The Lewis & Vasishth (2005) Sentence Parser

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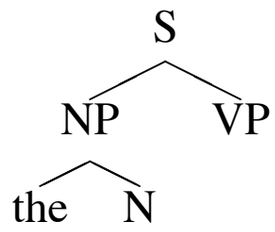
2015

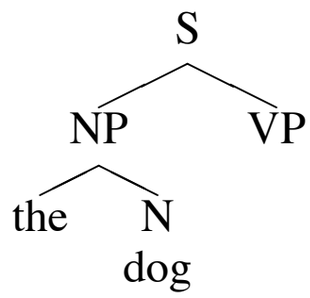
Left-Corner Parsing

$S \rightarrow NP\ VP$	$Det \rightarrow a, the$	$NP \rightarrow Det\ N$
$N \rightarrow man, dog$	$V \rightarrow ran, saw$	$VP \rightarrow V$
	$VP \rightarrow V\ NP$	

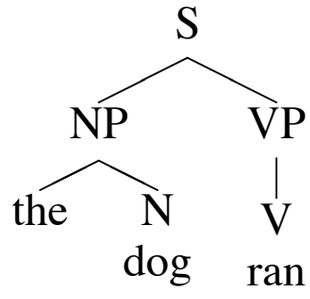
INPUT: *the*
GOAL CATEGORY STACK: [S]
ACTIONS: If *the* is the left corner of any phrase structure rule then replace the stack content with the LHS of that rule. Repeat this left-corner rule until no further steps are possible. Wait for next input word. These actions yield the structure to the right:



INPUT: *dog*
GOAL CATEGORY STACK: [N NP VP S]
ACTIONS: Use the left-corner rule to expand *dog* to N. Since N is predicted in the incremental structure built so far (Step 1), integrate the N built up bottom-up into the tree. Since no further applications of the left-corner rule are possible, wait for the next input.



INPUT: *ran*
GOAL CATEGORY STACK: [VP S]
ACTIONS: Use the left-corner rule to expand *ran* to V, and apply this rule once again to expand to VP. Since a VP is predicted in the structure, integrate this with the tree.



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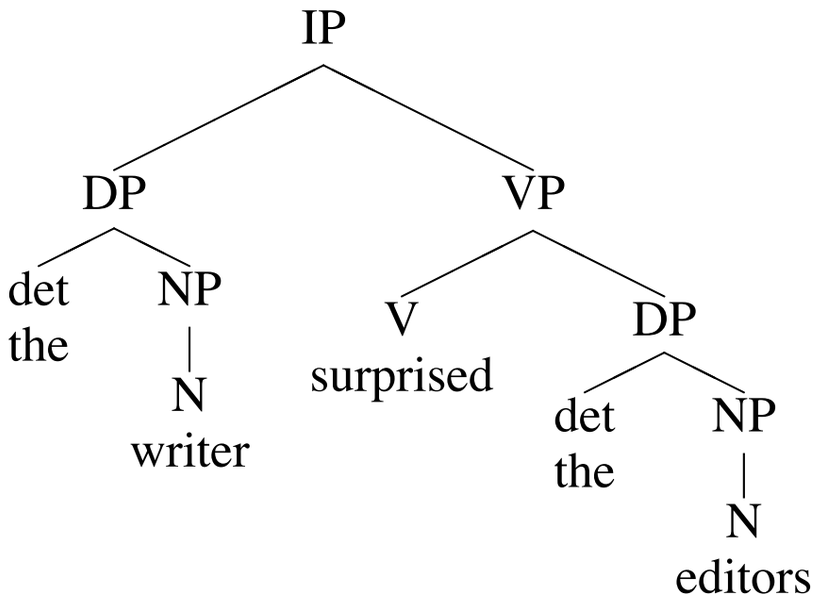

IP3

cat	:	IP
num	:	sing
spec	:	DP3
comp	:	VP7
tense	:	past
finite	:	finite

DP3

cat	:	DP
num	:	sing
head	:	*the*
comp	:	NP6

NP6

cat	:	NP
case	:	nom
num	:	sing
head	:	*writer*

VP7

cat	:	VP
num	:	sing-plural
tense	:	past
head	:	*surprised*
comp	:	DP9

DP9

cat	:	DP
num	:	plural
head	:	*the*
comp	:	NP14

NP14

cat	:	NP
case	:	acc
num	:	plural
head	:	*editors*

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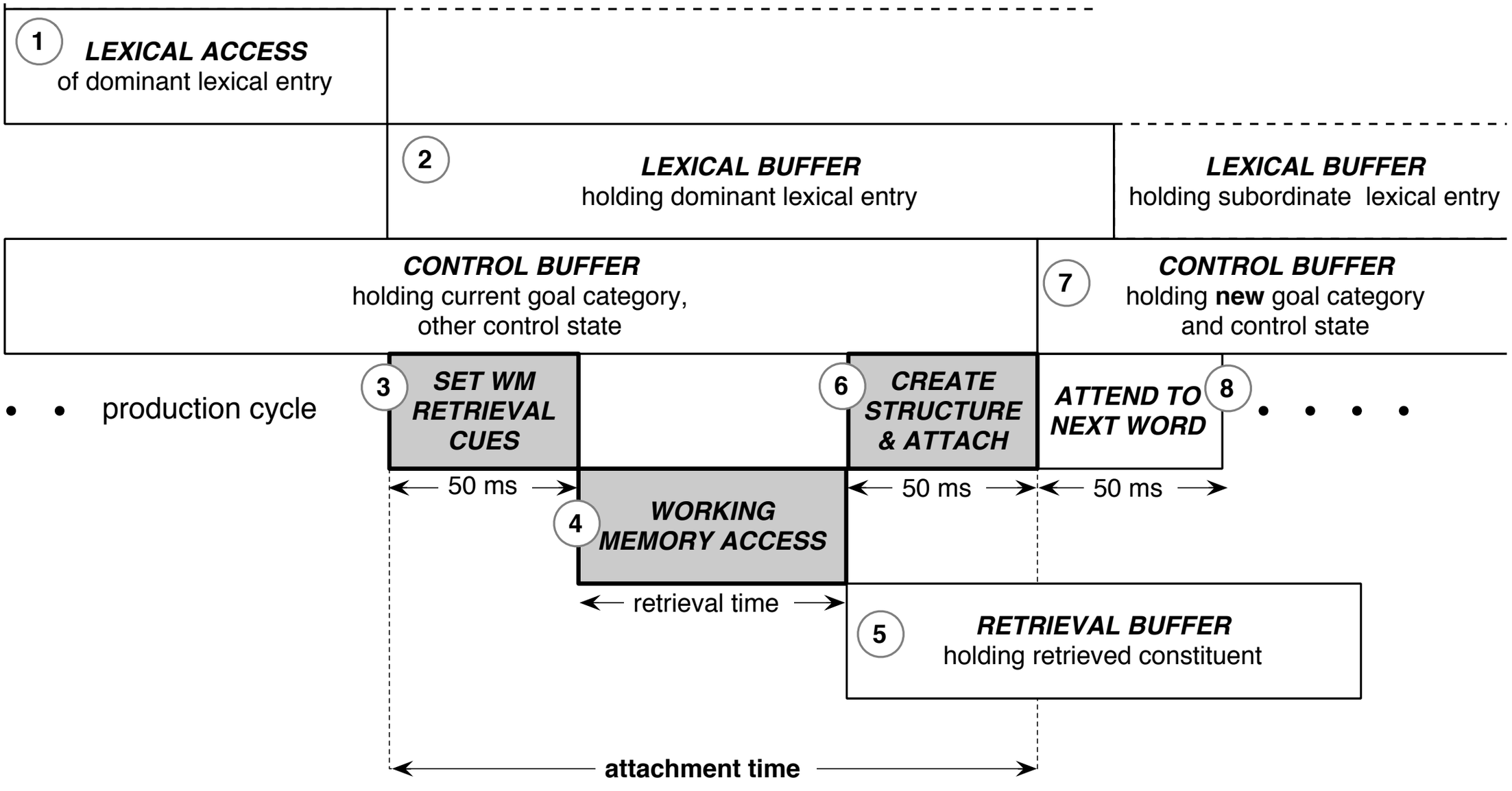

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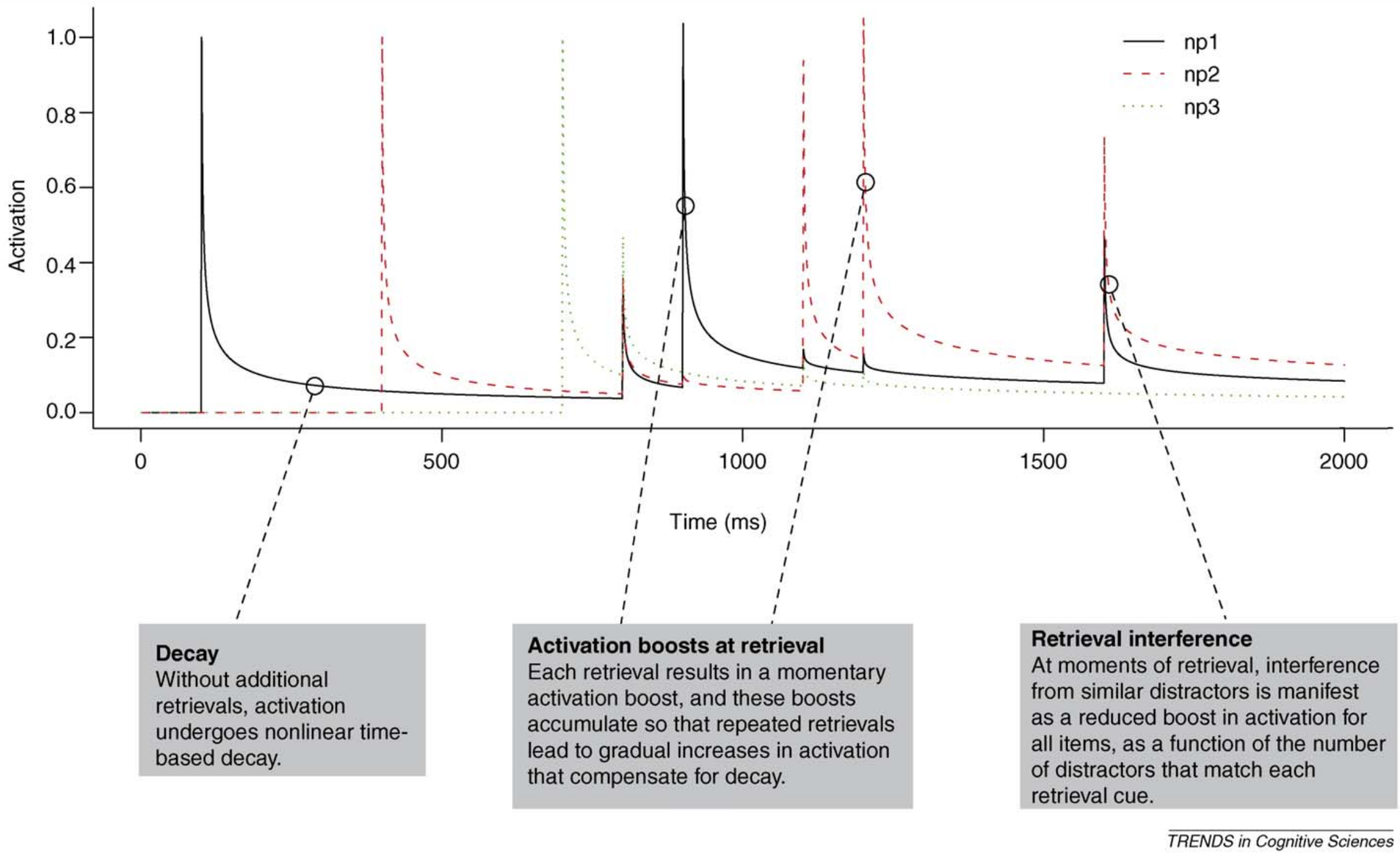

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Goal stack

IP

DONE

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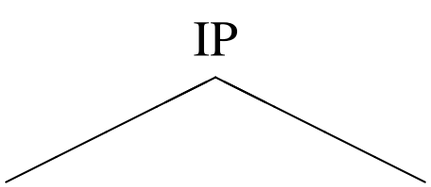

IP3

cat : IP
num :
spec :
comp :
tense :
finite :

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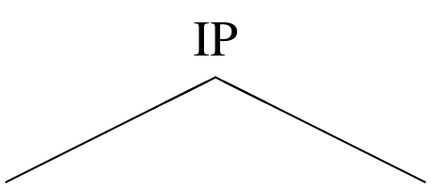
Goal stack

IP

DONE

```
(P set-retrieval-cues-IP-goal-input-DET …)
```



IP3

cat : IP
num :
spec :
comp :
tense :
finite :

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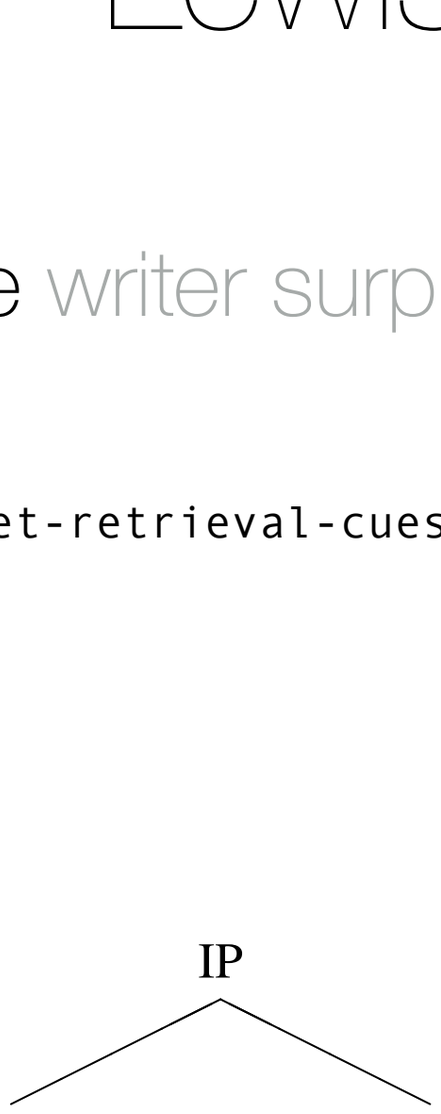
Goal stack

IP

DONE

```
(P set-retrieval-cues-IP-goal-input-DET …)
```



Retrieval

IP3

cat : IP
num :
spec :
comp :
tense :
finite :

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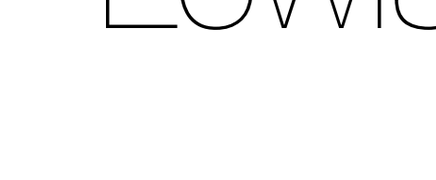
Goal stack

IP
DONE

(P set-retrieval-cues-IP-goal-input-DET …)

(P attach-DP-as-subject-of-predicted-IP …)



Retrieval

IP3
cat : IP
num :
spec :
comp :
tense :
finite :

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Goal stack

IP

DONE

`(P set-retrieval-cues-IP-goal-input-DET …)`

`(P attach-DP-as-subject-of-predicted-IP …)`

Retrieval

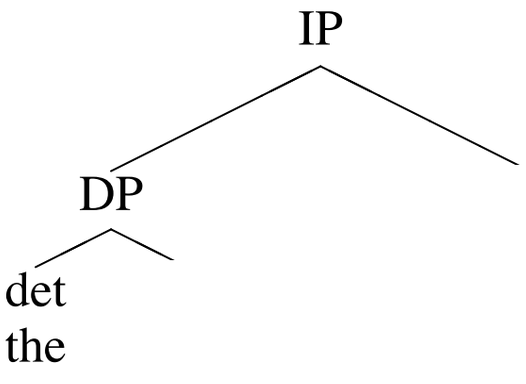
Creation

IP3

cat	:	IP
num	:	
spec	:	DP3
comp	:	
tense	:	
finite	:	

DP3

cat	:	DP
num	:	
head	:	*the*
comp	:	



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Goal stack

NP
VP
DONE

`(P set-retrieval-cues-IP-goal-input-DET …)`

`(P attach-DP-as-subject-of-predicted-IP …)`

Retrieval

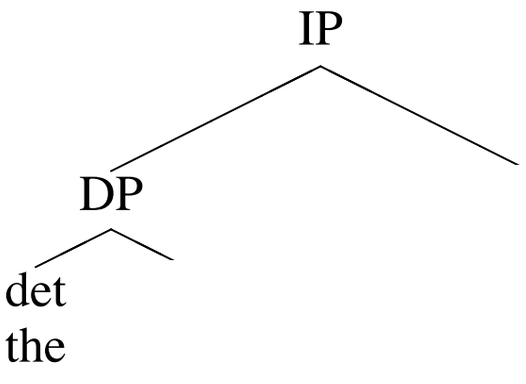
Creation

IP3

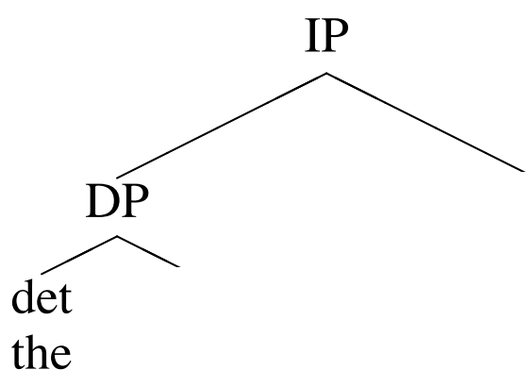
cat	:	IP
num	:	
spec	:	DP3
comp	:	
tense	:	
finite	:	

DP3

cat	:	DP
num	:	
head	:	*the*
comp	:	

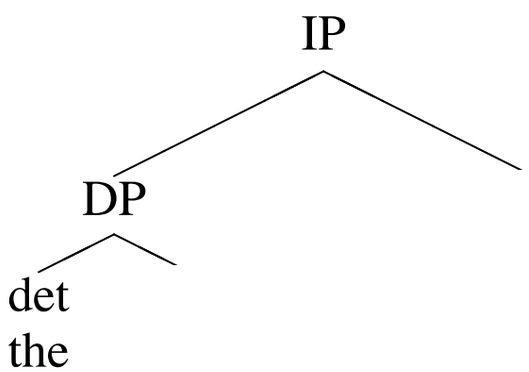


```
(P set-retrieval-cues-IP-goal-input-DET
   =goal>
      ISA                 comprehend-sentence
      state               "read"
      goal-cat            IP-goal
   =retrieval>
      isa                 lexical-entry
      word                =word
      cat                 DET
==>
   =lex> =retrieval
   =goal>
      state               "wm-retrieval"
      cue1                wait-for-IP
   +retrieval>
      ISA                 syn-obj
      waiting-for-cat     wait-for-IP
)
```




```
(P attach-DP-as-subject-of-predicted-IP
   =goal>
      ISA                 comprehend-sentence
      state               "wm-retrieval"
   =retrieval>
      isa                 syn-obj
      cat                 IP
      ID                  =ID-RETR
      head                nil
      waiting-for-cat     wait-for-IP
   =lex>
      isa                 lexical-entry
      cat                 DET
      word                =word
      number              sing-plural-lex
==>
   =goal>
      state               "read"
      goal-cat            NP-goal
   +DPb>
      isa                 syn-obj
      cat                 DP
      ID                  =ID-DP
      head                =word
      spec-of             =ID-RETR
      number              sing-plural
      waiting-for-cat     wait-for-NP
      next-goal           next-VP-goal
   =retrieval>
      spec                =ID-DP
      waiting-for-cat     wait-for-VP
)
```

```
(P set-retrieval-cues-IP-goal-input-DET
   =goal>
      ISA                  comprehend-sentence
      state                "read"
      goal-cat             IP-goal
   =retrieval>
      isa                  lexical-entry
      word                 =word
      cat                  DET
==>
   =lex> =retrieval
   =goal>
      state                "wm-retrieval"
      cue1                 wait-for-IP
   +retrieval>
      ISA                  syn-obj
      waiting-for-cat      wait-for-IP
)
```



Goal stack

```
(P attach-DP-as-subject-of-predicted-IP
   =goal>
      ISA                  comprehend-sentence
      state                "wm-retrieval"
   =retrieval>
      isa                  syn-obj
      cat                  IP
      ID                   =ID-RETR
      head                 nil
      waiting-for-cat      wait-for-IP
   =lex>
      isa                  lexical-entry
      cat                  DET
      word                 =word
      number               sing-plural-lex
==>
   =goal>
      state                "read"
      goal-cat             NP-goal
   +DPb>
      isa                  syn-obj
      cat                  DP
      ID                   =ID-DP
      head                 =word
      spec-of              =ID-RETR
      number               sing-plural
      waiting-for-cat      wait-for-NP
      next-goal            next-VP-goal
   =retrieval>
      spec                 =ID-DP
      waiting-for-cat      wait-for-VP
)
```

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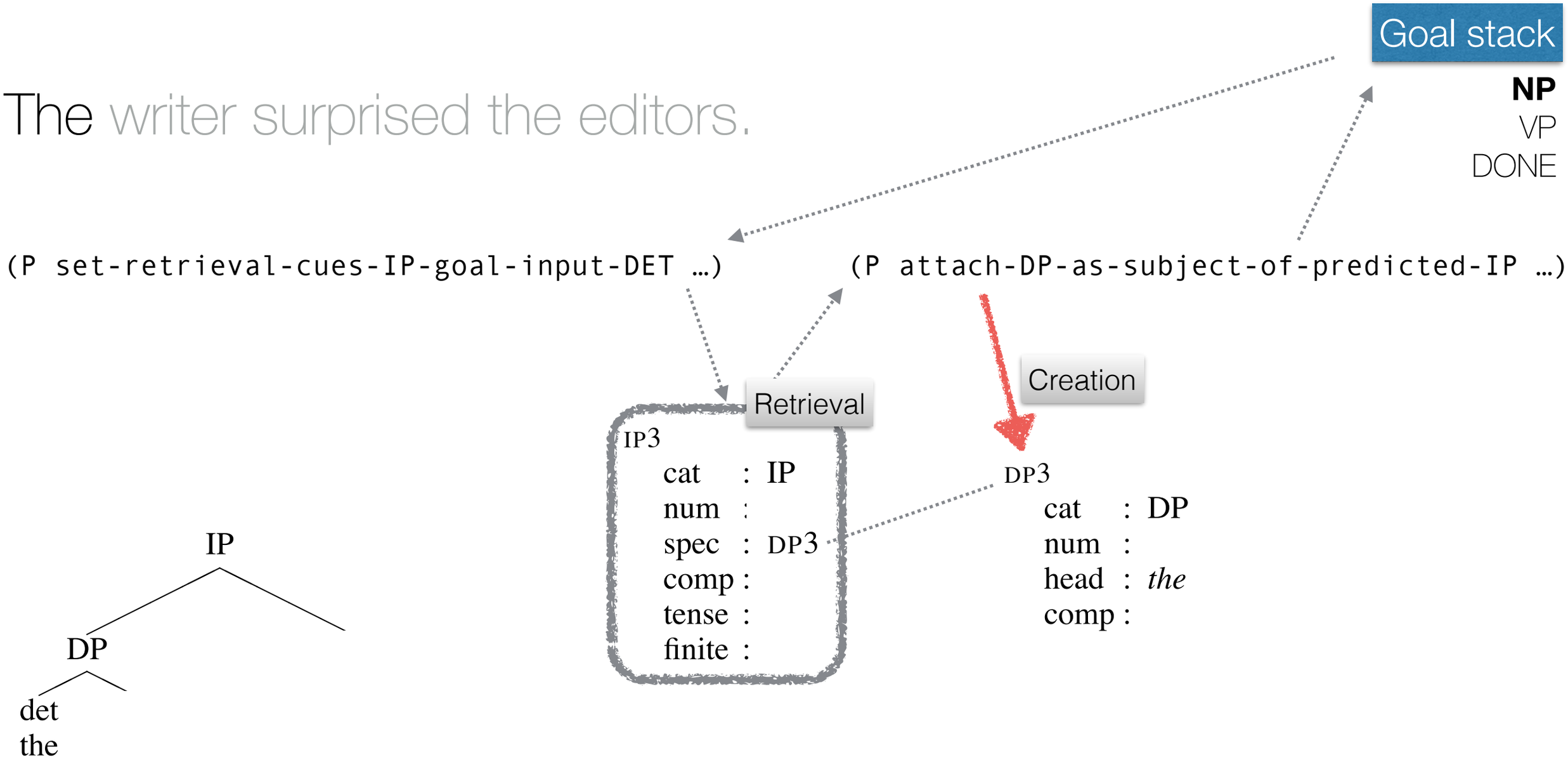

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Goal stack

NP
VP
DONE

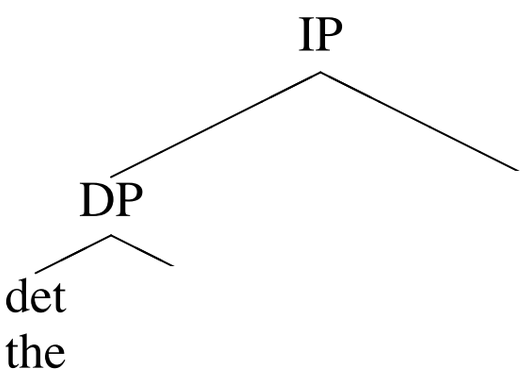
The writer surprised the editors.

`(P set-retrieval-cues-…)`

`(P attach-…)`

IP3
cat : IP
num :
spec : DP3
comp :
tense :
finite :

DP3
cat : DP
num :
head : *the*
comp :



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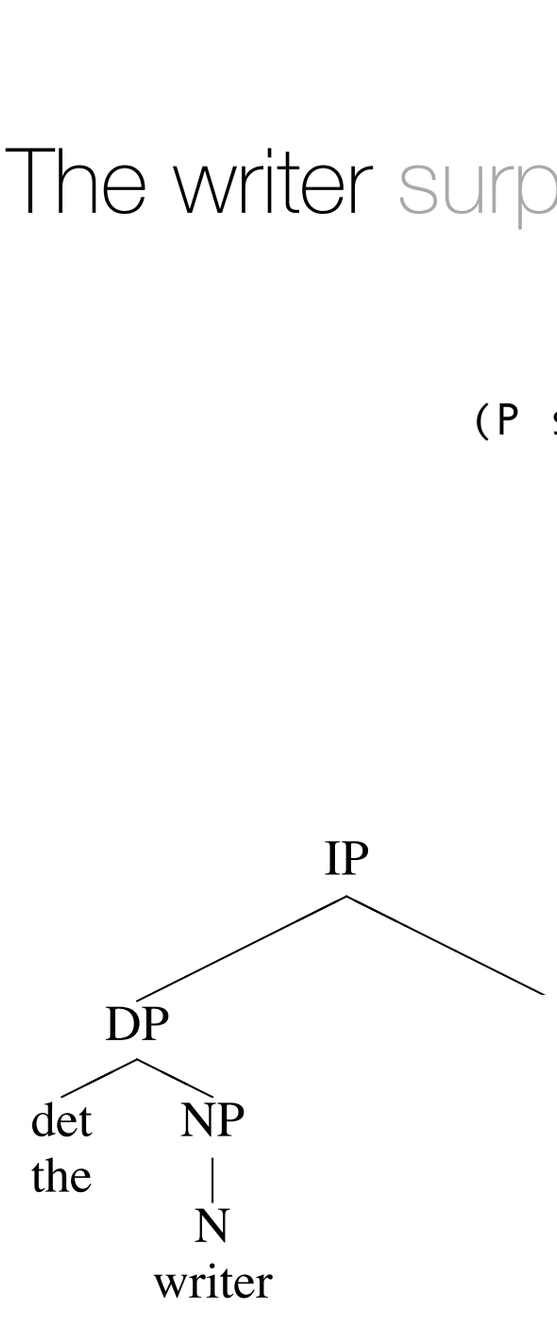

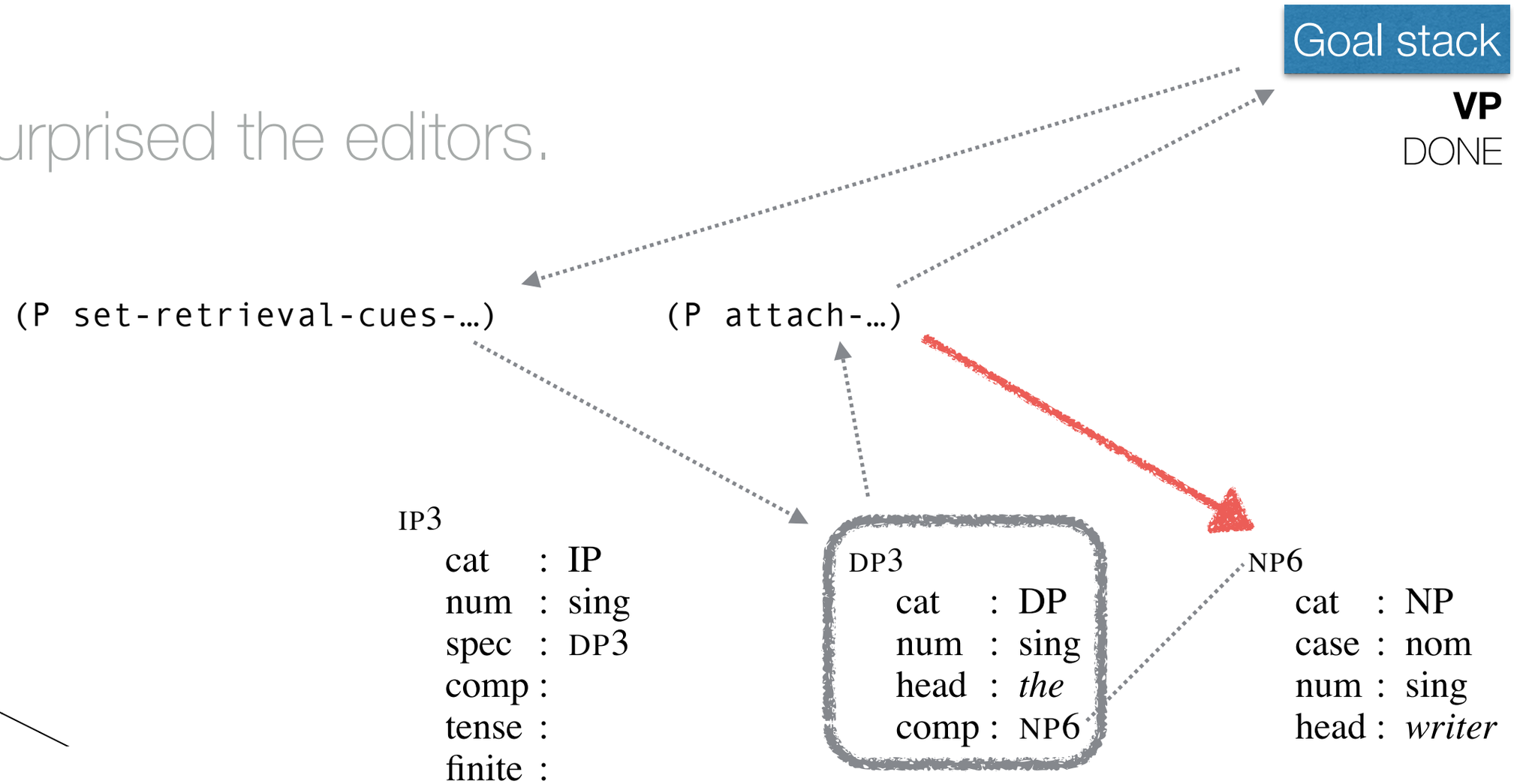

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Goal stack

VP
DONE

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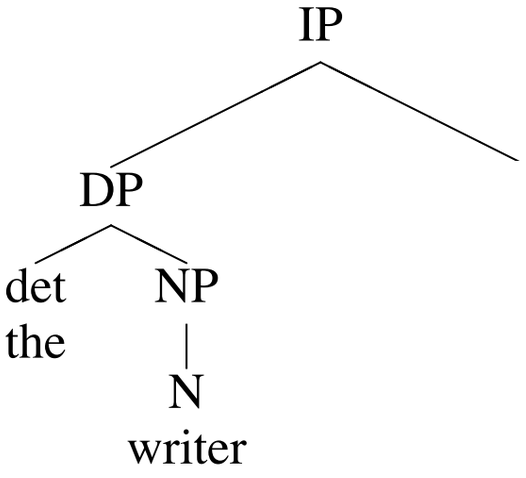
(P set-retrieval-cues-…)

(P attach-…)



IP3
cat : IP
num : sing
spec : DP3
comp :
tense :
finite :

DP3
cat : DP
num : sing
head : *the*
comp : NP6

NP6
cat : NP
case : nom
num : sing
head : *writer*

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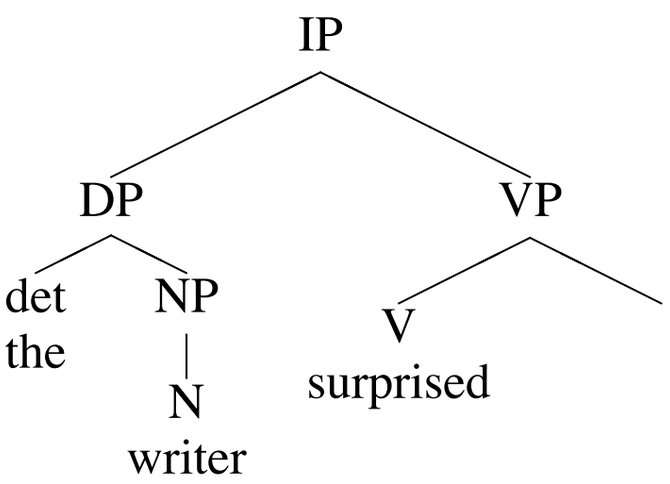
Goal stack

DP
DONE

(P set-retrieval-cues-…)

(P attach-…)



IP3
cat : IP
num : sing
spec : DP3
comp : VP7
tense : past
finite : finite

DP3
cat : DP
num : sing
head : *the*
comp : NP6

NP6
cat : NP
case : nom
num : sing
head : *writer*

VP7
cat : VP
num : sing-plural
tense : past
head : *surprised*
comp :

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Goal stack

DP
DONE

The writer surprised the editors.

(P set-retrieval-cues-…)

(P attach-…)

IP3

cat	:	IP
num	:	sing
spec	:	DP3
comp	:	VP7
tense	:	past
finite	:	finite

DP3

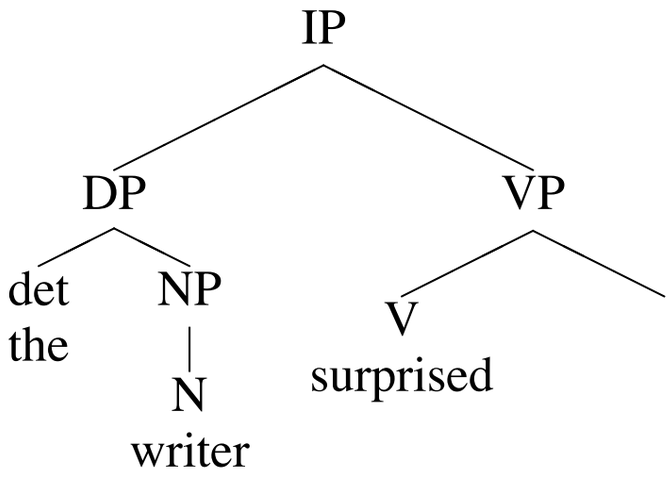
cat	:	DP
num	:	sing
head	:	*the*
comp	:	NP6

NP6

cat	:	NP
case	:	nom
num	:	sing
head	:	*writer*

VP7

cat	:	VP
num	:	sing-plural
tense	:	past
head	:	*surprised*
comp	:	



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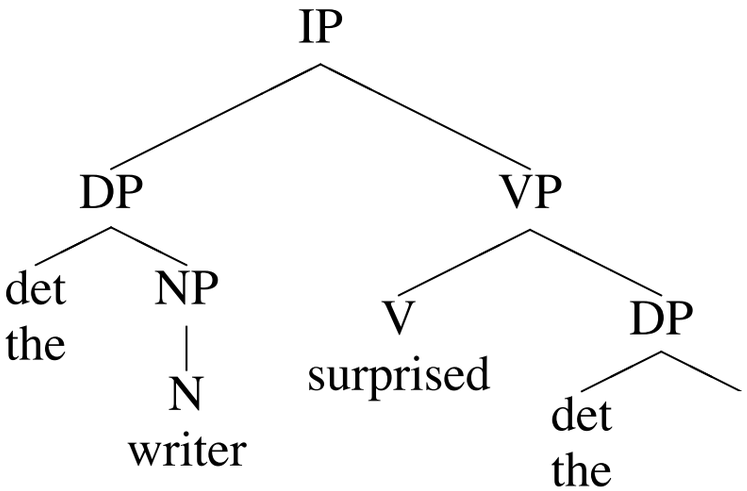
Goal stack

NP
DONE

`(P set-retrieval-cues-…)`

`(P attach-…)`



IP3

cat	:	IP
num	:	sing
spec	:	DP3
comp	:	VP7
tense	:	past
finite	:	finite

DP3

cat	:	DP
num	:	sing
head	:	*the*
comp	:	NP6

NP6

cat	:	NP
case	:	nom
num	:	sing
head	:	*writer*

VP7

cat	:	VP
num	:	sing-plural
tense	:	past
head	:	*surprised*
comp	:	DP9

DP9

cat	:	DP
num	:	
head	:	
comp	:	

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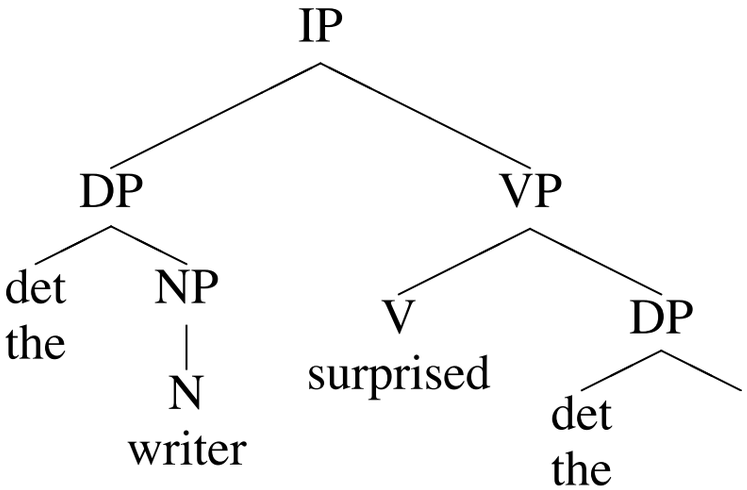
Goal stack

NP
DONE

`(P set-retrieval-cues-…)`

`(P attach-…)`



IP3

cat	:	IP
num	:	sing
spec	:	DP3
comp	:	VP7
tense	:	past
finite	:	finite

DP3

cat	:	DP
num	:	sing
head	:	*the*
comp	:	NP6

NP6

cat	:	NP
case	:	nom
num	:	sing
head	:	*writer*

VP7

cat	:	VP
num	:	sing-plural
tense	:	past
head	:	*surprised*
comp	:	DP9

DP9

cat	:	DP
num	:	
head	:	
comp	:	

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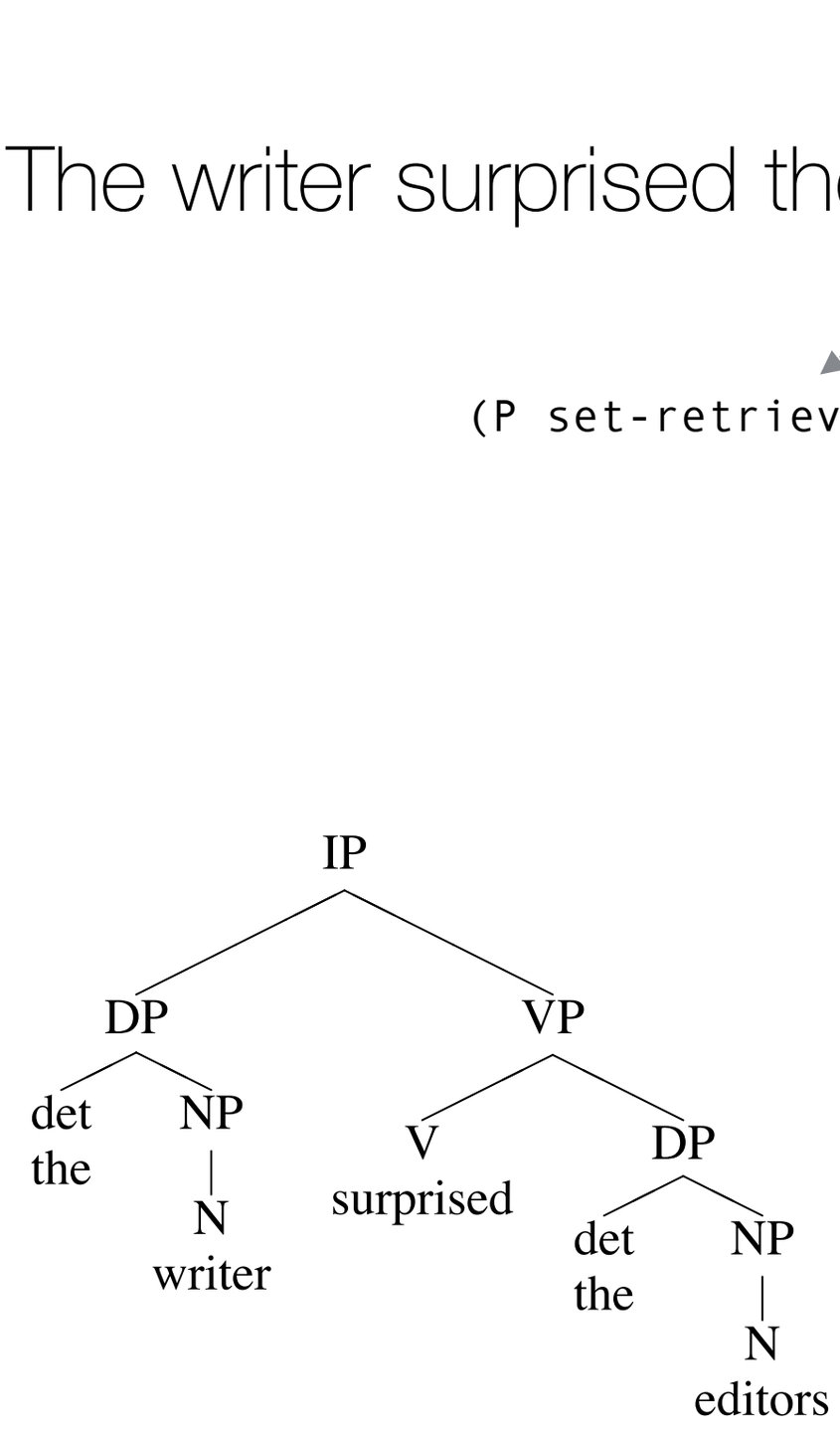

Goal stack

DONE

(P set-retrieval-cues-…)

(P attach-…)

IP3

cat : IP
num : sing
spec : DP3
comp : VP7
tense : past
finite : finite

VP7

cat : VP
num : sing-plural
tense : past
head : *surprised*
comp : DP9

DP3

cat : DP
num : sing
head : *the*
comp : NP6

NP6

cat : NP
case : nom
num : sing
head : *writer*

DP9

cat : DP
num : plural
head : *the*
comp : NP14

NP14

cat : NP
case : acc
num : plural
head : *editors*

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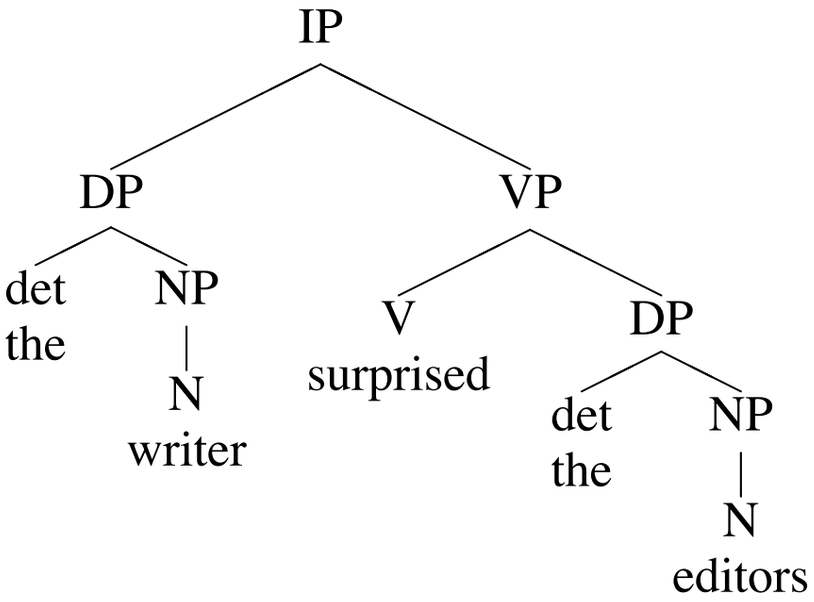

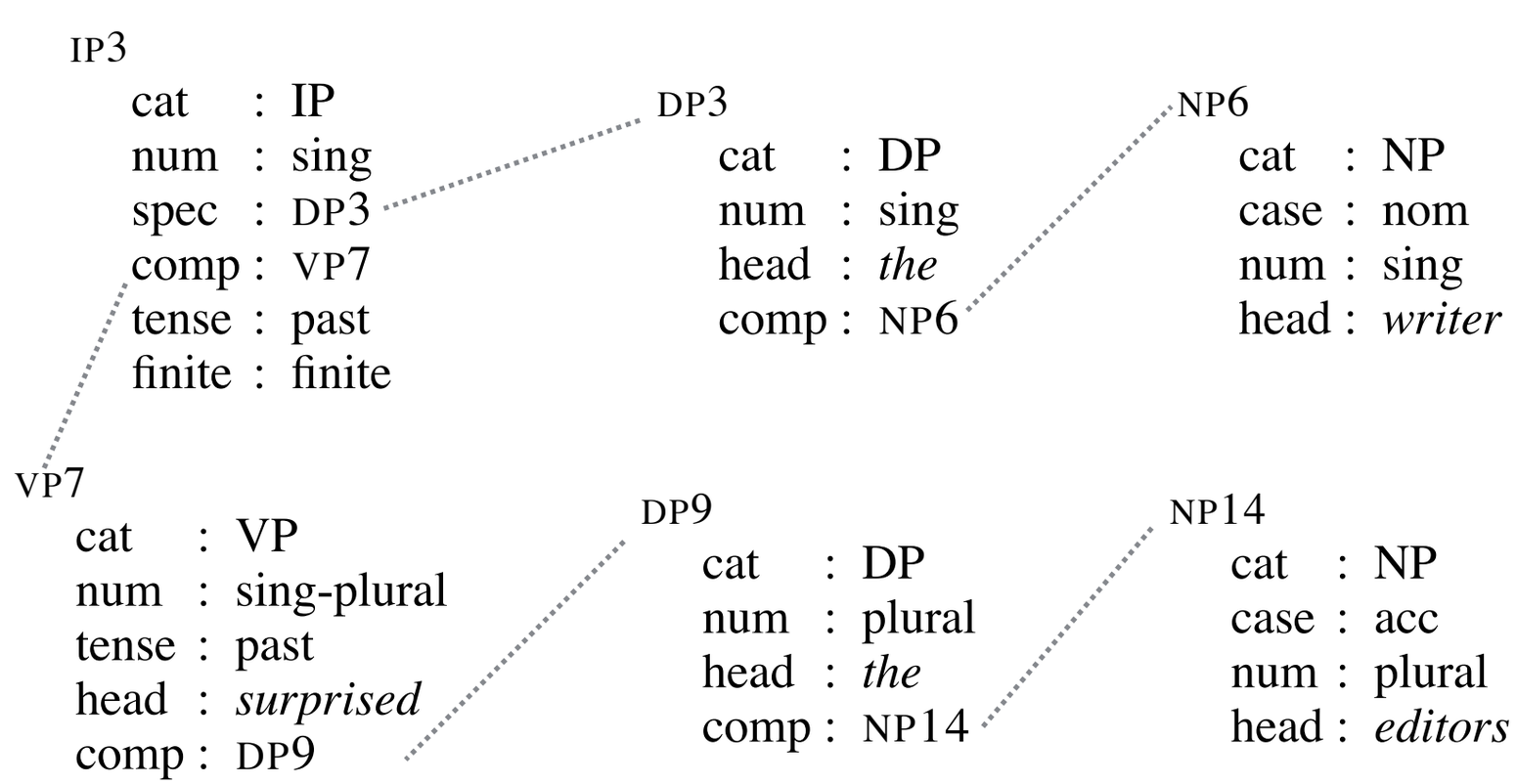

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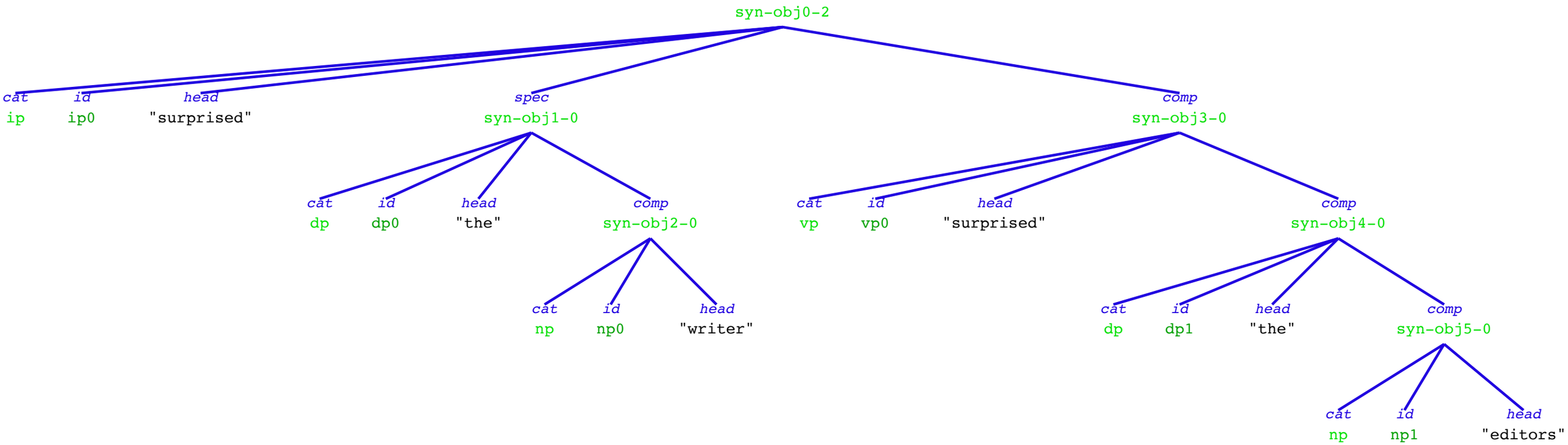


```
(ps "the writer surprised the
editors *")
(setf *real-time* T)
```

Exercise

```
(load "../actr6/load-act-r-6.lisp")
(run-environment) OR (start-environment)
(load “sp-lv05.lisp")


(ps "the writer surprised the editors *”)


(delete-output)
(setf *real-time* T)
(sgp :gram-lf 0.8)
(ps *gg-or*)


(re 'gg-exp1 60)
```

Example: Relative Clauses

Grodner & Gibson (2005)

SR: The reporter who sent the photographer to the editor hoped for a story.

OR: The reporter who the photographer sent to the editor hoped for a story.