SS) |
| c. | [1 2] | [S SS] | (SSS) |
| d. | [2 1] | [SS S] | (SS)(S) |
| e. | [[1 1] [1 [1 1]]] | [[S S][S [S S]]] | (SS)(SSS) |
| f. | [[1 [1 1]] [1 1]] | [[S [S S]][S S]] | (SSS)(SS) |
| g. | [[1 1] 1] | [[S S] S] | (SS)(S) |
| h. | [1 [1 1]] | [S [S S]] | (SSS) |
| i. | [1 5] | [S SSSSS] | (SSS)(SSS) |
| j. | [1 [1 [1 1]]] | [S [S [S S]]] | (SSSS) |

- | | | | | |
|------|----|---|-----|--|
| (11) | a. | [ze'-b\O(÷,e) mu-se-ka']
'Japanese mosaic' | --> | (ze'-b\O(÷,e))(mu-se-ka') |
| | b. | [pa-na-ma • <-t• o]
'Panama banana' | --> | (pa-na-ma)(• <-t• o) *(pa-na)(-ma • <-t• o) |
| | c. | [n _i zo-• i]
'South Korea' | --> | (n _i zo-• i) |
| | d. | [z<-he z]
'Shanghai City' | --> | (z<-he)(z) |

- g.
$$[[S\ S]\ S] \xrightarrow{x\ x\ x\ \text{clash}\ x\ x} [[(S)(S)](S)] \xrightarrow{} (SS)(S)$$
- h.
$$[S\ [S\ S]] \xrightarrow{x\ x\ x\ \text{clash}\ x\ x\ \text{clash}\ x} [(S)[(S)(S)] \xrightarrow{} (S)(SS) \xrightarrow{} (SSS)$$
- i.
$$[S\ SSSSS] \xrightarrow{x\ x\ x\ \text{clash}\ x\ x} [(S)\ (SS)(SSS)] \xrightarrow{} (SSS)(SSS)$$
- j.
$$[S\ [S\ [S\ S]]] \xrightarrow{x\ x\ x\ x} [(S)[(S)[(S)(S)]]] \quad \text{cycle 1}$$
- $$[(S)[(S)[(SS)]]] \quad \text{cycle 2 clash}$$
- $$[(S)[(SSS)]] \quad \text{cycle 3 clash}$$
- $$[(SSSS)] \quad \text{cycle 4 clash}$$

5. One-step OT analysis

5.1. Single morphemes

- (13) a. Parse: Parse every syllable into a metrical foot
 b. Bin: Feet are binary
 c. Align-Ft-L: Align the left of each foot to the left of a word
- (14) Parse>>Bin>>Align-Ft-L
- a.
$$\begin{array}{lll} /S/ & \text{Parse } \gg & \text{Bin} \\ \$(S) & & * \\ S & *! & \end{array}$$
- b.
$$\begin{array}{lll} /SSSS/ & \text{Bin } \gg & \text{Align-Ft-L} \\ (SSSS) & *!* & \# \\ \$(SS)(SS) & & \#, \#** \end{array}$$
- (15)
$$\begin{array}{llll} /S/ & \text{Parse} & \text{Bin} & \text{Align-Ft-L} \\ \$(S) & & * & \# \\ S & *! & & \end{array}$$
- $$\begin{array}{llll} /SS/ & \text{Parse} & \text{Bin} & \text{Align-Ft-L} \\ \$(SS) & & & \# \\ (S)(S) & & *!* & \#, \#* \end{array}$$
- $$\begin{array}{llll} /SSS/ & \text{Parse} & \text{Bin} & \text{Align-Ft-L} \\ \$(SSS) & & * & \# \\ (SS)(S) & & * & \#, \#*!* \\ (S)(SS) & & * & \#, \#! \end{array}$$

/SSSS/ (SSSS) \$(SS)(SS) (S)(SSS)	Parse	Bin *!* *!*	Align-Ft-L # #, #** #, #*
/SSSSS/ (SSSSS) \$(SS)(SSS) (S)(SS)(SS)	Parse	Bin **!* * *	Align-Ft-L # #, #** #, #*, #**!*

5.2. Clash and Align (McCarthy and Prince 1993)

- (16) Clash>>Align-Wd-L
 a. Clash: Avoid stress clash
 b. Align-Wd-L: Align the left of a word with the left of a foot
- (17) [3 2]
 /SS#SS/
 (SS)(S#SS)
 \$(SS)#(SS)
- Align-Wd-L
 #, *!
 #, #
- (18) [2 1]
 /SS#S/
 \$(SS)#(S)
 (SS#S)
- Align-Wd-L
 #, #
 #, *!
- (19) [1 2]
 /S#SS/
 \$(S)#(SS)
 \$(S#SS)
- Clash
 *!
- Align-Wd-L
 #, #
 #, *

Problems

- (20) [1 5]
 /S#SSSSS/
 (S)#(SS)(SSS)
 *\$(S#S)(SS)(SS)
 (S#SS)(SSS)
- Clash
 *!
- Align-Wd-L
 #, #
 #, *
 #, *
- Bin
 *
 **
- (21) [1 [1 [1 1]]]
 /S#S#S#S/
 *\$(S#S)#(S#S)
 (S#S#S#S)
- Clash
- Align-Wd-L
 #, *, #, *
 #, *, *!, *
- Bin
 **

Problems also anticipated for
 other [1 n] compounds

[[1 1] 1]
 [1 [1 1]]
 [[1 1] [1 [1 1]]]
 [[1 [1 1]] [1 1]]

(30)	[2 1] (SS)#(S) (S)(SS) (SSS) \$(SS)(S)	Clash *!	Iden-stress ** *!	Bin * * * *
(31)	[1 [1 1]]			
a.	Inner cycle [1 1] (S)#(S) (S)(S) (SS)	Clash *!	Iden-stress *	Bin *
b.	Final cycle (S)#(SS) (S)(SS) \$(SSS) (SS)(S)	Clash *!	Iden-stress * *! *	Bin * * *
(32)	[[1 1] [1 [1 1]]]			
a.	Inner cycles (see (31)) [1 1] --> (SS) [1 [1 1]] --> (SSS)			
b.	Final cycle (SS)#(SSS) \$(SS)(SSS) (SSSSS) (SS)(SS)(S)	Clash	Iden-stress *! *!	Bin * *** *
(33)	[[1 [1 1]] [1 1]]			
a.	Inner cycles [1 [1 1]] --> (SSS) [1 1] --> (SS)			
b.	Final cycle (same as [3 2] in (28)) (SSS)#(SS) --> (SSS)(SS)			
(34)	[1 [1 [1 1]]]			
a.	Inner [1 [1 1]] --> (SSS)			
b.	Final cycle [1 3] (S)#(SSS) (S)(SSS) \$(SSSS) (SS)(SS)	Clash *!	Iden-stress * *! *!	Bin ** ** **

7. Conclusions

The cycle is needed in OT

Iden and the cycle reduce the need for some alignment functions

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