

## 15. DBS.3: Adnominal and Adverbial Modifiers

### 15.1 Interpreting Elementary and Complex Modifiers

#### 15.1.1 Preposition, complex adjective, and elementary adjective

on	on the big table	fast
[ sur: on adj: <i>on</i> n_2 cat: adj sem: mdr: mdd: idy: prn: ]	[ sur: on adj: <i>on table</i> cat: adj sem: def sg mdr: big mdd: apple 1 idy: 2 prn: 1 ]	[ sur: fast adj: <i>fast</i> cat: adj sem: mdr: B mdd: car 4 idy: B prn: 3 ]

#### 15.1.2 Representing (eat) the apple on the table (adnominal)

[ noun: apple cat: np sem: def sg fnc: eat mdr: on table idy: 1 prn: 1 ]	[ adj: on table cat: adn sem: def sg mdr: mdd: apple 1 idy: 2 prn: 1 ]
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#### 15.1.3 Representing eat (the apple) on the table (adverbial)

sur:	
verb: <i>eat</i>	adj: on table
cat: v	cat: adv
sem: past	sem: def sg
mdr: on table	mdr:
arg: Julia apple	mdd: eat
nc:	idy: 2
pc:	prn: 1
prn: 1	

### 15.1.4 Positions of elementary adnominals

- (i) The + *young* + girl ate an apple (modifying the subject)
- (ii) Julia gave the + *young* + girl an apple (modifying the indirect object)
- (iii) Julia gave the girl a + *red* + apple (modifying the direct object)

### 15.1.5 Positions of complex adnominals (prepositional phrases)

- (i) the apple + *on the table* + pleased Julia (modifying the subject)
- (ii) Julia ate the apple + *on the table* (modifying the direct object)
- (iii) Julia gave John the apple + *on the table* (modifying the direct object)

### 15.1.6 Positions of elementary adverbials

- (i) *quickly* + Julia ate the apple
- (ii) Julia + *quickly* + ate the apple
- (iii) Julia slept + *soundly*
- (iv) Julia ate the apple + *quickly*

### 15.1.7 Positions of prepositional phrases used as adverbs

- (i) *on the table* + Julia ate an apple
- (ii) \*Julia + *on the table* + ate the apple
- (iii) Julia slept + *on the table*
- (iv) Julia ate the apple + *on the table*

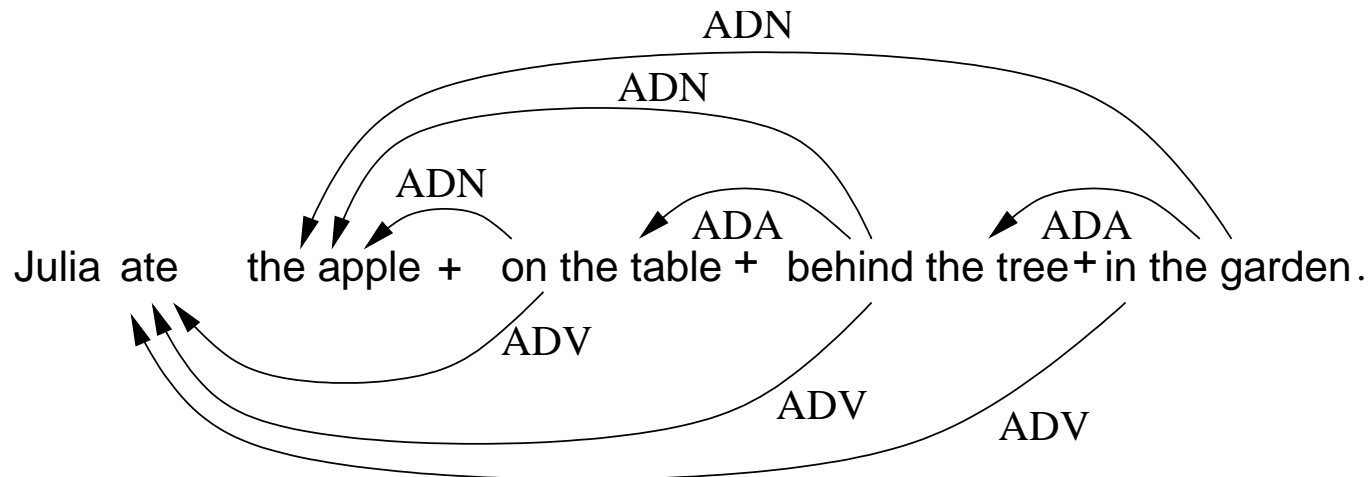
### 15.1.8 Positions of intensifiers

- (i) the + *very* big + table (noun phrase)
- (ii) on the + *very* big + table (prepositional phrase)
- (iii) *very* quickly + Julia ate an apple (elementary adverbial)
- (iv) Julia + *very* quickly + ate an apple (elementary adverbial)
- (v) Julia ate the apple + *very* quickly (elementary adverbial)

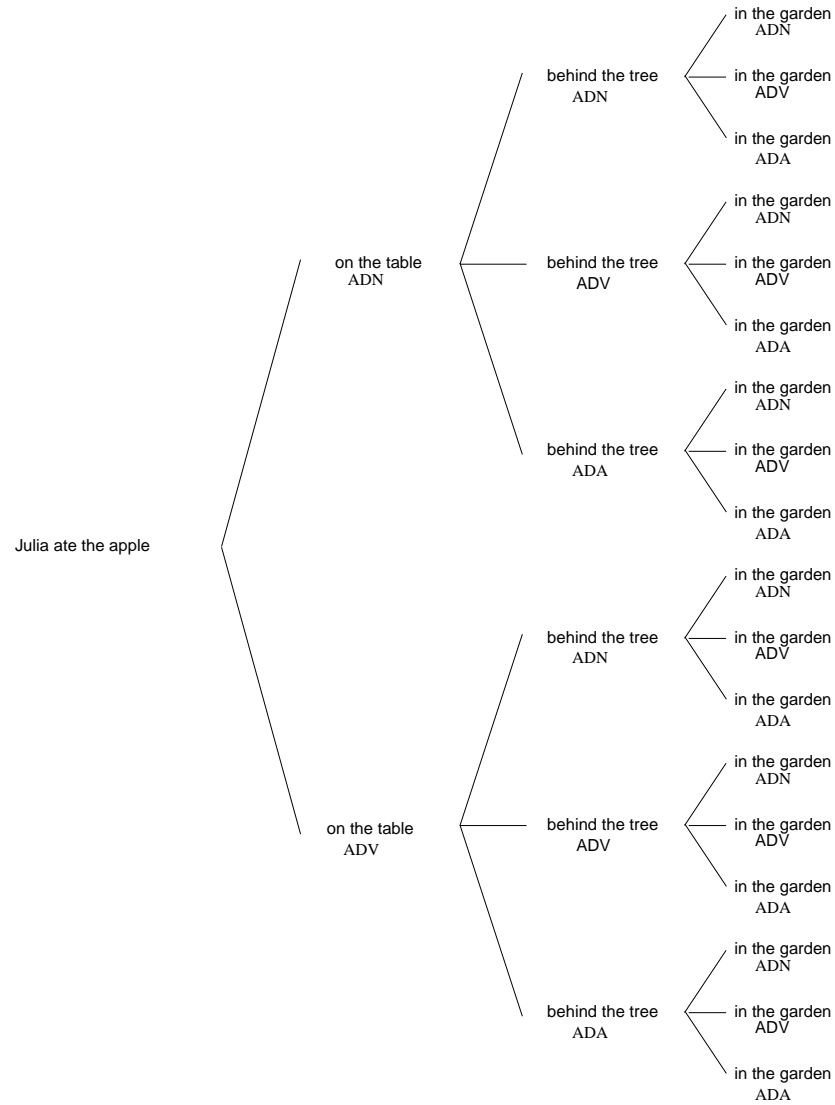
### 15.1.9 Interpretations of sequences of prepositional phrases

- (i) the car + in the garage + with the broken window
- (ii) Julia walked + into the garden + with John's shoes

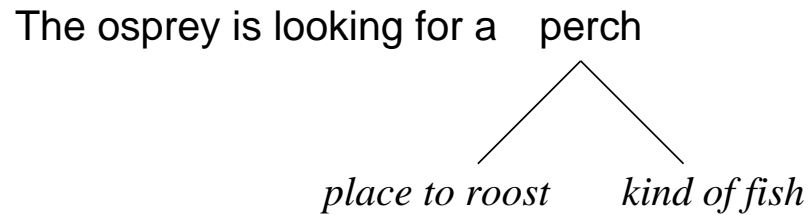
### 15.1.10 Readings created by a sequence prepositional phrases



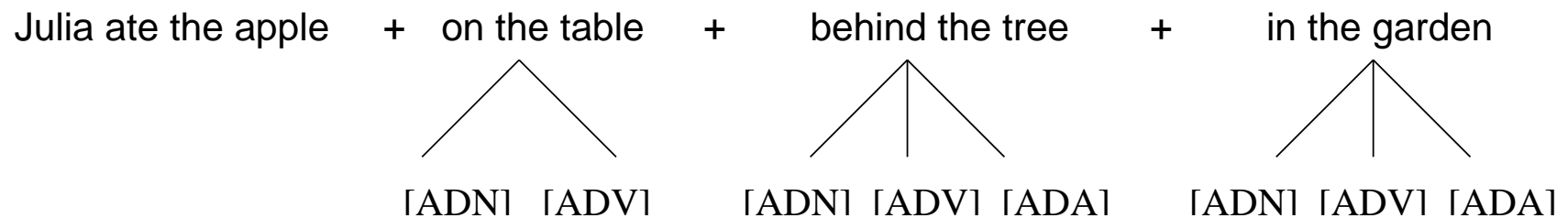
### 15.1.11 Nativist treatment of prepositional phrase ambiguities



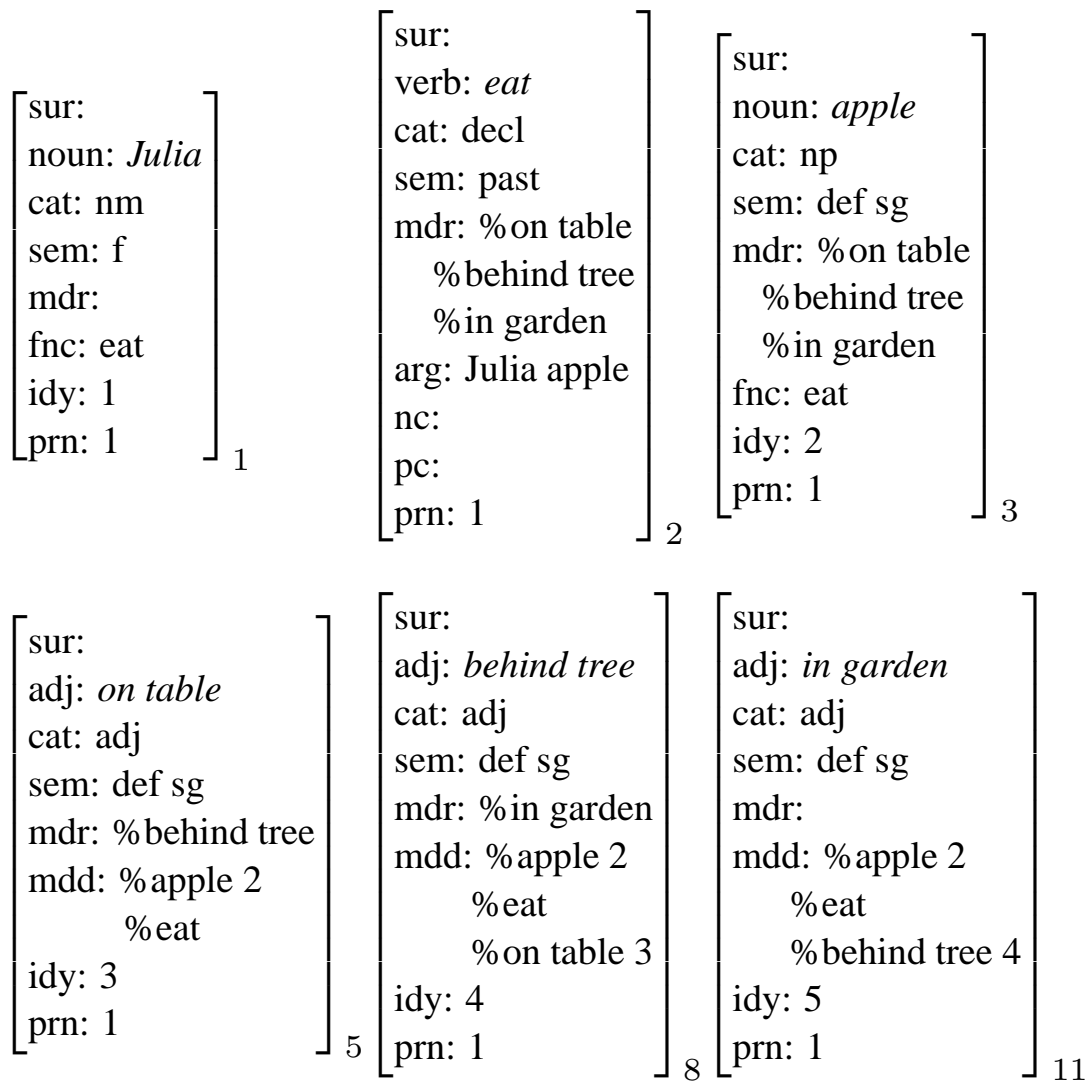
### 15.1.12 Example of lexically-based semantic doubling



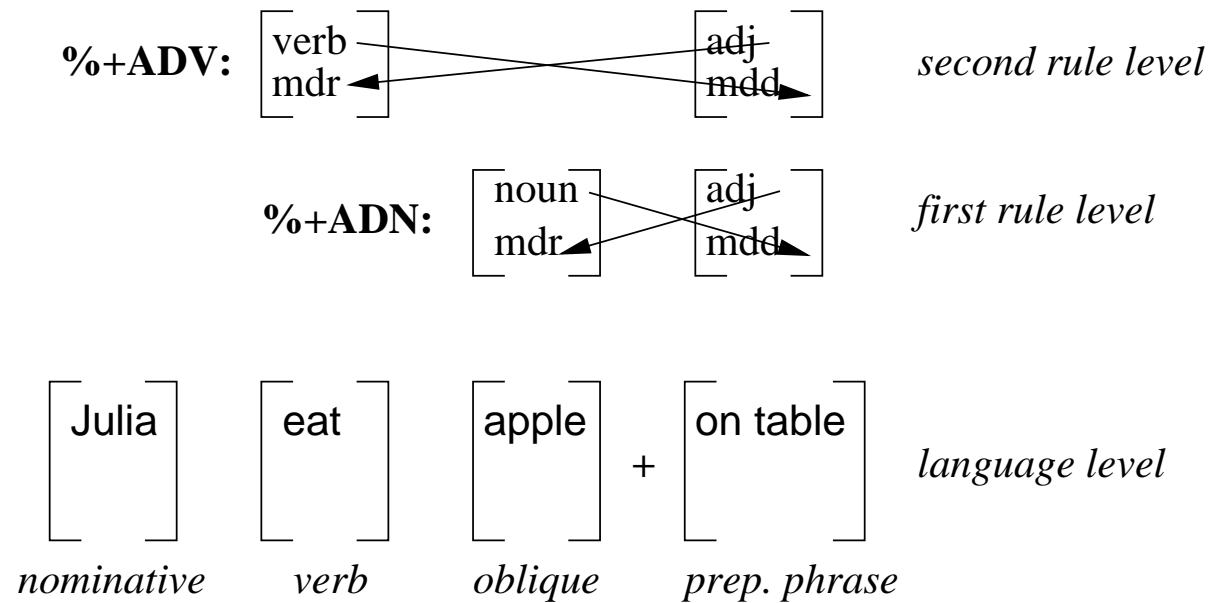
### 15.1.13 Prepositional phrase ambiguity as semantic doubling



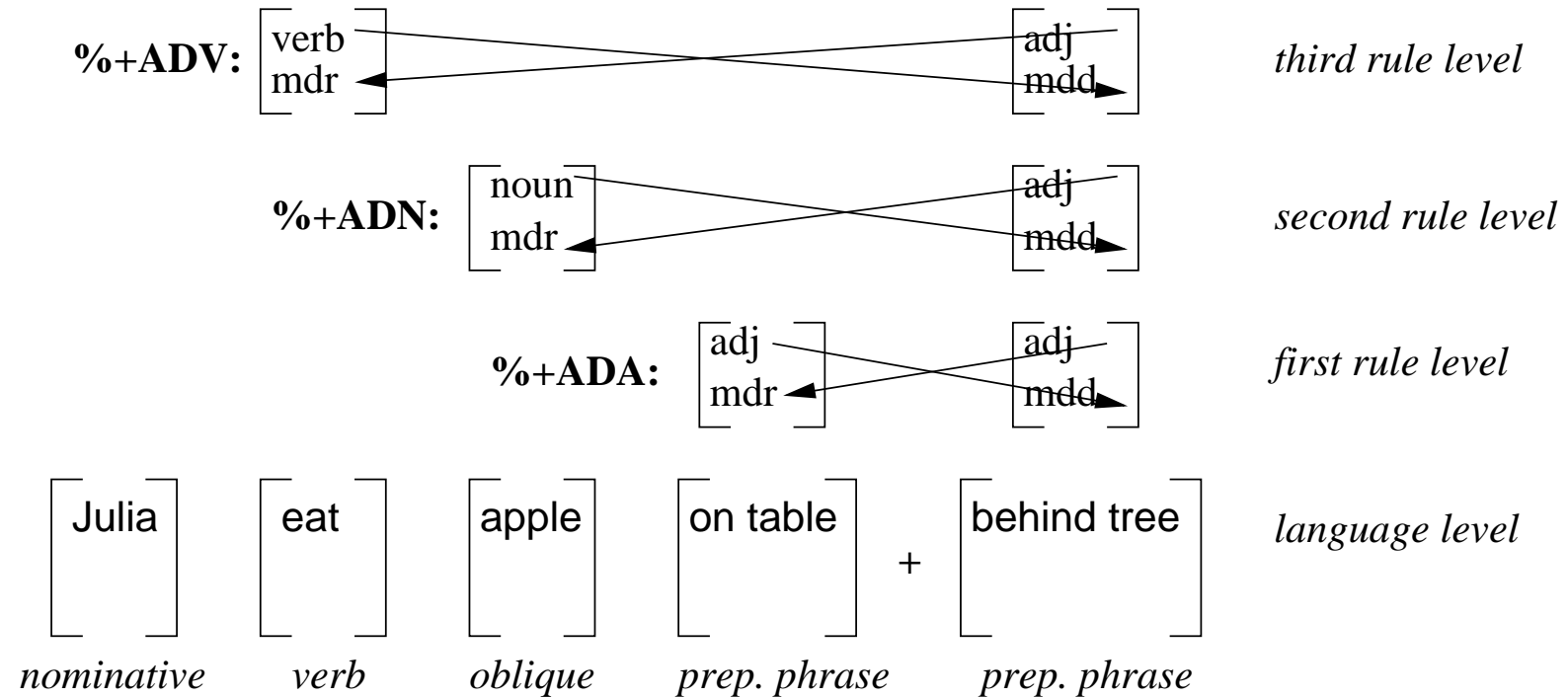
### 15.1.14 Formalizing semantic doubling in Database Semantics



### 15.1.15 Adding preposition. phrase with adv and adn interpretation



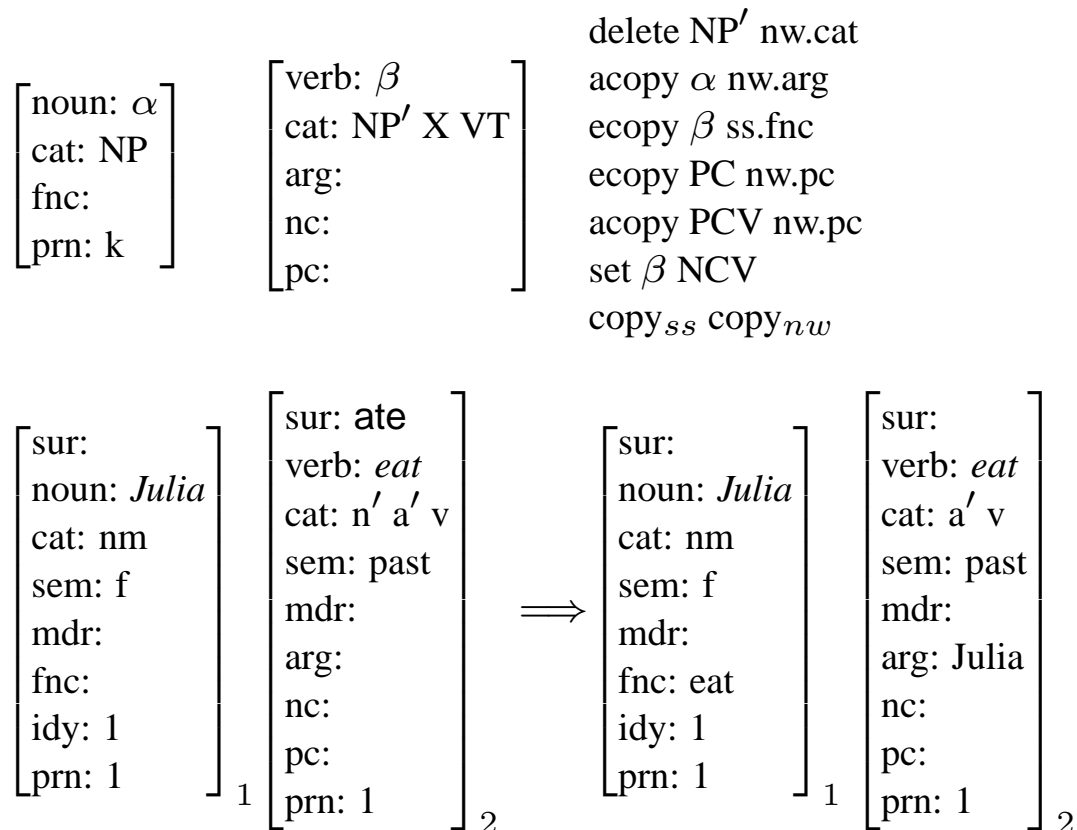
### 15.1.16 Prepositional phrase with adv, adn, and ada interpretation



## 15.2 ADN and ADA Interpretations of Prepositional Phrases

### 15.2.1 Combining Julia and ate with NOM+FV

NOM+FV {22 FV+NP, 23 AUX+NFV, 24 S+IP}



### 15.2.2 Combining Julia ate and the with FV+NP

**FV+NP** {DET+NN, DET+ADN, DET+INT, FV+NP, %NP+PREP, %V+ADV, V+INT, S+IP}

$\left[ \begin{array}{l} \text{verb: } \beta \\ \text{cat: NP' X VT} \\ \text{arg:} \end{array} \right]$	$\left[ \begin{array}{l} \text{noun: } \alpha \\ \text{cat: Y NP} \\ \text{fnc:} \end{array} \right]$	delete NP' ss.cat acopy $\alpha$ ss.arg ecopy $\beta$ nw.fnc copy <sub>ss</sub> copy <sub>nw</sub>
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$\left[ \begin{array}{l} \text{sur:} \\ \text{verb: } eat \\ \text{cat: a' v} \\ \text{sem: past} \\ \text{mdr:} \\ \text{arg: Julia} \\ \text{nc:} \\ \text{pc:} \\ \text{prn: 2} \end{array} \right]_1$		$\left[ \begin{array}{l} \text{sur: the} \\ \text{noun: n\_1} \\ \text{cat: nn' np} \\ \text{sem: def} \\ \text{mdr:} \\ \text{fnc:} \\ \text{idy:} \\ \text{prn:} \end{array} \right]_3$	$\Rightarrow$	$\left[ \begin{array}{l} \text{sur:} \\ \text{verb: } eat \\ \text{cat: v} \\ \text{sem: past} \\ \text{mdr:} \\ \text{arg: Julia n\_1} \\ \text{nc:} \\ \text{pc:} \\ \text{prn: 1} \end{array} \right]_2$		$\left[ \begin{array}{l} \text{sur:} \\ \text{noun: n\_1} \\ \text{cat: nn' np} \\ \text{sem: def} \\ \text{mdr:} \\ \text{fnc: eat} \\ \text{idy: 2} \\ \text{prn: 1} \end{array} \right]_3$
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### 15.2.3 Combining Julia ate the and apple with DET+NN

**DET+NN** {NOM+FV, ADVNOM+FV, FV+NP, %NP+PREP, %V+ADV, V+INT, S+IP}

$$\begin{bmatrix} \text{noun: } N_n \\ \text{cat: } N' X \\ \text{sem: } Y \end{bmatrix} \quad \begin{bmatrix} \text{noun: } \alpha \\ \text{cat: } N \\ \text{sem: } Z \end{bmatrix}$$

delete  $N'$  ss.cat  
 acopy nw.sem ss.sem  
 replace  $\alpha$   $N_n$   
 copy<sub>ss</sub>

$$\begin{bmatrix} \text{sur:} \\ \text{verb: } eat \\ \text{cat: } v \\ \text{sem: } past \\ \text{mdr:} \\ \text{arg: } Julia \ n\_1 \\ \text{nc:} \\ \text{pc:} \\ \text{prn: } 1 \end{bmatrix}_2 \quad \begin{bmatrix} \text{sur:} \\ \text{noun: } n\_1 \\ \text{cat: } nn' \ np \\ \text{sem: } def \\ \text{mdr:} \\ \text{fnc: } eat \\ \text{idy: } 2 \\ \text{prn: } 1 \end{bmatrix}_3 \quad \begin{bmatrix} \text{sur: } apple \\ \text{noun: } apple \\ \text{cat: } sn \\ \text{sem: } sg \\ \text{mdr:} \\ \text{fnc:} \\ \text{idy:} \\ \text{prn:} \end{bmatrix}_4 \quad \Rightarrow \quad \begin{bmatrix} \text{sur:} \\ \text{verb: } eat \\ \text{cat: } v \\ \text{sem: } past \\ \text{mdr:} \\ \text{arg: } Julia \ apple \\ \text{nc:} \\ \text{pc:} \\ \text{prn: } 1 \end{bmatrix}_2 \quad \begin{bmatrix} \text{sur:} \\ \text{noun: } apple \\ \text{cat: } np \\ \text{sem: } def \ sg \\ \text{mdr:} \\ \text{fnc: } eat \\ \text{idy: } 2 \\ \text{prn: } 3 \end{bmatrix}_3$$

### 15.2.4 Combining Julia ate the apple and on with %NP+PREP

%NP+PREP

{PREP+NP}

$$\begin{bmatrix} \text{noun: } \alpha \\ \text{cat: N} \\ \text{mdr:} \\ \text{idy: j} \end{bmatrix}$$

$$\begin{bmatrix} \text{adj: PREP N}_n \\ \text{cat: adj} \\ \text{mdd:} \end{bmatrix}$$

%ecopy nw.adj ss.mdr  
 %ecopy  $\alpha$  nw.mdd  
 acopy ss.idy nw.mdd  
 copy<sub>ss</sub>copy<sub>nw</sub>

$$\begin{bmatrix} \text{sur:} \\ \text{noun: } \textit{apple} \\ \text{cat: np} \\ \text{sem: def sg} \\ \text{mdr:} \\ \text{fnc: eat} \\ \text{idy: 2} \\ \text{prn: 1} \end{bmatrix}_3$$

$$\begin{bmatrix} \text{sur: on} \\ \text{adj: } \textit{on} \text{ n}_2 \\ \text{cat: adj} \\ \text{sem:} \\ \text{mdr:} \\ \text{mdd:} \\ \text{idy:} \\ \text{prn:} \end{bmatrix}_5$$
 $\Rightarrow$ 

$$\begin{bmatrix} \text{sur:} \\ \text{noun: } \textit{apple} \\ \text{cat: np} \\ \text{sem: def sg} \\ \text{mdr: } \% \textit{on} \text{ n}_2 \\ \text{fnc: eat} \\ \text{idy: 2} \\ \text{prn: 1} \end{bmatrix}_3$$

$$\begin{bmatrix} \text{sur:} \\ \text{adj: } \textit{on} \text{ n}_2 \\ \text{cat: adj} \\ \text{sem:} \\ \text{mdr:} \\ \text{mdd: } \% \textit{apple} \text{ 2} \\ \text{idy: 3} \\ \text{prn: 1} \end{bmatrix}_5$$

### 15.2.5 Combining Julia ate the apple on and the with PREP+NP

**PREP+NP** {PREP+NN,PREP+ADN,PREP+INT,%NP+PREP,%V+ADV,%PREP+PREP,ADV+NOM,S+IP}

$$\begin{bmatrix} \text{adj: PREP } N_n \\ \text{cat: adj} \\ \text{sem:} \end{bmatrix} \quad \begin{bmatrix} \text{noun: } \alpha \\ \text{cat: Y NP} \\ \text{sem: x} \end{bmatrix}$$

replace  $\alpha$   $N_n$   
 acopy Y ss.cat:1  
 acopy nw.sem ss.sem  
 copy<sub>ss</sub>

$$\begin{bmatrix} \text{sur:} \\ \text{noun: } \textit{apple} \\ \text{cat: np} \\ \text{sem: def sg} \\ \text{mdr: \%on } n_2 \\ \text{fnc: eat} \\ \text{idy: 2} \\ \text{prn: 1} \end{bmatrix}_3 \quad \begin{bmatrix} \text{sur:} \\ \text{adj: } \textit{on } n_2 \\ \text{cat: adj} \\ \text{sem:} \\ \text{mdr:} \\ \text{mdd: \%apple 2} \\ \text{idy: 3} \\ \text{prn: 1} \end{bmatrix}_5 \quad \begin{bmatrix} \text{sur: the} \\ \text{noun: } n_3 \\ \text{cat: nn' np} \\ \text{sem: def} \\ \text{mdr:} \\ \text{fnc:} \\ \text{idy:} \\ \text{prn:} \end{bmatrix}_6 \quad \Rightarrow \quad \begin{bmatrix} \text{sur:} \\ \text{noun: } \textit{apple} \\ \text{cat: np} \\ \text{sem: def sg} \\ \text{mdr: \%on } n_3 \\ \text{fnc: eat} \\ \text{idy: 2} \\ \text{prn: 1} \end{bmatrix}_3 \quad \begin{bmatrix} \text{sur:} \\ \text{adj: } \textit{on } n_3 \\ \text{cat: nn' adj} \\ \text{sem: def} \\ \text{mdr:} \\ \text{mdd: \%apple 2} \\ \text{idy: 3} \\ \text{prn: 1} \end{bmatrix}_5$$

### 15.2.6 Combining Julia ate the apple on the and table with PREP+NN

**PREP+NN** {ADV+NOM, NOM+FV, FV+NP, %NP+PREP, %V+ADV, %PREPP+PREP, V+INT, S+IP}

$\left[ \begin{array}{l} \text{adj: PREP } N\_n \\ \text{cat: } N' \text{ adj} \\ \text{sem: } Y \end{array} \right]$	$\left[ \begin{array}{l} \text{noun: } \alpha \\ \text{cat: } N \\ \text{sem: } Z \end{array} \right]$	<p>delete <math>N'</math> ss.cat          acopy nw.sem ss.sem          replace <math>\alpha</math> <math>N\_n</math>          copy<sub>ss</sub></p>
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$\left[ \begin{array}{l} \text{sur:} \\ \text{noun: } \textit{apple} \\ \text{cat: np} \\ \text{sem: def sg} \\ \text{mdr: \%on } n\_3 \\ \text{fnc: eat} \\ \text{idy: 2} \\ \text{prn: 1} \end{array} \right]_3$	$\left[ \begin{array}{l} \text{sur:} \\ \text{adj: } \textit{on } n\_3 \\ \text{cat: } nn' \text{ adj} \\ \text{sem: def} \\ \text{mdr:} \\ \text{mdd: \%apple 2} \\ \text{idy: 3} \\ \text{prn: 1} \end{array} \right]_5$	$\left[ \begin{array}{l} \text{sur: } \textit{table} \\ \text{noun: } \textit{table} \\ \text{cat: sn} \\ \text{sem: sg} \\ \text{mdr:} \\ \text{fnc:} \\ \text{idy:} \\ \text{prn:} \end{array} \right]_6$	$\Rightarrow$	$\left[ \begin{array}{l} \text{sur:} \\ \text{noun: } \textit{apple} \\ \text{cat: np} \\ \text{sem: def sg} \\ \text{mdr: \%on table} \\ \text{fnc: eat} \\ \text{idy: 2} \\ \text{prn: 1} \end{array} \right]_3$	$\left[ \begin{array}{l} \text{sur:} \\ \text{adj: } \textit{on table} \\ \text{cat: adj} \\ \text{sem: def sg} \\ \text{mdr:} \\ \text{mdd: \%apple 2} \\ \text{idy: 3} \\ \text{prn: 1} \end{array} \right]_5$
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### 15.2.7 The ADN-interpretation of Julia ate the apple on the table

sur: noun: <i>Julia</i> cat: nm sem: f mdr: fnc: eat idy: 1 prn: 1	1	sur: verb: <i>eat</i> cat: v sem: past mdr: arg: Julia apple nc: pc: prn: 1	2	sur: noun: <i>apple</i> cat: np sem: def sg mdr: %on table fnc: eat idy: 2 prn: 1	3	sur: adj: <i>on table</i> cat: adj sem: def sg mdr: mdd: %apple 2 idy: 3 prn: 1	5
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### 15.2.8 Combining the apple on the table and behind with %PREPP+PREP

**%PREPP+PREP**

{PREP+NP}

[  
adj: PREP  $\alpha$   
cat: adj  
mdr:  
idy: j  
]

[  
adj: PREP N<sub>n</sub>  
cat: adj  
mdd:  
]

%ecopy nw.adj ss.mdr  
%ecopy ss.adj nw.mdd  
acopy ss.idy nw.mdd  
copy<sub>ss</sub>copy<sub>nw</sub>

[  
sur:  
noun: *apple*  
cat: snp  
sem: def sg  
mdr: %on table  
fnc:  
idy: 1  
prn: 1  
]

3

[  
sur:  
adj: *on table*  
cat: adj  
sem: def sg  
mdr:  
mdd: %apple 2  
idy: 3  
prn: 1  
]

5

[  
sur: behind  
adj: *behind* n<sub>4</sub>  
cat: adj  
sem:  
mdr:  
mdd:  
idy:  
prn:  
]

⇒

[  
sur:  
noun: *apple*  
cat: snp  
sem: def sg  
mdr: %on table  
fnc:  
idy: 2  
prn: 1  
]

3

[  
sur:  
adj: *on table*  
cat: adj  
sem: def sg  
mdr: %*behind* n<sub>4</sub>  
mdd: %apple 2  
idy: 3  
prn: 1  
]

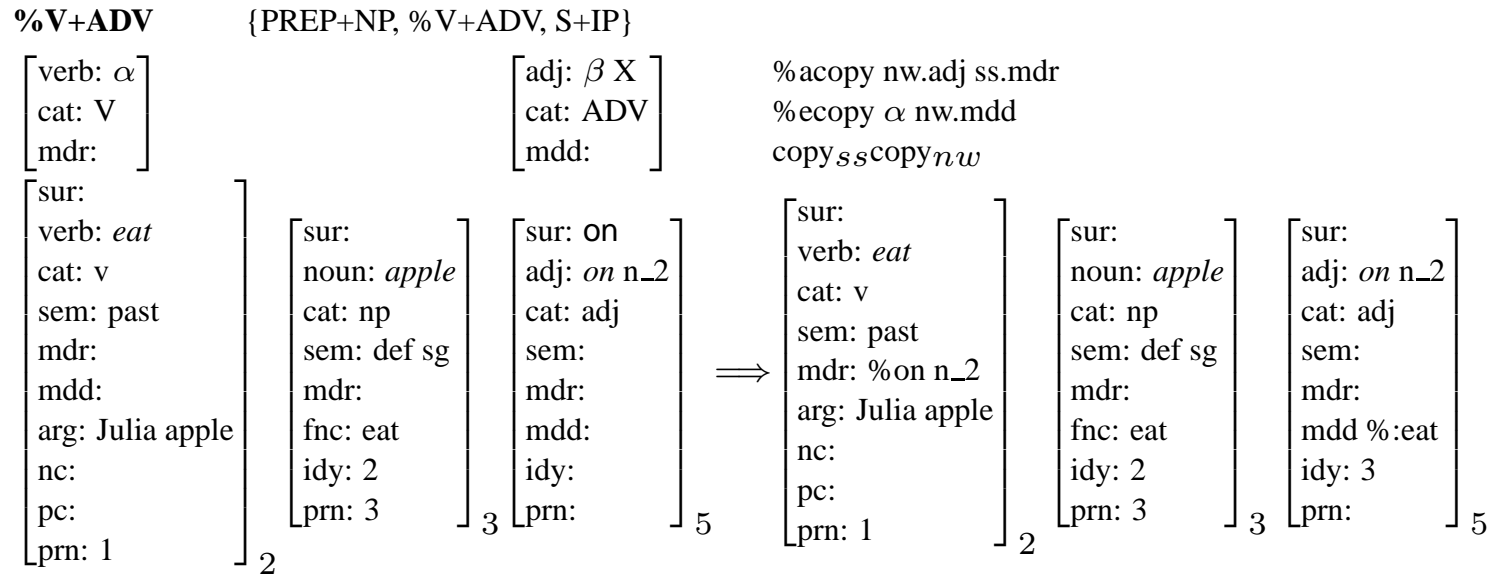
5

[  
sur: behind  
adj: *behind* n<sub>4</sub>  
cat: adj  
sem:  
mdr:  
mdd: %on table  
idy: 4  
prn:  
]

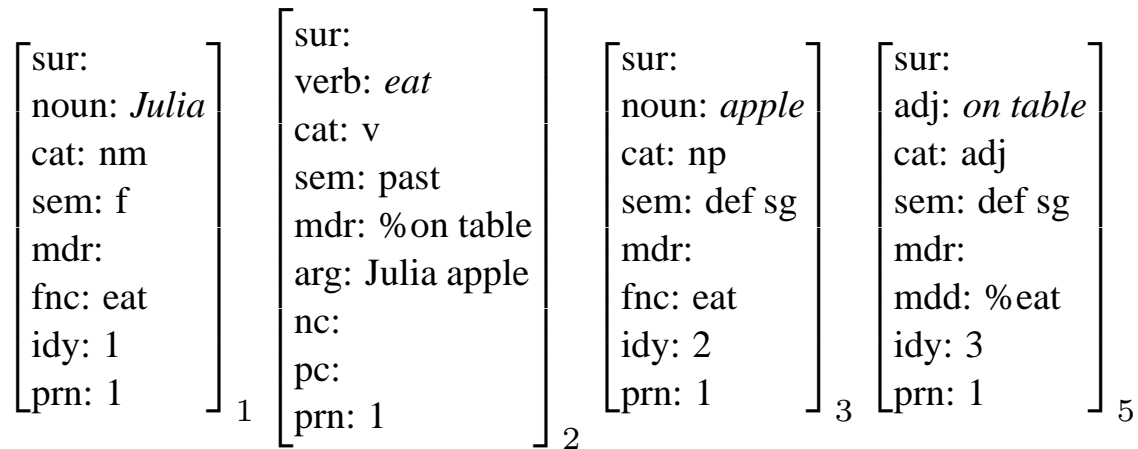
8

# 15.3 ADV Interpretation of Prepositional Phrases

## 15.3.1 Combining Julia ate the apple and on with %V+ADV



### 15.3.2 The ADV-interpretation of Julia ate the apple on the table



### 15.3.3 Combining Julia ate the apple and fast with %V+ADV

**%V+ADV**      {PREP+NP, %V+ADV, S+IP}

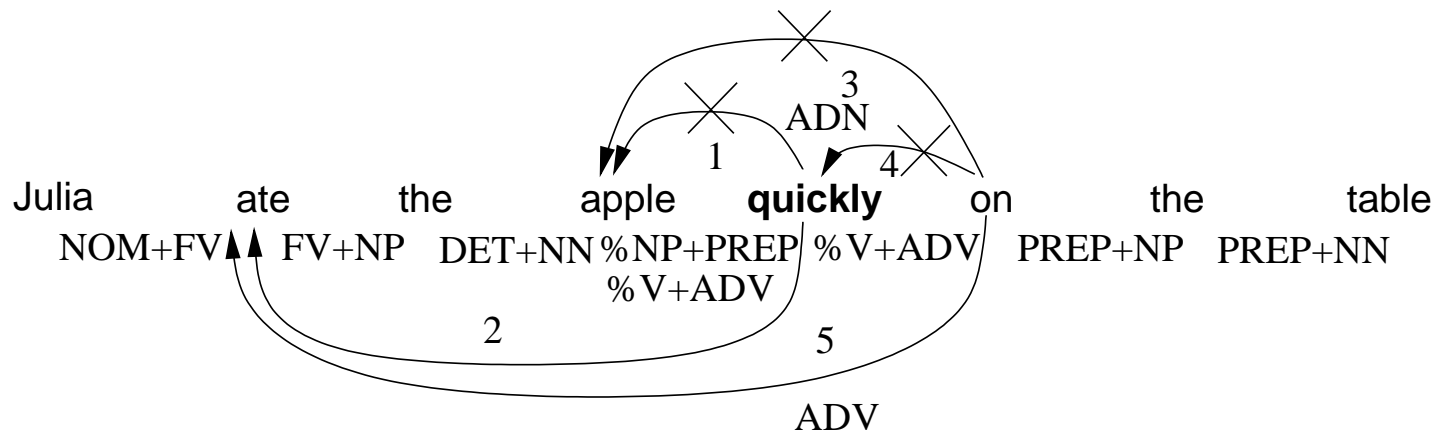
verb: $\alpha$ cat: v mdr:	adj: $\beta$ X cat: ADV mdd:	%acopy nw.adj ss.mdr %ecopy $\alpha$ nw.mdd copy <sub>ss</sub> copy <sub>nw</sub>
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sur: verb: <i>eat</i> cat: v sem: past mdr: arg: Julia apple nc: pc: prn: 1	$\Rightarrow$	sur: verb: <i>eat</i> cat: v sem: past mdr: %fast arg: Julia apple nc: pc: prn: 1	sur: adj: <i>fast</i> cat: adj sem: mdr: mdd: %eat idy: prn: 1
$\left. \vphantom{\begin{array}{l} \text{sur:} \\ \text{verb: } \textit{eat} \\ \text{cat: v} \\ \text{sem: past} \\ \text{mdr:} \\ \text{arg: Julia apple} \\ \text{nc:} \\ \text{pc:} \\ \text{prn: 1} \end{array}} \right\} 2$		$\left. \vphantom{\begin{array}{l} \text{sur:} \\ \text{verb: } \textit{eat} \\ \text{cat: v} \\ \text{sem: past} \\ \text{mdr: \%fast} \\ \text{arg: Julia apple} \\ \text{nc:} \\ \text{pc:} \\ \text{prn: 1} \end{array}} \right\} 2$	$\left. \vphantom{\begin{array}{l} \text{sur:} \\ \text{adj: } \textit{fast} \\ \text{cat: adj} \\ \text{sem:} \\ \text{mdr:} \\ \text{mdd: \%eat} \\ \text{idy:} \\ \text{prn: 1} \end{array}} \right\} 5$

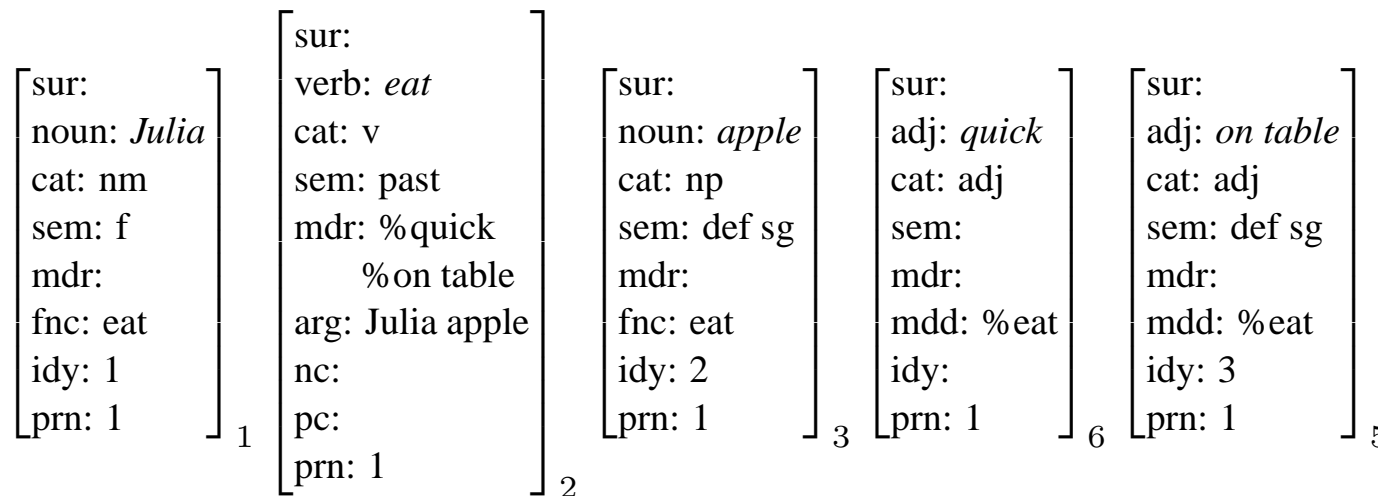
### 15.3.4 Result of interpreting Julia ate the apple fast

sur: noun: <i>Julia</i> cat: nm sem: f mdr: fnc: eat idy: 1 prn: 1	1	sur: verb: <i>eat</i> cat: v sem: past mdr: %fast arg: Julia apple nc: pc: prn: 1	2	sur: noun: <i>apple</i> cat: np sem: def sg mdr: fnc: eat idy: 2 prn: 1	3	sur: adj: <i>fast</i> cat: adj sem: mdr: mdd: %eat idy: prn: 1	5
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### 15.3.5 Interpretation of post-adverbial prepositional phrases



### 15.3.6 Result of interpreting Julia ate the apple quickly on the table



### 15.3.7 Combining Quickly and Julia with ADV+NOM

**ADV+NOM** {NOM+ADV, ADVNOM+FV, DET+NN, DET+ADN, DET+INT}

$\left[ \begin{array}{l} \text{adj: } \alpha \\ \text{cat: ADV} \\ \text{mdd:} \end{array} \right]$	$\left[ \begin{array}{l} \text{noun: } \beta \\ \text{cat: Y NP} \\ \text{fnc:} \end{array} \right]$	acopy v_n ss.mdd ecopy v_n nw.fnc replace adv ss.cat copy <sub>ss</sub> copy <sub>nw</sub>
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$\left[ \begin{array}{l} \text{sur: quickly} \\ \text{adj: } \textit{quick} \\ \text{cat: adv} \\ \text{sem:} \\ \text{mdr:} \\ \text{mdd:} \\ \text{idy:} \\ \text{prn: 1} \end{array} \right]_1$	$\left[ \begin{array}{l} \text{sur: Julia} \\ \text{noun: } \textit{Julia} \\ \text{cat: nm} \\ \text{sem: f} \\ \text{mdr:} \\ \text{fnc:} \\ \text{idy:} \\ \text{prn:} \end{array} \right]_2$	$\Rightarrow$	$\left[ \begin{array}{l} \text{sur:} \\ \text{adj: } \textit{quick} \\ \text{cat: adv} \\ \text{sem:} \\ \text{mdr:} \\ \text{mdd: v\_1} \\ \text{idy:} \\ \text{prn: 1} \end{array} \right]_1$	$\left[ \begin{array}{l} \text{sur:} \\ \text{noun: } \textit{Julia} \\ \text{cat: nm} \\ \text{sem: f} \\ \text{mdr:} \\ \text{fnc: v\_1} \\ \text{idy: 1} \\ \text{prn: 1} \end{array} \right]_2$
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### 15.3.8 Combining On the table and Julia with ADV+NOM

**ADV+NOM**      {NOM+ADV, ADVNOM+FV, DET+NN, DET+ADN, DET+INT}

adj: $\alpha$	noun: $\beta$	acopy v_n ss.mdd ecopy v_n nw.fnc replace adv ss.cat copy <sub>ss</sub> copy <sub>nw</sub>
cat: ADV	cat: Y NP	
mdd:	fnc:	

sur:	sur: <i>Julia</i>	⇒	sur:	sur:
adj: <i>on table</i>	noun: <i>Julia</i>		adj: <i>on table</i>	noun: <i>Julia</i>
cat: adj	cat: nm		cat: adv	cat: nm
sem: def sg	sem: f		sem: def sg	sem: f
mdr:	mdr:		mdr:	mdr:
mdd:	fnc:		mdd: v_1	fnc: v_1
idy: 1	idy:		idy: 1	idy: 2
prn: 1	prn:	prn: 1	prn: 1	
]	]	]	]	
1	2	1	2	

### 15.3.9 Combining Julia and quickly with NOM+ADV

**NOM+ADV**

{ADV NOM+FV}

$$\begin{bmatrix} \text{noun: } \beta \\ \text{cat: NP} \\ \text{fnc:} \end{bmatrix}$$

$$\begin{bmatrix} \text{adj: } \alpha \\ \text{cat: adv} \\ \text{mdd:} \end{bmatrix}$$

acopy v\_1 nw.mdd  
ecopy v\_1 ss.fnc  
copy<sub>ss</sub>copy<sub>nw</sub>

$$\begin{bmatrix} \text{sur:} \\ \text{noun: } \textit{Julia} \\ \text{cat: nm} \\ \text{sem: f} \\ \text{mdr:} \\ \text{fnc:} \\ \text{idy: 1} \\ \text{prn: 1} \end{bmatrix}_1$$

$$\begin{bmatrix} \text{sur: quickly} \\ \text{adj: } \textit{quick} \\ \text{cat: adv} \\ \text{sem:} \\ \text{mdr:} \\ \text{mdd:} \\ \text{idy:} \\ \text{prn: 1} \end{bmatrix}_2$$

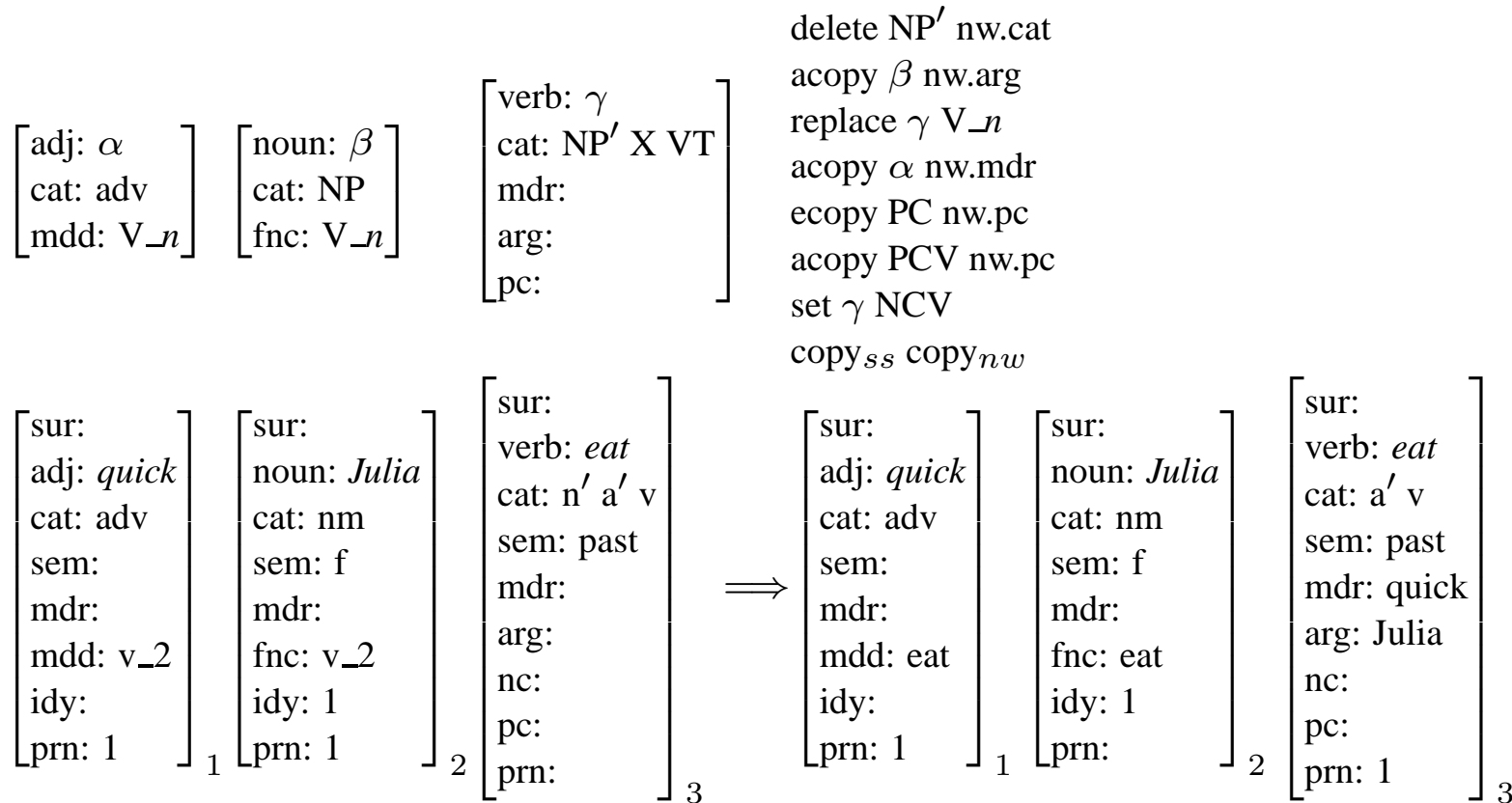
$\Rightarrow$

$$\begin{bmatrix} \text{sur:} \\ \text{noun: } \textit{Julia} \\ \text{cat: nm} \\ \text{sem: f} \\ \text{mdr:} \\ \text{fnc: v\_1} \\ \text{idy: 1} \\ \text{prn: 1} \end{bmatrix}_1$$

$$\begin{bmatrix} \text{sur:} \\ \text{adj: } \textit{quick} \\ \text{cat: adv} \\ \text{sem:} \\ \text{mdr:} \\ \text{mdd: v\_1} \\ \text{idy:} \\ \text{prn: 1} \end{bmatrix}_2$$

### 15.3.10 Combining Quickly Julia and ate with ADVNOM+FV

ADV NOM+FV {FV+NP, AUX+NFV, %V+ADV, S+IP}

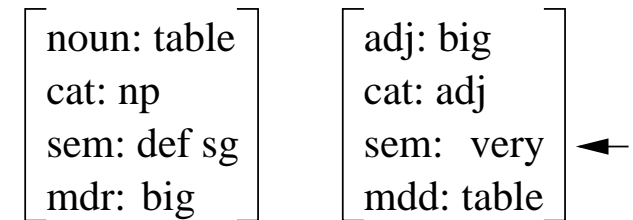
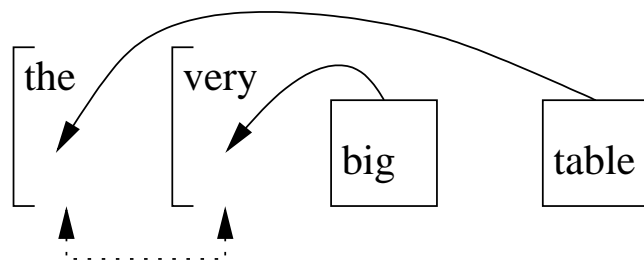
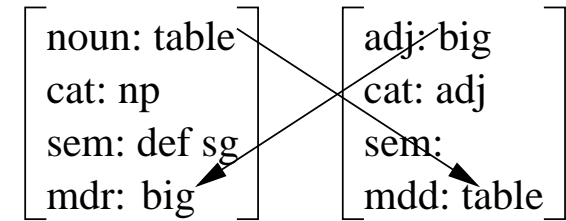
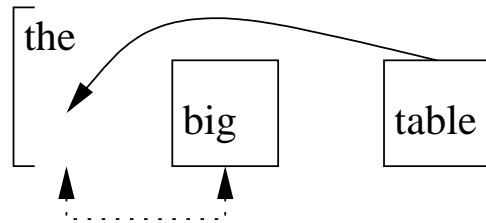
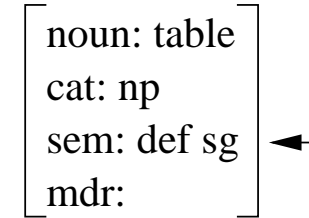
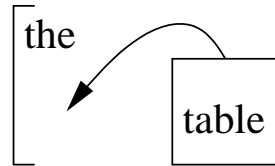


### 15.3.11 Result of parsing On the table Julia quickly ate the apple

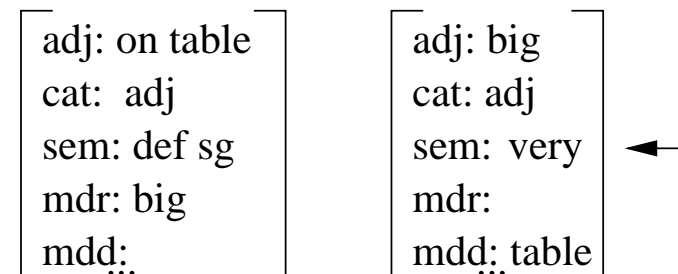
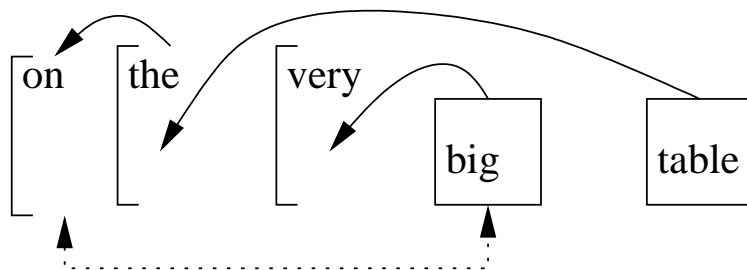
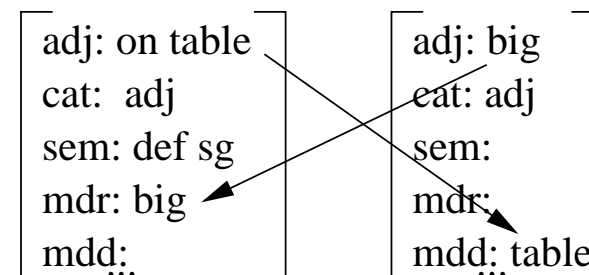
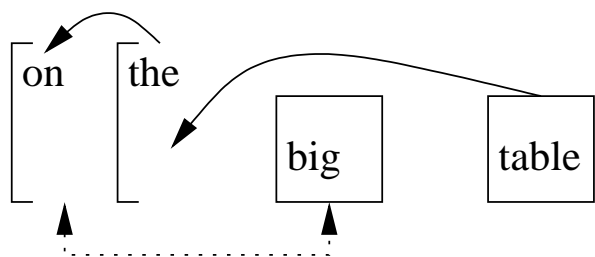
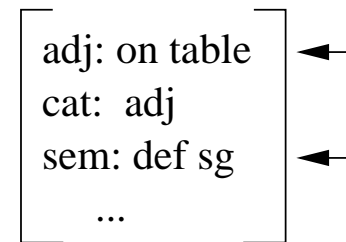
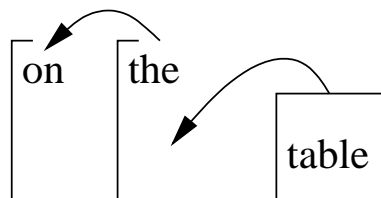
$\left[ \begin{array}{l} \text{sur:} \\ \text{adj: } \textit{on table} \\ \text{cat: adj} \\ \text{sem: def sg} \\ \text{mdr:} \\ \text{mdd: eat} \\ \text{idy: 1} \\ \text{prn: 1} \end{array} \right]_1$	$\left[ \begin{array}{l} \text{sur:} \\ \text{noun: } \textit{Julia} \\ \text{cat: nm} \\ \text{sem: f} \\ \text{mdr:} \\ \text{fnc: eat} \\ \text{idy: 2} \\ \text{prn: 1} \end{array} \right]_4$	$\left[ \begin{array}{l} \text{sur:} \\ \text{adj: } \textit{quick} \\ \text{cat: adv} \\ \text{sem:} \\ \text{mdr:} \\ \text{mdd: eat} \\ \text{idy:} \\ \text{prn: 1} \end{array} \right]_5$	$\left[ \begin{array}{l} \text{sur:} \\ \text{verb: } \textit{eat} \\ \text{cat: decl} \\ \text{sem: past} \\ \text{mdr: on table quick} \\ \text{arg: Julia apple} \\ \text{nc: pc:} \\ \text{prn: 1} \end{array} \right]_6$	$\left[ \begin{array}{l} \text{sur:} \\ \text{noun: } \textit{apple} \\ \text{cat: np} \\ \text{sem: def sg} \\ \text{mdr:} \\ \text{fnc: eat} \\ \text{idy: 3} \\ \text{prn: 1} \end{array} \right]_7$
--	--	--	---	---

# 15.4 Intensifiers in Noun Phrases and Prepositional Phrases

## 15.4.1 Wrappers in Noun Phrases



### 15.4.2 Wrappers in Prepositional Phrases



### 15.4.3 Lexical Analysis of intensifier very and detensifier rather

[sur: very  
adj: a\_1  
cat: int  
sem: very  
mdr: B  
mdd:  
idy: B  
prn: ]

[sur: rather  
adj: a\_1  
cat: int  
sem: rather  
mdr: B  
mdd:  
idy: B  
prn: ]

### 15.4.4 Combining The and very with DET+INT

DET+INT      {INT+ADJ}

$$\begin{bmatrix} \text{noun: } N_n \\ \text{cat: } N' X \\ \text{mdr:} \\ \text{idy:} \end{bmatrix}$$

$$\begin{bmatrix} \text{adj: } A_n \\ \text{mdd:} \\ \text{cat:} \end{bmatrix}$$

acopy nw.adj ss.mdr  
ecopy ss.noun nw.mdd  
acopy ss.idy nw.mdd  
replace adn nw.cat  
copy<sub>ss</sub> copy<sub>nw</sub>

$$\begin{bmatrix} \text{sur: the} \\ \text{noun: } n_1 \\ \text{cat: } nn' np \\ \text{sem: def} \\ \text{mdr:} \\ \text{fnc:} \\ \text{idy:} \\ \text{prn:} \end{bmatrix}_1$$

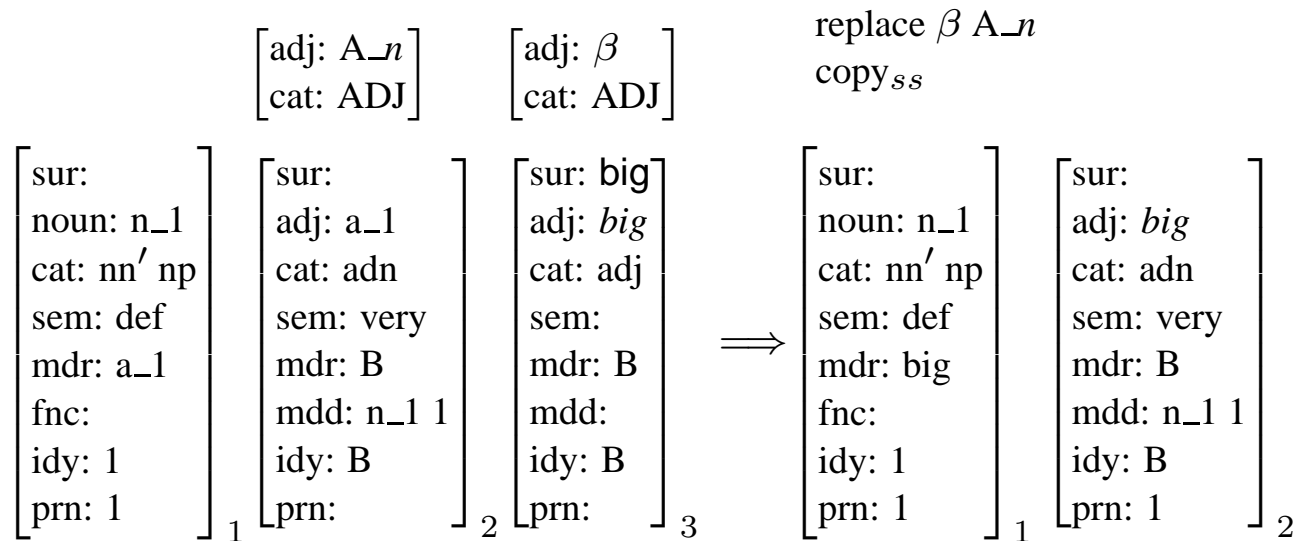
$$\begin{bmatrix} \text{sur: very} \\ \text{adj: } a_1 \\ \text{cat: adj} \\ \text{sem: very} \\ \text{mdr: B} \\ \text{mdd:} \\ \text{idy: B} \\ \text{prn:} \end{bmatrix}_3$$
 $\Rightarrow$ 

$$\begin{bmatrix} \text{sur:} \\ \text{noun: } n_1 \\ \text{cat: } nn' np \\ \text{sem: def} \\ \text{mdr: } a_1 \\ \text{fnc:} \\ \text{idy: } 1 \\ \text{prn:} \end{bmatrix}_1$$

$$\begin{bmatrix} \text{sur:} \\ \text{adj: } a_1 \\ \text{cat: adn} \\ \text{sem: very} \\ \text{mdr: B} \\ \text{mdd: } n_1 1 \\ \text{idy: B} \\ \text{prn:} \end{bmatrix}_2$$

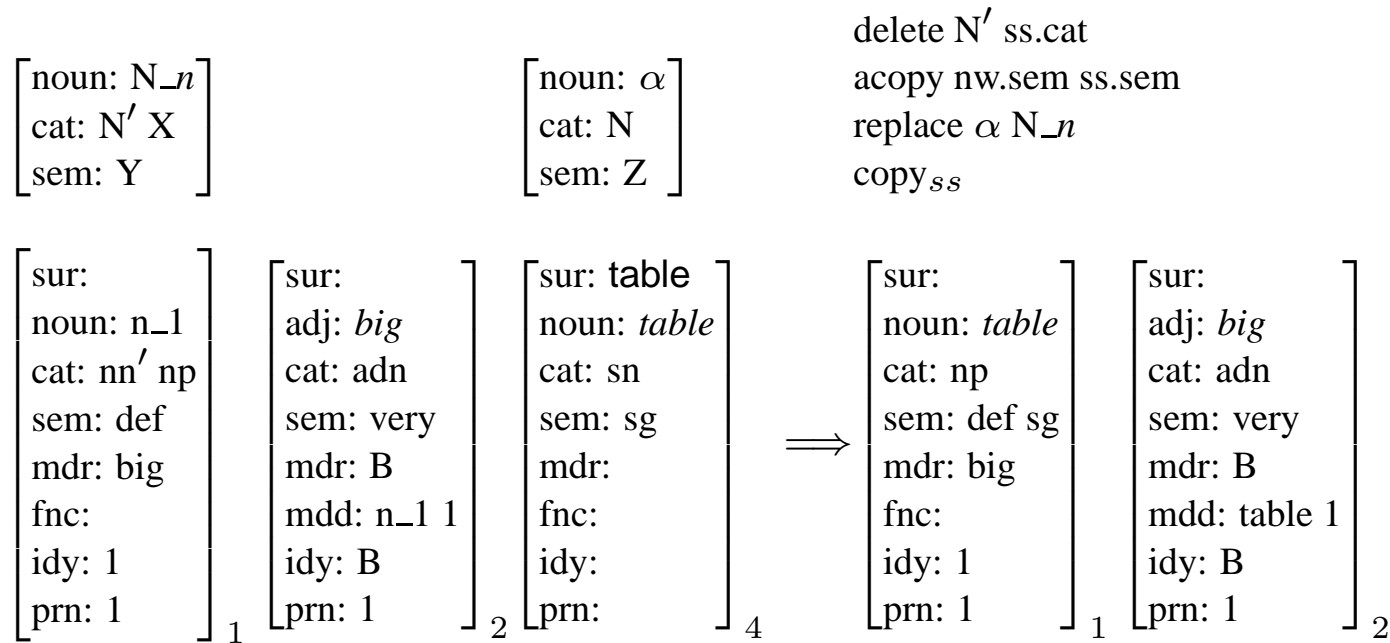
### 15.4.5 Combining The very and big with INT+ADJ

**INT+ADJ** {DET+NN,DET+ADN,DET+INT,ADV+NOM,ADV NOM+FV,% V+ADV,S+IP}



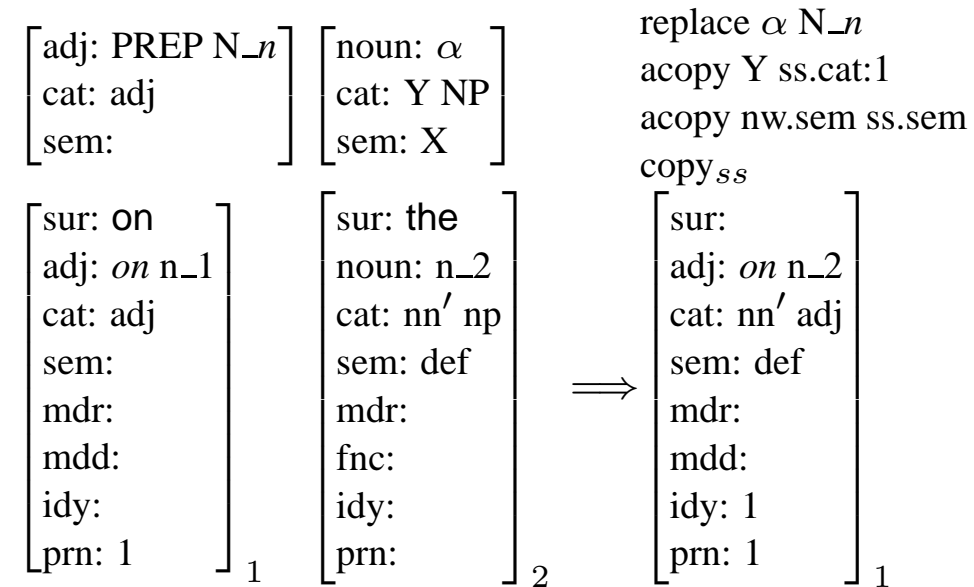
### 15.4.6 Combining The very big and table with DET+NN

**DET+NN** {NOM+FV, ADJ+NOM, FV+NP, %NP+PREP, %V+ADV, V+INT, S+IP}



### 15.4.7 Combining the preposition *On* and the *with* PREP+NP

**PREP+NP** {PREP+NN,PREP+ADN,PREP+INT,%NP+PREP,%V+ADV,%PREPP+PREP,ADV+NOM,S+IP}



### 15.4.8 Combining On the and big with PREP+ADN

**PREP+ADN** {PREP+ADN, PREP+NN, PREP+INT}

[adj: PREP N <sub>-n</sub> cat: N' ADJ mdr: idy: j]	[adj: $\alpha$ cat: adn mdd: ]	acopy $\alpha$ ss.mdr acopy ss.adj nw.mdd ecopy ss.idy nw.mdd copy <sub>ss</sub> copy <sub>nw</sub>
--	--------------------------------------	--

[sur: adj: <i>on n_2</i> cat: nn' adj sem: def mdr: mdd: idy: 1 prn: 1]	⇒	[sur: adj: <i>on n_2</i> cat: nn' adj sem: def mdr: big mdd: idy: 1 prn: 1]	[sur: big adj: <i>big</i> cat: adj sem: mdr: B mdd: on n_2 1 idy: B prn: 1]
] <sub>1</sub>		] <sub>1</sub>	] <sub>3</sub>

### 15.4.9 Result of parsing On the big table

sur:	sur: big
adj: <i>on table</i>	adj: <i>big</i>
cat: adj	cat: adj
sem: def sg	sem:
mdr: big	mdr: B
mdd:	mdd: on table 1
idy: 1	idy: B
prn: 1	prn: 1

] <sub>1</sub>                      ] <sub>3</sub>

### 15.4.10 Combining On the and very with PREP+INT

**PREP+INT**      {INT+ADJ}

$$\left[ \begin{array}{l} \text{adj: PREP } N\_n \\ \text{cat: } N' \text{ adj} \\ \text{mdr:} \\ \text{idy: j} \end{array} \right]$$

$$\left[ \begin{array}{l} \text{adj: } A\_n \\ \text{cat: adj} \\ \text{mdd:} \end{array} \right]$$

acopy nw.adj ss.mdr  
 acopy ss.adj nw.mdd  
 ecopy ss.idy nw.mdd  
 replace adn nw.cat  
 copy<sub>ss</sub> copy<sub>nw</sub>

$$\left[ \begin{array}{l} \text{sur:} \\ \text{adj: } on \ n\_2 \\ \text{cat: } nn' \text{ adj} \\ \text{sem: def} \\ \text{mdr:} \\ \text{mdd:} \\ \text{idy: 1} \\ \text{prn: 1} \end{array} \right]_1$$

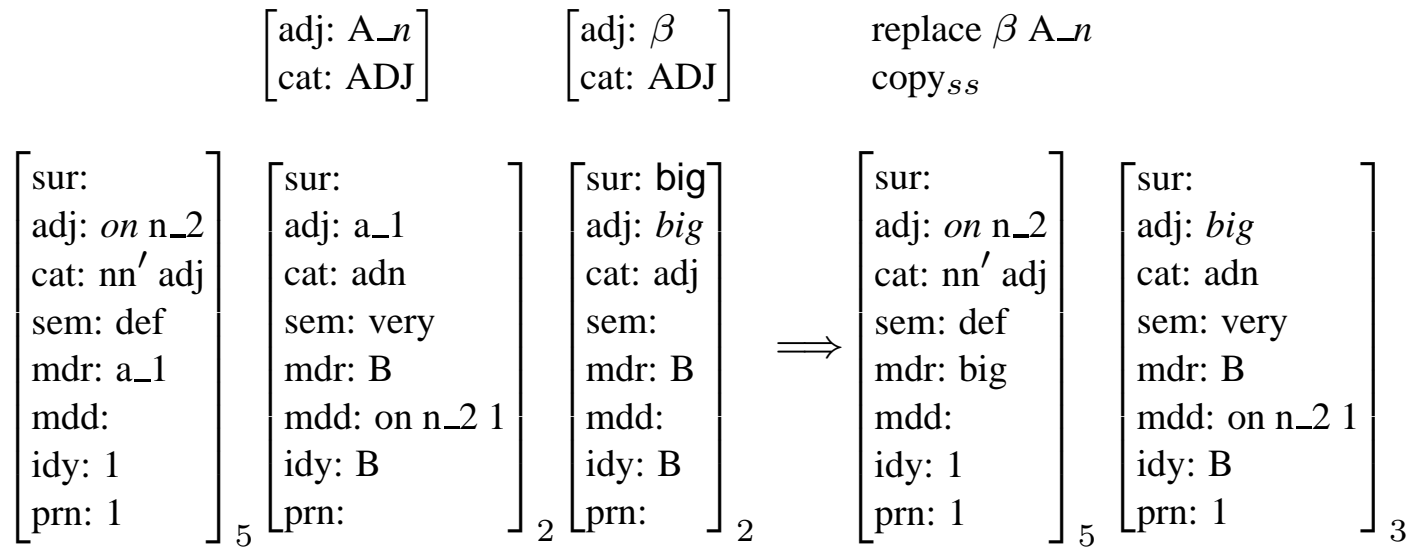
$$\left[ \begin{array}{l} \text{sur: very} \\ \text{adj: } a\_1 \\ \text{cat: adj} \\ \text{sem: very} \\ \text{mdr: B} \\ \text{mdd:} \\ \text{idy: B} \\ \text{prn:} \end{array} \right]_3$$
 $\Rightarrow$ 

$$\left[ \begin{array}{l} \text{sur:} \\ \text{adj: } on \ n\_2 \\ \text{cat: } nn' \text{ adj} \\ \text{sem: def} \\ \text{mdr: } a\_1 \\ \text{mdd:} \\ \text{idy: 1} \\ \text{prn: 1} \end{array} \right]_1$$

$$\left[ \begin{array}{l} \text{sur:} \\ \text{adj: } a\_1 \\ \text{cat: adn} \\ \text{sem: very} \\ \text{mdr: B} \\ \text{mdd: } on \ n\_2 \ 1 \\ \text{idy: B} \\ \text{prn: 1} \end{array} \right]_3$$

### 15.4.11 Combining On the very and big with INT+ADJ

**INT+ADJ** {DET+NN, DET+ADN, DET+INT, ADV+NOM, ADVNOM+FV, %V+ADV, S+IP}



### 15.4.12 Combining On the very big and table with PREP+NN

**PREP+NN** {ADV+NOM, NOM+FV, FV+NP, %NP+PREP, %V+ADV, %PREPP+PREP, S+IP}

$$\left[ \begin{array}{l} \text{adj: PREP } N\_n \\ \text{cat: } N' \text{ adj} \\ \text{sem: Y} \end{array} \right]$$

$$\left[ \begin{array}{l} \text{noun: } \alpha \\ \text{cat: N} \\ \text{sem: Z} \end{array} \right]$$

delete  $N'$  ss.cat  
 acopy nw.sem ss.sem  
 replace  $\alpha$   $N\_n$   
 copy<sub>ss</sub>

$$\left[ \begin{array}{l} \text{sur:} \\ \text{adj: } on \ n\_2 \\ \text{cat: } nn' \text{ adj} \\ \text{sem: def} \\ \text{mdr: big} \\ \text{mdd:} \\ \text{idy: 1} \\ \text{prn: 1} \end{array} \right]_1$$

$$\left[ \begin{array}{l} \text{sur:} \\ \text{adj: } big \\ \text{cat: adn} \\ \text{sem: very} \\ \text{mdr: B} \\ \text{mdd: } on \ n\_2 \ 1 \\ \text{idy: B} \\ \text{prn: 1} \end{array} \right]_3$$

$$\left[ \begin{array}{l} \text{sur: table} \\ \text{noun: } table \\ \text{cat: sn} \\ \text{sem: sg} \\ \text{mdr:} \\ \text{fnc:} \\ \text{idy:} \\ \text{prn:} \end{array} \right]_5$$
 $\Rightarrow$ 

$$\left[ \begin{array}{l} \text{sur:} \\ \text{adj: } on \ table \\ \text{cat: adj} \\ \text{sem: def sg} \\ \text{mdr: big} \\ \text{mdd:} \\ \text{idy: 1} \\ \text{prn: 1} \end{array} \right]_1$$

$$\left[ \begin{array}{l} \text{sur:} \\ \text{adj: } big \\ \text{cat: adn} \\ \text{sem: very} \\ \text{mdr: B} \\ \text{mdd: } on \ table \ 1 \\ \text{idy: B} \\ \text{prn: 1} \end{array} \right]_3$$

### 15.4.13 Result of parsing On the very big table

sur:	sur:
adj: <i>on table</i>	adj: <i>big</i>
cat: adj	cat: adn
sem: def sg	sem: very
mdr: big	mdr: B
mdd:	mdd: on table 1
idy: 1	idy: B
prn: 1	prn: 1
]	]
1	3

## 15.5 Elementary Adverbs with Intensifiers

### 15.5.1 Combining Very and quickly with INT+ADJ

**INT+ADJ** {DET+NN, DET+ADN, DET+INT, ADV+NOM, ADVNOM+FV, %V+ADV, S+IP}

$\left[ \begin{array}{l} \text{adj: } A\_n \\ \text{cat: ADJ} \end{array} \right]$	$\left[ \begin{array}{l} \text{adj: } \beta \\ \text{cat: ADJ} \end{array} \right]$	replace $\beta$ $A\_n$ copy <sub>SS</sub>
$\left[ \begin{array}{l} \text{sur: very} \\ \text{adj: a\_1} \\ \text{cat: adj} \\ \text{sem: very} \\ \text{mdr: B} \\ \text{mdd:} \\ \text{idy: B} \\ \text{prn: 1} \end{array} \right]_1$	$\left[ \begin{array}{l} \text{sur: quickly} \\ \text{adj: } \textit{quick} \\ \text{cat: adv} \\ \text{sem:} \\ \text{mdr: B} \\ \text{mdd:} \\ \text{idy: B} \\ \text{prn:} \end{array} \right]$	$\Rightarrow$
		$\left[ \begin{array}{l} \text{sur:} \\ \text{adj: quick} \\ \text{cat: adj} \\ \text{sem: very} \\ \text{mdr: B} \\ \text{mdd:} \\ \text{idy: B} \\ \text{prn: 1} \end{array} \right]_1$

### 15.5.2 Result of parsing Very quickly Julia ate the apple

sur: adj: <i>quick</i> cat: adv sem: very mdr: B mdd: eat idy: B prn: 1	] 1	sur: noun: <i>Julia</i> cat: nm sem: f mdr: fnc: eat idy: 1 prn: 1	] 3	sur: verb: <i>eat</i> cat: v sem: past mdr: quick arg: Julia apple nc: pc: prn: 1	] 4	sur: noun: <i>apple</i> cat: np sem: def sg mdr: fnc: eat idy: 2 prn: 1	] 5
--	-----	---	-----	---	-----	--	-----

### 15.5.3 Combining Julia and very with NOM+INT

NOM+INT

{INT+ADJ}

$$\begin{bmatrix} \text{noun: } \beta \\ \text{cat: NP} \\ \text{fnc:} \end{bmatrix}$$

$$\begin{bmatrix} \text{adj: } A_n \\ \text{cat: adj} \\ \text{mdd:} \end{bmatrix}$$

acopy v\_1 nw.mdd  
 ecopy v\_1 ss.fnc  
 replace adv nw.cat  
 copy<sub>ss</sub>copy<sub>nw</sub>

$$\begin{bmatrix} \text{sur:} \\ \text{noun: } \textit{Julia} \\ \text{cat: nm} \\ \text{sem: f} \\ \text{mdr:} \\ \text{fnc:} \\ \text{idy: 1} \\ \text{prn: 1} \end{bmatrix}_1$$

$$\begin{bmatrix} \text{sur: very} \\ \text{adj: a_1} \\ \text{cat: adj} \\ \text{sem: very} \\ \text{mdr: B} \\ \text{mdd:} \\ \text{idy: B} \\ \text{prn: 1} \end{bmatrix}_2$$

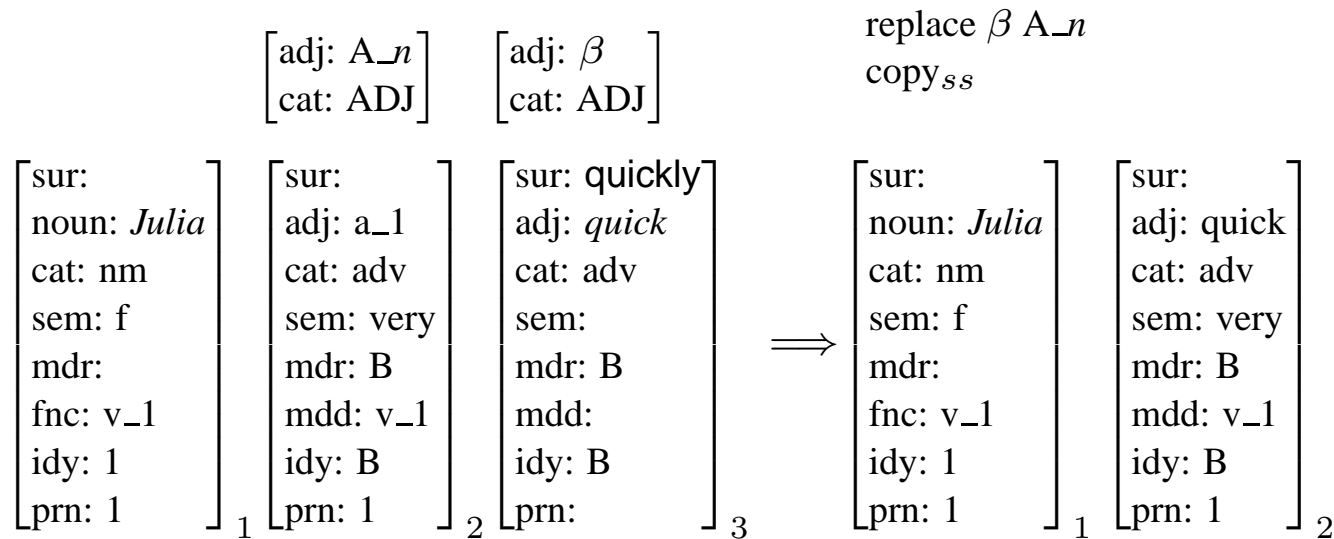
$$\Rightarrow$$

$$\begin{bmatrix} \text{sur:} \\ \text{noun: } \textit{Julia} \\ \text{cat: nm} \\ \text{sem: f} \\ \text{mdr:} \\ \text{fnc: v_1} \\ \text{idy: 1} \\ \text{prn: 1} \end{bmatrix}_1$$

$$\begin{bmatrix} \text{sur:} \\ \text{adj: a_1} \\ \text{cat: adv} \\ \text{sem: very} \\ \text{mdr: B} \\ \text{mdd: v_1} \\ \text{idy: B} \\ \text{prn: 1} \end{bmatrix}_2$$

### 15.5.4 Combining Julia very and quickly with INT+ADJ

**INT+ADJ** {DET+NN, DET+ADN, DET+INT, ADV+NOM, ADVNOM+FV, %V+ADV, S+IP}



### 15.5.5 Combining Julia ate the apple and very with V+INT

V+INT

{INT+ADJ}

$$\begin{bmatrix} \text{verb: } \alpha \\ \text{mdr:} \end{bmatrix}$$

$$\begin{bmatrix} \text{adj: } A_n \\ \text{cat: adj} \\ \text{mdd:} \end{bmatrix}$$

acopy  $\alpha$  nw.mdd  
 acopy nw.adj ss.mdr  
 replace adv nw.cat  
 copy<sub>ss</sub>copy<sub>nw</sub>

$$\begin{bmatrix} \text{sur:} \\ \text{verb: } eat \\ \text{cat: v} \\ \text{sem: past} \\ \text{mdr:} \\ \text{arg: Julia apple} \\ \text{nc:} \\ \text{pc:} \\ \text{prn: 1} \end{bmatrix}_2$$

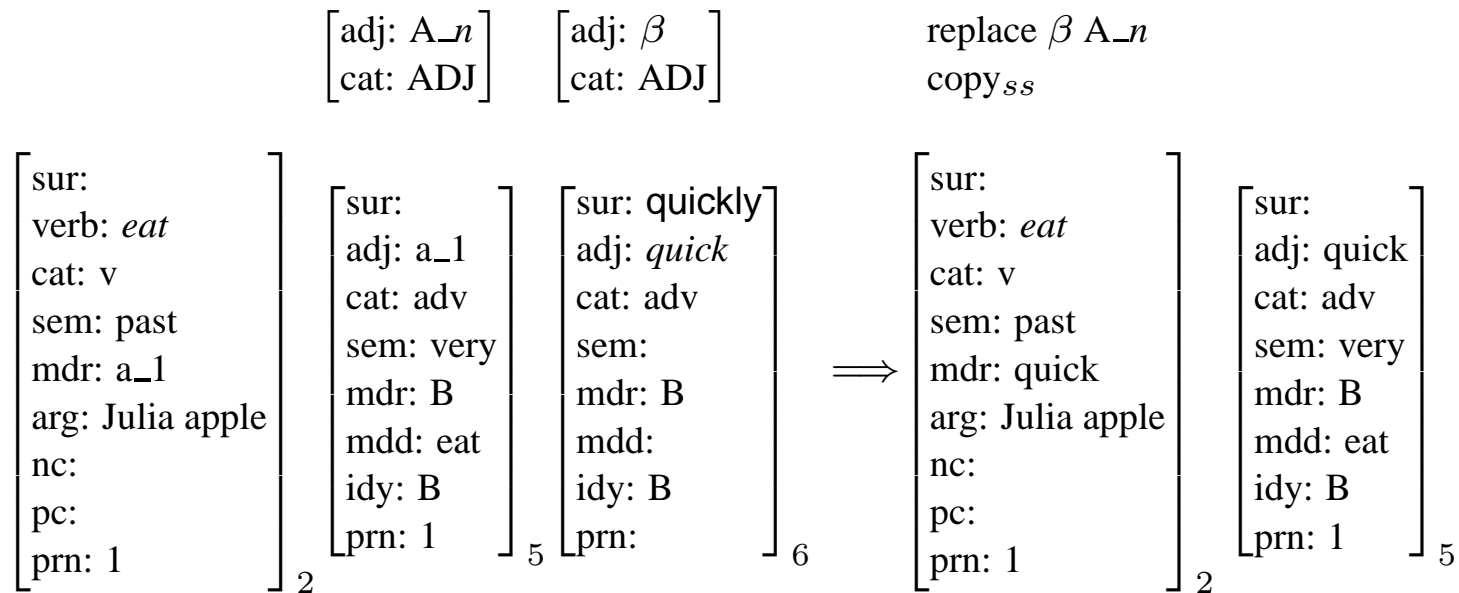
$$\begin{bmatrix} \text{sur: very} \\ \text{adj: a}_1 \\ \text{cat: adj} \\ \text{sem: very} \\ \text{mdr: B} \\ \text{mdd:} \\ \text{idy: B} \\ \text{prn: 1} \end{bmatrix}_5$$
 $\Rightarrow$ 

$$\begin{bmatrix} \text{sur:} \\ \text{verb: } eat \\ \text{cat: v} \\ \text{sem: past} \\ \text{mdr: a}_1 \\ \text{arg: Julia apple} \\ \text{nc:} \\ \text{pc:} \\ \text{prn: 1} \end{bmatrix}_2$$

$$\begin{bmatrix} \text{sur:} \\ \text{adj: a}_1 \\ \text{cat: adv} \\ \text{sem: very} \\ \text{mdr: B} \\ \text{mdd: eat} \\ \text{idy: B} \\ \text{prn: 1} \end{bmatrix}_5$$

### 15.5.6 Combining Julia ate the apple very and quickly with INT+ADJ

**INT+ADJ** {DET+NN, DET+ADN, DET+INT, ADV+NOM, ADVNOM+FV, %V+ADV, S+IP}



## 15.6 Definition of LA-hear.3

### 15.6.1 Lexicon and preamble of LA-hear3

1. Lexicon of LA-hear.3:

lexicon of LA-hear.1 and LA-hear.2 plus first entry of 15.1.1 and entries of 15.4.3.

2. Preamble of LA-hear3:

variable definitions, restrictions, and agreement conditions of LA-hear.1 (cf. 11.2.2) and LA-hear.2 (cf. 13.2.1) plus

PREP  $\in$  {*on, in, above, below, ...*}

ADJ  $\in$  {adj, adn, adv}

ADV  $\in$  {adj, adv}

ADN  $\in$  {adj, adn}

A<sub>*n*</sub> = simultaneous substitution variable for an adjective

### 15.6.2 Formal Definition of LA-hear.3

$ST_S =_{def} \{ ( [cat: X] \{1 DET+NN, 2 DET+ADN, 3 DET+INT, 4 NOM+ADV, 5 NOM+INT, 6 NOM+FV, 7 INT+ADJ, 8 PREP+NP, 9 ADV+NOM\}) \}$

**DET+NN** {10 NOM+FV, 11 FV+NP, 12 S+IP, 13 %NP+PREP, 14 %V+ADV, 15 V+INT}

$\left[ \begin{array}{l} \text{noun: } N_n \\ \text{cat: } N' X \\ \text{sem: } Y \end{array} \right]$	$\left[ \begin{array}{l} \text{noun: } \alpha \\ \text{cat: } N \\ \text{sem: } Z \end{array} \right]$	delete $N' ss.cat$
		acopy $nw.sem ss.sem$
		replace $\alpha N_n$
		$copy_{ss}$

**DET+ADN** {16 DET+NN, 17 DET+ADN, 18 DET+INT}

$\left[ \begin{array}{l} \text{noun: } N_n \\ \text{cat: } N' X \\ \text{mdr:} \\ \text{idy:} \end{array} \right]$	$\left[ \begin{array}{l} \text{adj: } \alpha \\ \text{cat: } adn \\ \text{mdd:} \end{array} \right]$	acopy $\alpha ss.mdr$
		ecopy $ss.noun nw.mdd$
		acopy $ss.idy nw.mdd$
		$copy_{ss} copy_{nw}$

**\$ DET+INT** {19 INT+ADJ}

$\left[ \begin{array}{l} \text{noun: } N_n \\ \text{cat: } N' X \\ \text{mdr:} \\ \text{idy:} \end{array} \right]$	$\left[ \begin{array}{l} \text{adj: } A_n \\ \text{mdd:} \end{array} \right]$	acopy $nw.adj ss.mdr$
		ecopy $ss.noun nw.mdd$
		acopy $ss.idy nw.mdd$
		$copy_{ss} copy_{nw}$

\$ **NOM+ADV**      {20 ADVNOM+FV}

$\left[ \begin{array}{l} \text{noun: } \beta \\ \text{cat: NP} \\ \text{fnc:} \end{array} \right]$	$\left[ \begin{array}{l} \text{adj: } \alpha \\ \text{cat: adv} \\ \text{mdd:} \end{array} \right]$	acopy v_1 nw.mdd
		acopy v_1 ss.fnc
		copy <sub>ss</sub> copy <sub>nw</sub>

\$ **NOM+INT**      {21 INT+ADJ}

$\left[ \begin{array}{l} \text{noun: } \beta \\ \text{cat: NP} \\ \text{fnc:} \end{array} \right]$	$\left[ \begin{array}{l} \text{adj: } A_n \\ \text{cat: adj} \\ \text{mdd:} \end{array} \right]$	acopy v_1 nw.mdd
		acopy v_1 ss.fnc
		replace adv nw.cat
		copy <sub>ss</sub> copy <sub>nw</sub>

**NOM+FV**      {22 FV+NP, 23 AUX+NFV, 24 S+IP}

		delete NP' nw.cat
$\left[ \begin{array}{l} \text{noun: } \alpha \\ \text{cat: NP} \\ \text{fnc:} \\ \text{prn: k} \end{array} \right]$	$\left[ \begin{array}{l} \text{verb: } \beta \\ \text{cat: NP' X VT} \\ \text{arg:} \\ \text{nc:} \\ \text{pc:} \end{array} \right]$	acopy $\alpha$ nw.arg
		ecopy $\beta$ ss.fnc
		ecopy PC nw.pc
		acopy PCV nw.pc
		set $\beta$ NCV
		copy <sub>ss</sub> copy <sub>nw</sub>

\$ **INT+ADJ** {25 DET+NN, 26 DET+ADN, 27 DET+INT, 28 ADV+NOM, 29 ADVNOM+FV,  
30 %V+ADV, 31 S+IP}

adj: A_n	adj: $\beta$	replace $\beta$ A_n
cat: ADJ	cat: ADJ	copy <sub>ss</sub>

\$ **PREP+NP** {32 PREP+NN, 33 PREP+ADN, 34 PREP+INT, 35 %NP+PREP, 36 %V+ADV,  
37 %PREPP+PREP, 38 ADV+NOM, 39 S+IP}

adj: PREP N_n	noun: $\alpha$	replace $\alpha$ N_n
cat: adj	cat: Y NP	acopy Y ss.cat:1
sem:	sem: X	acopy nw.sem ss.sem
		copy <sub>ss</sub>

\$ **ADV+NOM** {40 NOM+ADV, 41 ADVNOM+FV, 42 DET+NN, 43 DET+ADN, 44 DET+INT}

adj: $\alpha$	noun: $\beta$	acopy v_n ss.mdd
cat: ADV	cat: Y NP	acopy v_n nw.fnc
mdd:	fnc:	replace adv ss.cat
		copy <sub>ss</sub> copy <sub>nw</sub>

**FV+NP** {45 DET+NN, 46 DET+ADN, 47 DET+INT, 48 FV+NP, 49 %NP+PREP, 50 %V+ADV,  
51 V+INT, 52 S+IP}

$\left[ \begin{array}{l} \text{verb: } \beta \\ \text{cat: NP' X VT} \\ \text{arg:} \end{array} \right]$	$\left[ \begin{array}{l} \text{noun: } \alpha \\ \text{cat: Y NP} \\ \text{fnc:} \end{array} \right]$	delete NP' ss.cat acopy $\alpha$ ss.arg ecopy $\beta$ nw.fnc copy <sub>ss</sub> copy <sub>nw</sub>
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**S+IP** {53 IP+START}

$\left[ \begin{array}{l} \text{verb: } \alpha \\ \text{cat: VT} \\ \text{prn: k} \end{array} \right]$	$\left[ \text{cat: VT' SM} \right]$	replace SM VT set k PC set $\alpha$ PCV copy <sub>ss</sub>
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**\$ %NP+PREP** {54 PREP+NP}

$\left[ \begin{array}{l} \text{noun: } \alpha \\ \text{cat: N} \\ \text{mdr:} \\ \text{idy: j} \end{array} \right]$	$\left[ \begin{array}{l} \text{adj: PREP N}_n \\ \text{cat: adj} \\ \text{mdd:} \end{array} \right]$	ecopy nw.adj ss.mdr %ecopy $\alpha$ nw.mdd acopy ss.idy nw.mdd copy <sub>ss</sub> copy <sub>nw</sub>
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\$ %V+ADV {55 PREP+NP, 56 %V+ADV, 57 S+IP}

verb: $\alpha$	adj: $\beta$ X	acopy nw.adj ss.mdr
cat: v	cat: ADV	ecopy $\alpha$ nw.mdd
mdr:	mdd:	copy <sub>ss</sub> copy <sub>nw</sub>

\$ V+INT {58 INT+ADJ}

verb: $\alpha$	adj: A <sub>n</sub>	acopy $\alpha$ nw.mdd
mdr:	cat: adj	acopy nw.adj ss.mdr
	mdd:	copy <sub>ss</sub> copy <sub>nw</sub>

\$ PREP+NN {59 ADV+NOM, 60 NOM+FV, 62 FV+NP, 62 %NP+PREP,  
63 %V+ADV, 64 %PREPP+PREP, 65 S+IP}

adj: PREP N <sub>n</sub>	noun: $\alpha$	delete N' ss.cat
cat: N' adj	cat: N	acopy nw.sem ss.sem
sem: Y	sem: Z	replace $\alpha$ N <sub>n</sub>
		copy <sub>ss</sub>

\$ PREP+ADN {66 PREP+ADN, 67 PREP+NN, 68 PREP+INT}

adj: PREP N <sub>n</sub>	adj: $\alpha$	acopy $\alpha$ ss.mdr
cat: N' ADJ	cat: adn	acopy ss.adj nw.mdd
mdr:	mdd:	ecopy ss.idy nw.mdd
idy: j		copy <sub>ss</sub> copy <sub>nw</sub>

\$ PREP+INT {69 INT+ADJ}

adj: PREP N <sub>n</sub>	[	adj: A <sub>n</sub>	acopy nw.adj ss.mdr
cat: N' adj		cat: adj	acopy ss.adj nw.mdd
mdr:		mdd:	ecopy ss.idy nw.mdd
idy: j			replace adn nw.cat
		copy <sub>ss</sub> copy <sub>nw</sub>	

**\$ %PREPP+PREP**      {70 PREP+NP}

adj: PREP $\alpha$	[	adj: PREP N <sub>n</sub>	%ecopy nw.adj ss.mdr
cat: adj		cat: adj	%ecopy ss.adj nw.mdd
mdr:		mdd:	acopy ss.idy nw.mdd
idy: j			copy <sub>ss</sub> copy <sub>nw</sub>

**\$ ADVNOM+FV**      {71 FV+NP, 72 AUX+NFV, 73 % V+ADV, 74 S+IP}

adj: $\alpha$	[	[	verb: $\gamma$	delete NP' nw.cat		
cat: adv				noun: $\beta$	cat: NP' X VT	acopy $\beta$ nw.arg
mdd: V <sub>n</sub>				cat: NP	mdr:	replace $\gamma$ V <sub>n</sub>
				fnc: V <sub>n</sub>	arg:	acopy $\alpha$ nw.mdr
		pc:		ecopy PC nw.pc		
				acopy PCV nw.pc		
				set $\gamma$ NCV		
				copy <sub>ss</sub> copy <sub>nw</sub>		

**AUX+NFV**      {75 AUX+NFV, 76 FV+NP, 77 S+IP}

$\begin{bmatrix} \text{verb: } V\_n \\ \text{cat: } \text{AUX}' V \\ \text{sem: } X \end{bmatrix}$	$\begin{bmatrix} \text{verb: } \alpha \\ \text{cat: } Y \text{ AUX} \\ \text{sem: } Z \end{bmatrix}$	replace Y AUX' acopy nw.sem ss.sem replace $\alpha$ V_n copy <sub>ss</sub>
--	--	---

**IP+START** {1 DET+NN, 2 DET+ADN, 3 DET+INT, 4 NOM+ADV, 5 NOM+INT, 6 NOM+FV,  
7 INT+ADJ, 8 PREP+NP, 9 ADV+NOM}

$\begin{bmatrix} \text{verb: } \alpha \\ \text{cat: } \text{SM} \\ \text{nc:} \end{bmatrix}$	$\begin{bmatrix} \text{noun: } \beta \\ \text{cat: } \text{NP} \\ \text{prn:} \end{bmatrix}$	increment nw.prn ecopy k ss.nc acopy 'NCV' ss.nc copy <sub>ss</sub> copy <sub>nw</sub>
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**ST<sub>F</sub>** =*def* { ( [cat: decl] rp S+IP) }

### 15.6.3 Transitions handled by rule packages

*rule name rule package applications of rules in rule package*

IP+START:	DET+NN	The + table
(= ST <sub>S</sub> )	DET+ADN	The + beautiful (table)
	DET+INT	The + very (beautiful table)
	NOM+ADV	Julia + quickly (ate an apple)
	NOM+INT	Julia + very (quickly ate an apple)
	NOM+FV	Julia + read (the book)
	INT+ADJ	Very + quickly (Julia ate an apple)
	PREP+NP	On + the (table)
	ADV+NOM	Quickly + Julia (ate an apple)
DET+NN:	NOM+FV	the book + pleased (Julia)
	FV+NP	Julia gave the man + a (book)
	S+IP	Julia read the book + .
	%NP+PREP	the book + on (the table pleased Julia)
	%V+ADV	Julia read the book + on (the table)
	V+INT	Julia ate the apple + very (quickly)
DET+ADN:DET+NN		the big + table
	DET+ADN	the big + beautiful (table)
	DET+INT	the big + very (beautiful table)

<i>rule name</i>	<i>rule package</i>	<i>applications of rules in rule package</i>
DET+INT:	INT+ADJ	the very + beautiful (table)
NOM+ADV:	ADVNOM+FV	Julia quickly + ate (an apple)
NOM+INT:	INT+ADJ	The young woman + very (quickly ate an apple)
NOM+FV:	FV+NP	Julia ate + the (apple)
	AUX+NFV	Julia has + eaten (an apple)
	S+IP	Julia slept + .
INT+ADJ:	DET+NN	the very beautiful + table
	DET+ADN	the very beautiful + big (table)
	DET+INT	the very beautiful + very (big table)
	ADV+NOM	very quickly + Julia
	ADVNOM+FV	Julia very quickly + ate (an apple)
	%V+ADV	Julia slept very soundly + on (the table)
	S+IP	Julia slept very soundly + .

<i>rule name</i>	<i>rule package</i>	<i>applications of rules in rule package</i>
PREP+NP:	PREP+NN	on the + table
	PREP+ADN	on the + big (table)
	PREP+INT	on the + very (big table)
	%NP+PREP	the letter for Julia + on (the table)
	%V+ADV	John read the letter for Julia + quickly
	%PREPP+PREP	the letter for Julia + from Hamburg
	ADV+NOM	for Mary + John bought a book
	S+IP	John read the letter for Julia + .
ADV+NOM	NOM+ADV	On the table Julia + quickly (ate an apple)
	ADVNOM+FV	Quickly Julia + ate (an apple)
	DET+NN	Quickly the + girl (ate an apple)
	DET+ADN	Quickly the + pretty (girl ate an apple)
	DET+INT	Quickly the + very (pretty girl ate an apple)
FV+NP:	DET+NN	John saw the + table
	DET+ADN	John saw the + beautiful (table)
	DET+INT	John saw the + very (beautiful table)
	FV+NP	John gave Julia + the (book)
	%NP+PREP	John saw Julia + from (Hamburg)
	%V+ADV	John saw Julia + from (Hamburg)
	V+INT	John saw Julia + very (often).
	S+IP	John saw Julia + .

<i>rule name</i>	<i>rule package</i>	<i>applications of rules in rule package</i>
S+IP:	IP+START	Julia was sleeping. + The (dog barked)
%NP+PREP:	PREP+NP	the book on + the (table)
%V+ADV:	PREP+NP	Julia ate the apple on + the (table)
	%V+ADV	Julia ate the apple quickly + on (the table)
	S+IP	Julia ate the apple quickly + .
V+INT:	INT+ADJ	Julia slept very + soundly
PREP+NN:	ADV+NOM	on the table + Julia (ate an apple)
	NOM+FV	the book on the table + pleased (Julia)
	FV+NP	Julia gave the man in the corner + a (book)
	%NP+PREP	Julia ate the apple on the table + behind (the tree)
	%V+ADV	Julia ate the apple on the table + behind (the tree)
	%PREPP+PREP	Julia ate the apple on the table + behind (the tree)
	S+IP	Julia ate the apple on the table + .
PREP+ADN	PREP+ADN	on the big + beautiful (table)
	PREP+NN	on the big + table
	PREP+INT	on the big + very (beautiful table)
PREP+INT	INT+ADJ	on the very + beautiful (table)

<i>rule name</i>	<i>rule package</i>	<i>applications of rules in rule package</i>
%PREPP+PREP	PREP+NP	Julia ate the apple on the table + behind (the tree)
ADV NOM+FV:	FV+NP	Julia quickly ate + an (apple)
	AUX+NFV	In this bed Julia will + sleep
	%V+ADV	Quickly Julia slipped + under (the covers)
	S+IP	In this bed Julia slept + .
AUX+NFV:	AUX+NFV	the car had been + speeding
	FV+NP	Julia had read + the (book)
	S+IP	Julia was sleeping + .
IP+START:	DET+NN	The + table
	DET+ADN	The + beautiful (table)
	DET+INT	The + very (beautiful table)
	NOM+ADV	Julia + quickly (ate an apple)
	NOM+INT	Julia + very (quickly ate an apple)
	NOM+FV	Julia + read (the book)
	INT+ADJ	Very + quickly (Julia ate an apple)
	PREP+NP	On + the (table)
ADV+NOM	Quickly + Julia (ate an apple)	