# Extraposed relative clauses in Role and Reference Grammar. An analysis using Tree Wrapping Grammars

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# Outline

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Or it can be embedded in an argument.

(3) Es fängt [das Team des Spielers] an, der zuletzt in Portugal war .

In principle, there is no limit to the level of embedding.

(4) Es fängt [die Figur aus dem Team desjenigen Spielers] an, der zuletzt in Portugal war .

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- a precise analysis of extraposed relative clauses within *Role and Reference Grammar* (RRG; Van Valin & LaPolla 1997; Van Valin 2005), which provides at the same time
- an analysis of this phenomenon within a tree-rewriting formalism in the spirit of *Lexicalized Tree Adjoining Grammar* (LTAG Joshi & Schabes, 1997; Abeillé & Rambow, 2000) while overcoming the limitations of LTAG when dealing with extraposition.

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What this talk is not about:

- Semantics and syntax-semantics interface.

# Background: RRG as TWG

- RRG assumes that clauses have a **layered structure**:
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- Other projections of predicative elements (NPs, APs etc.) also come with layers of NUC, CORE and full phrase.

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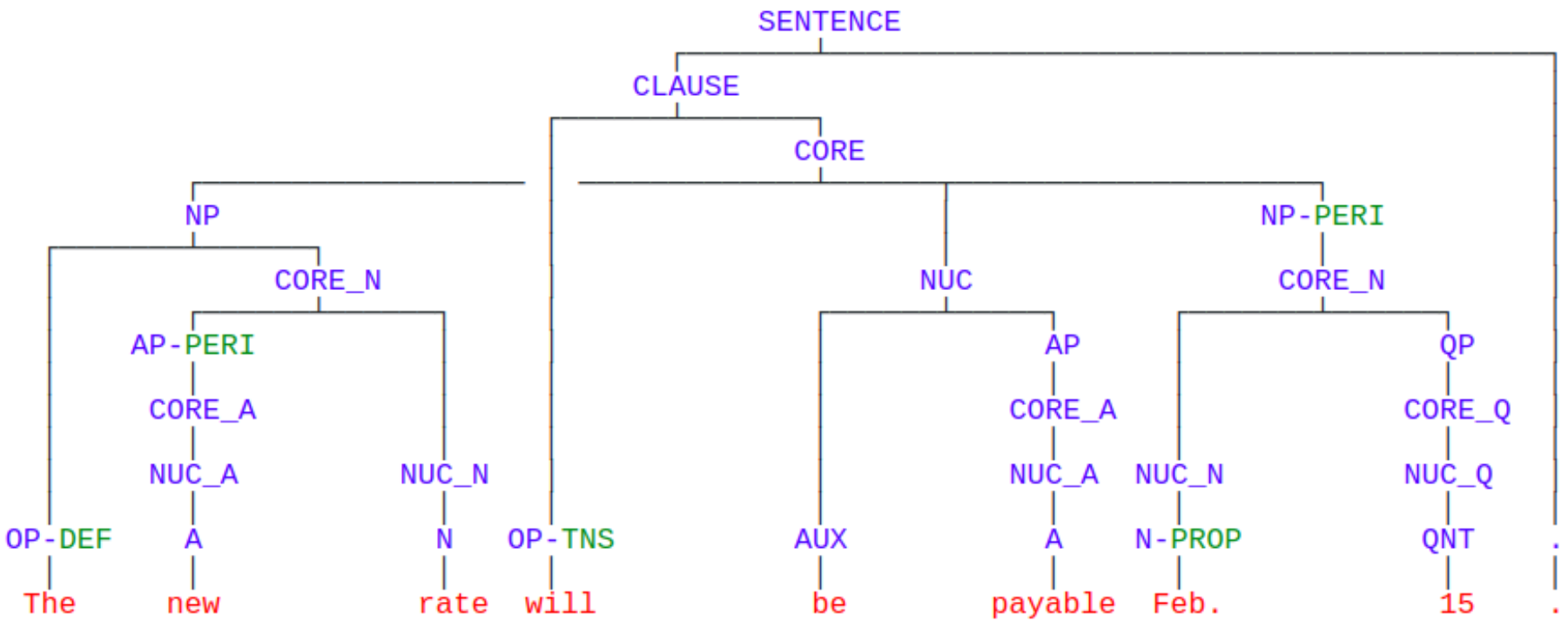
An example from the RRGbank
(Bladier et al., 2018, `rrgbank.phil.hhu.de`):



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- Our **formalization of RRG** as a tree rewriting grammar has lead to the definition of **Tree Wrapping Grammar** (Kallmeyer et al., 2013; Osswald & Kallmeyer, 2018).
- Periphery and operators are integrated into the constituent structure while being marked as OP or . . . -PERI respectively.
- Both, OP and . . . -PERI elements, are attached according to their surface position. Features on nodes and edges keep track of their scopal position (Kallmeyer & Osswald, 2017).

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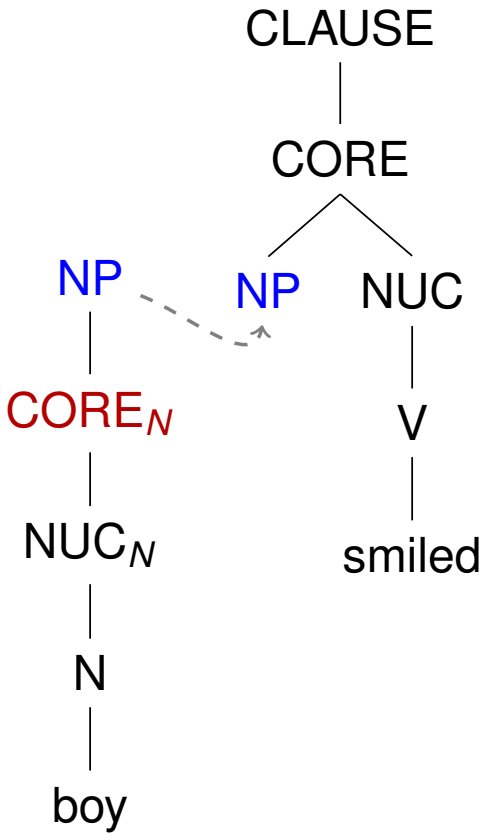
- **Wrapping substitution** = adding a tree with a d-edge (= dominance edge) between a node $v_1$ and its d-daughter $v_d$ such that an argument slot is filled by the subtree below $v_d$ and the root of the target tree merges with $v_1$. Used for adding arguments out of which something has been extracted.

# Background: RRG as TWG

Example: substitution



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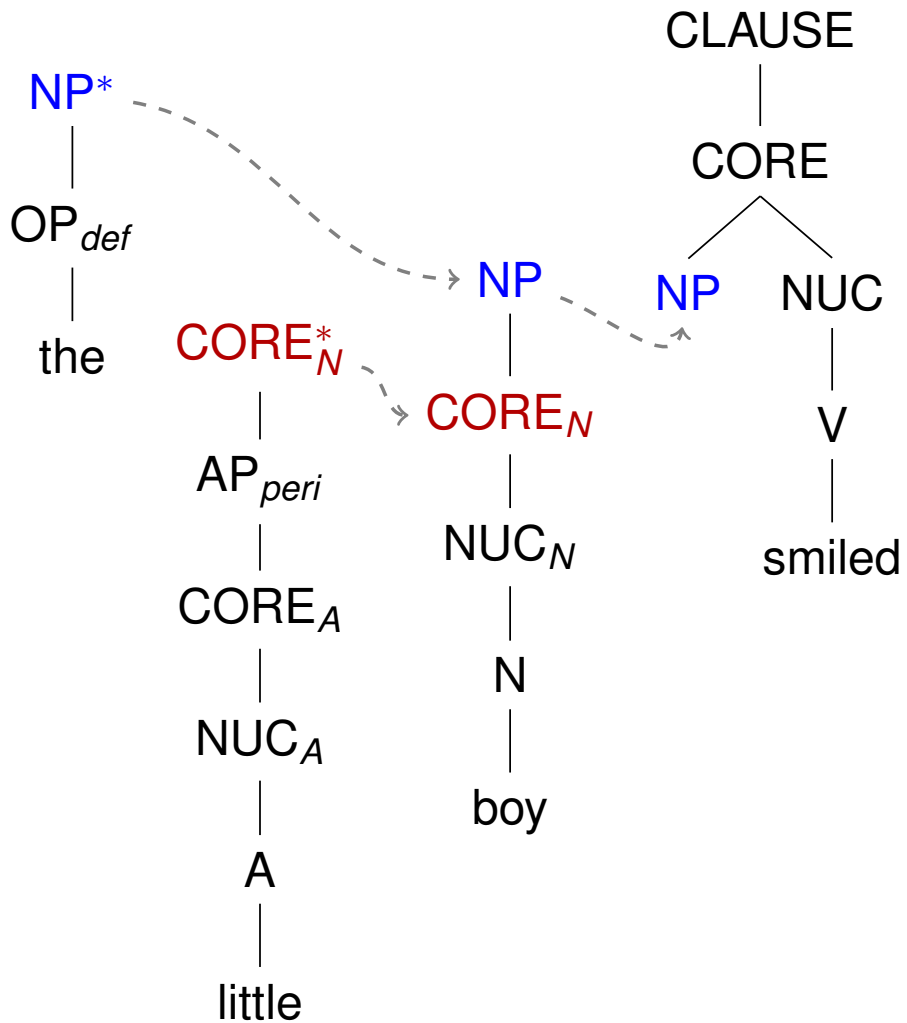

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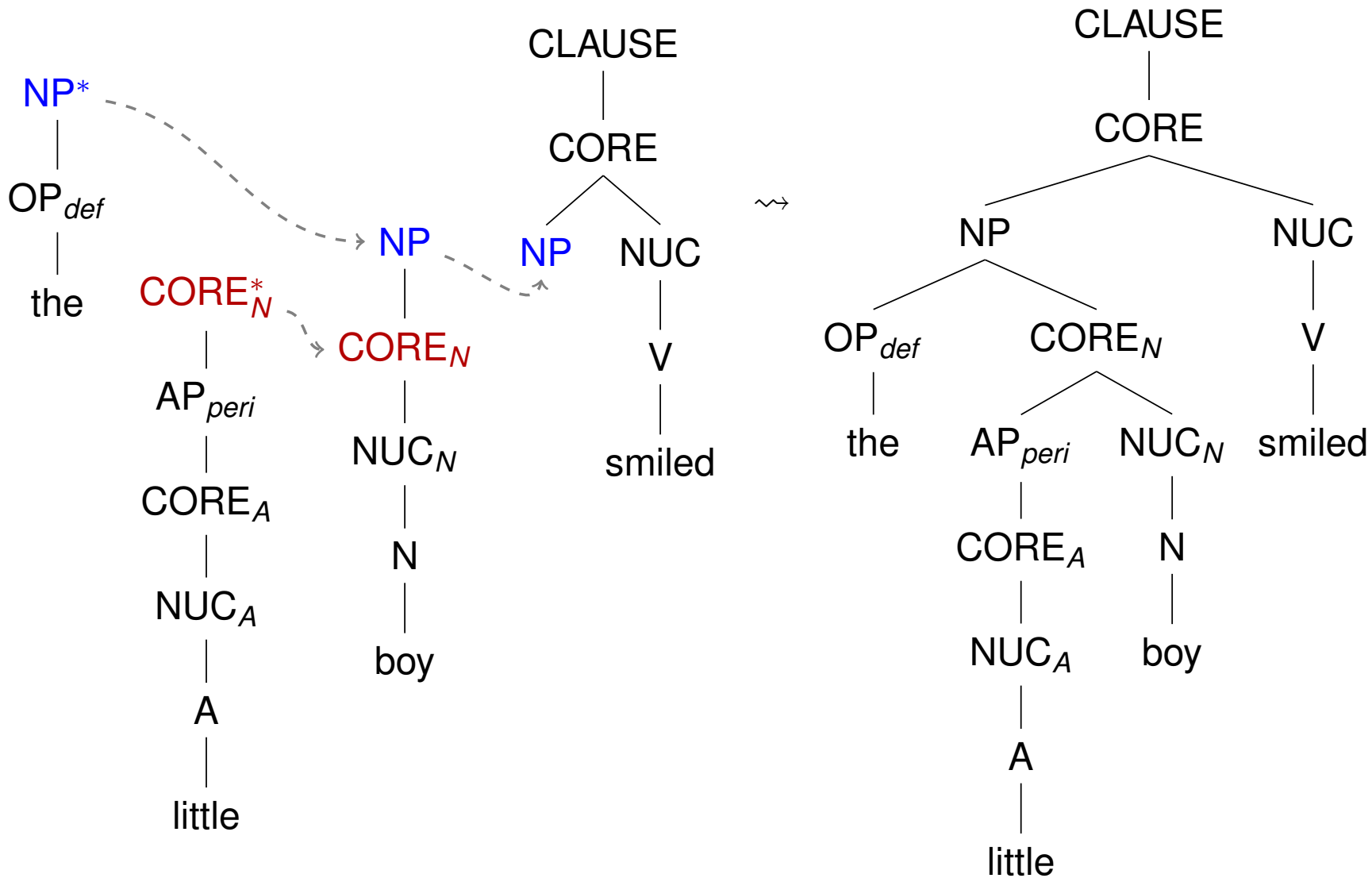

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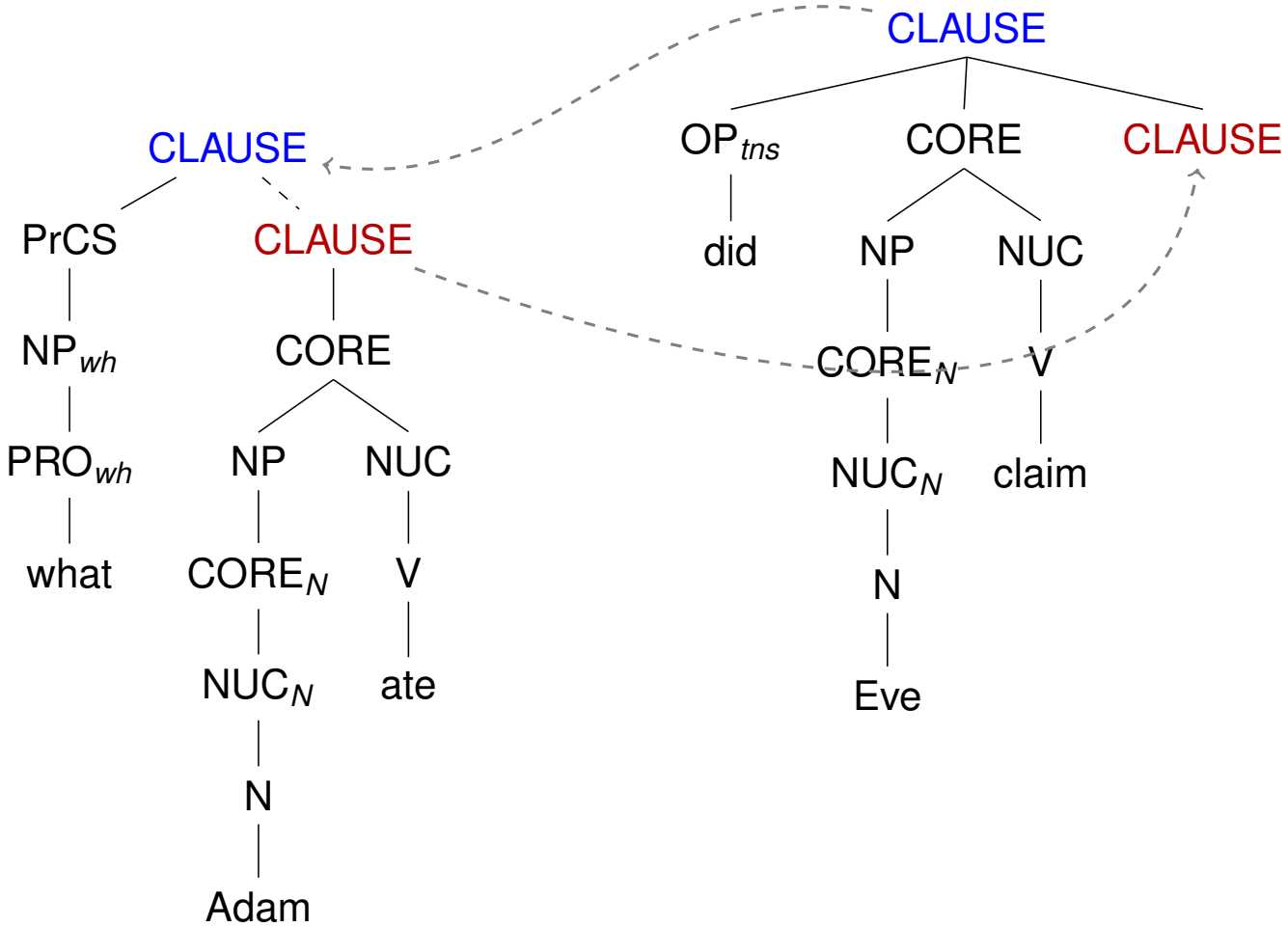

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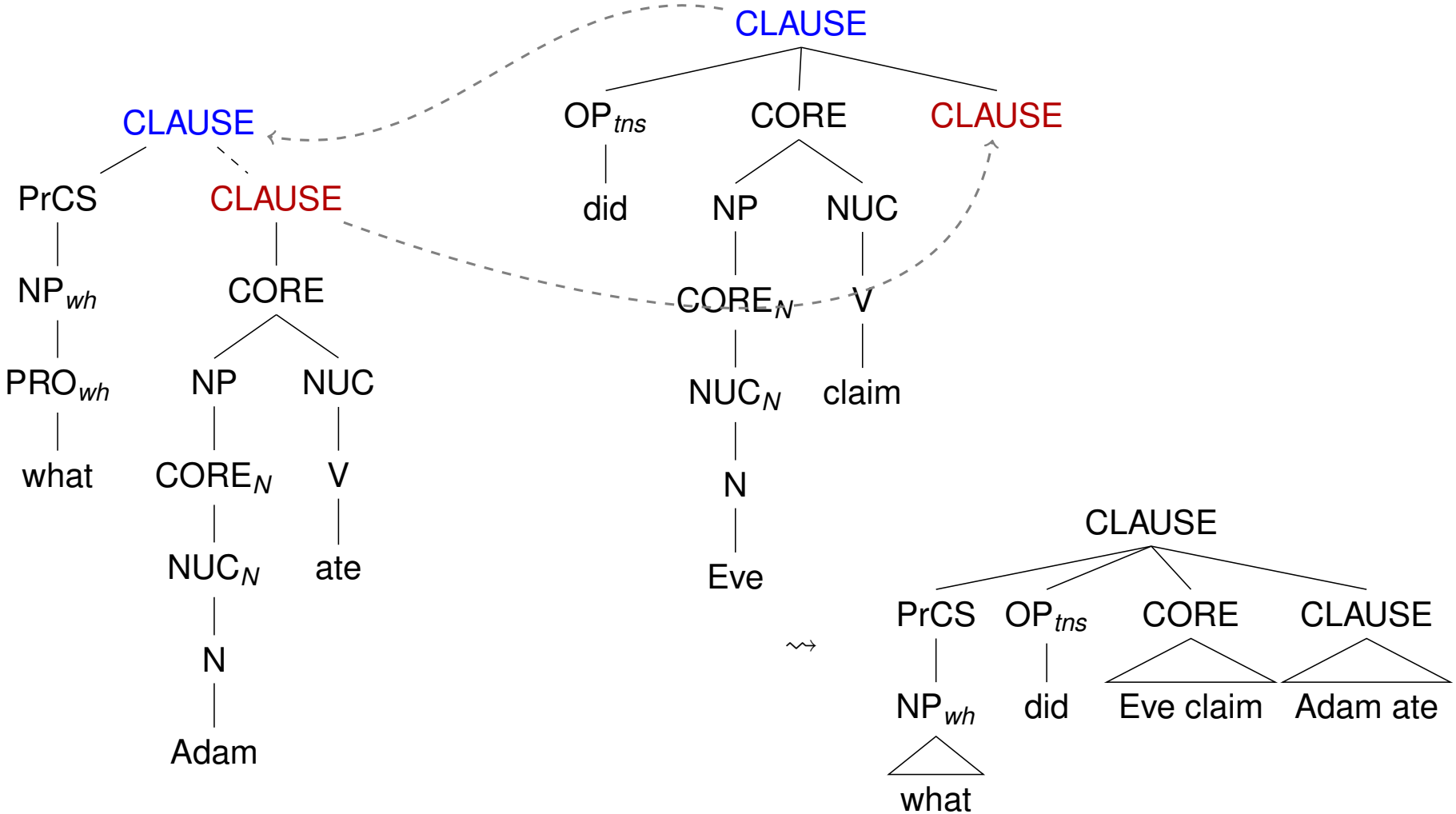
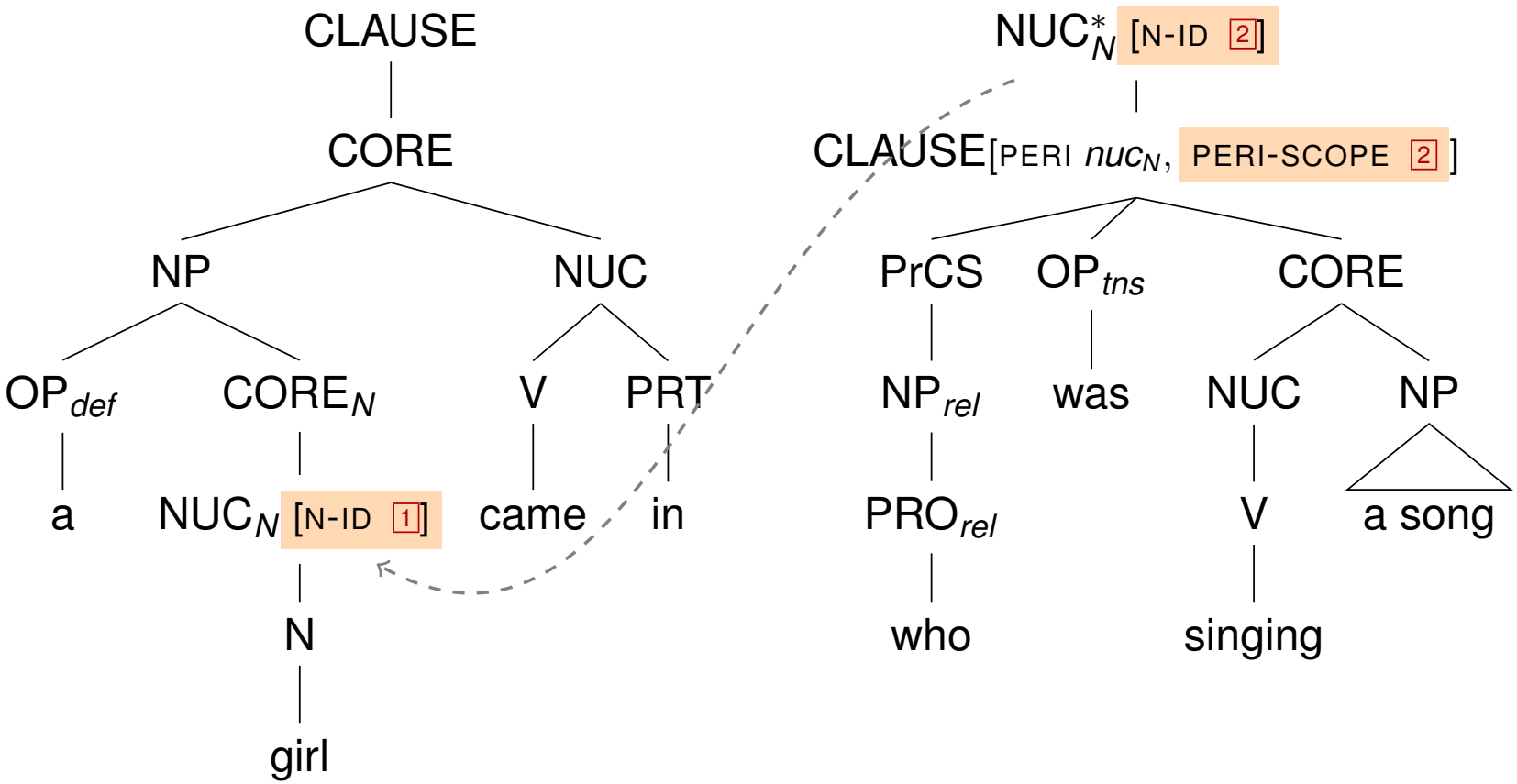


# Extraposed relative clauses: analysis

A non-extraposed restrictive relative clause:

(5) a girl who was singing a song came in



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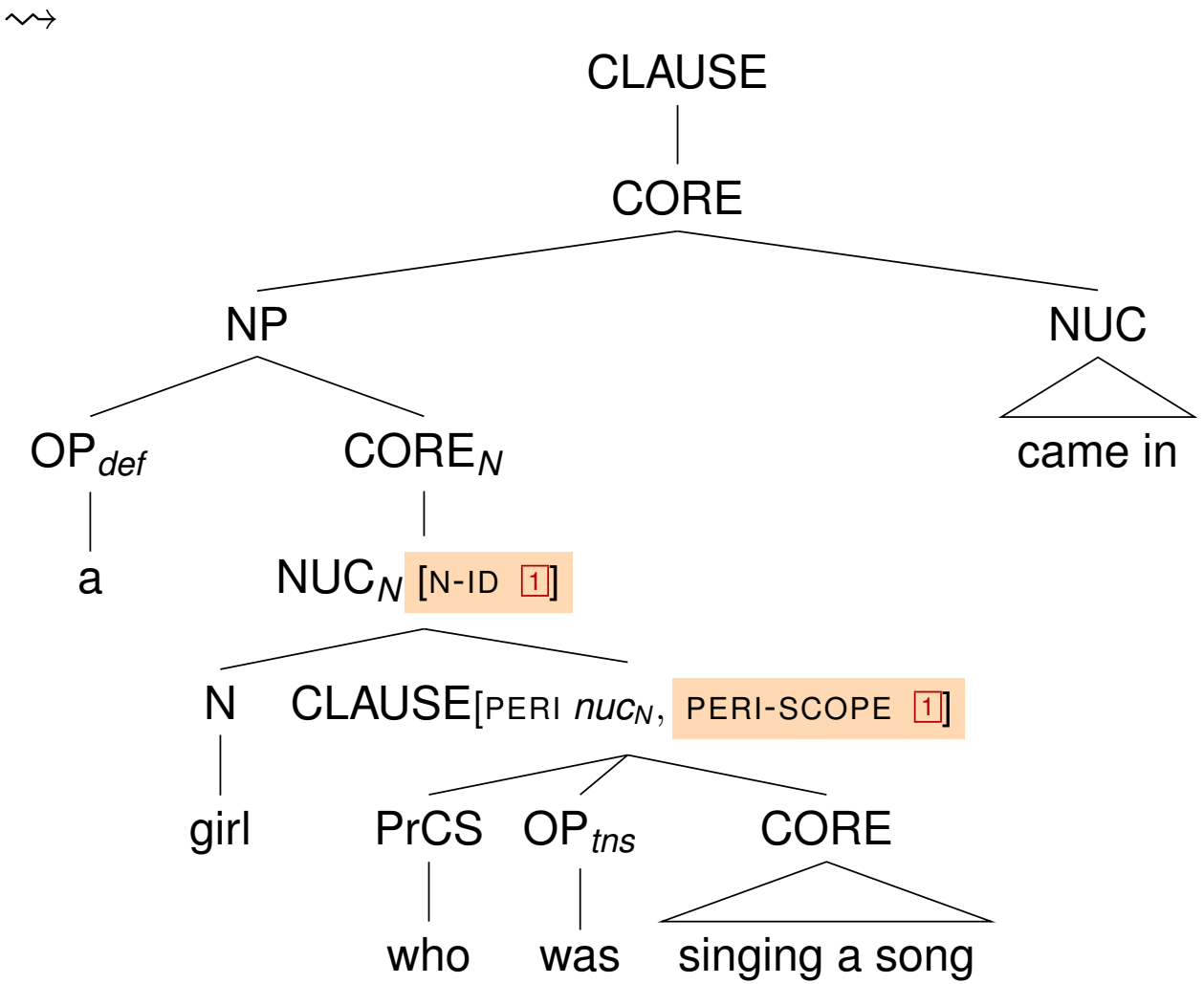

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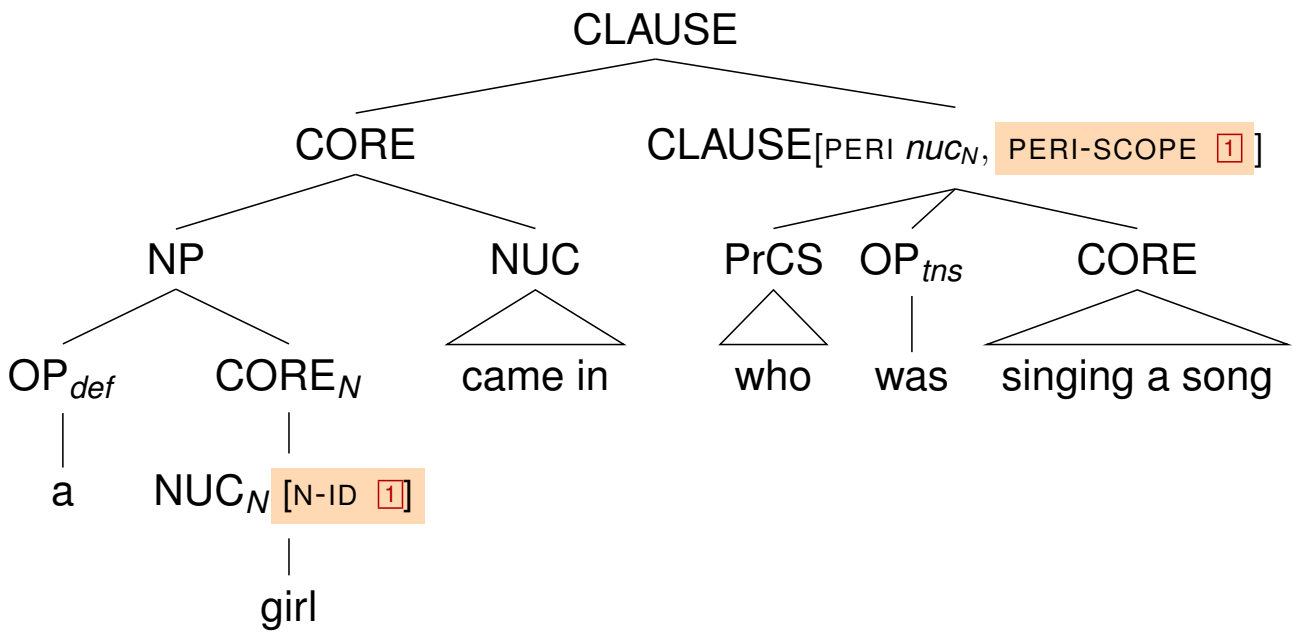
(6) a girl came in who was singing a song

Structure we want to obtain:



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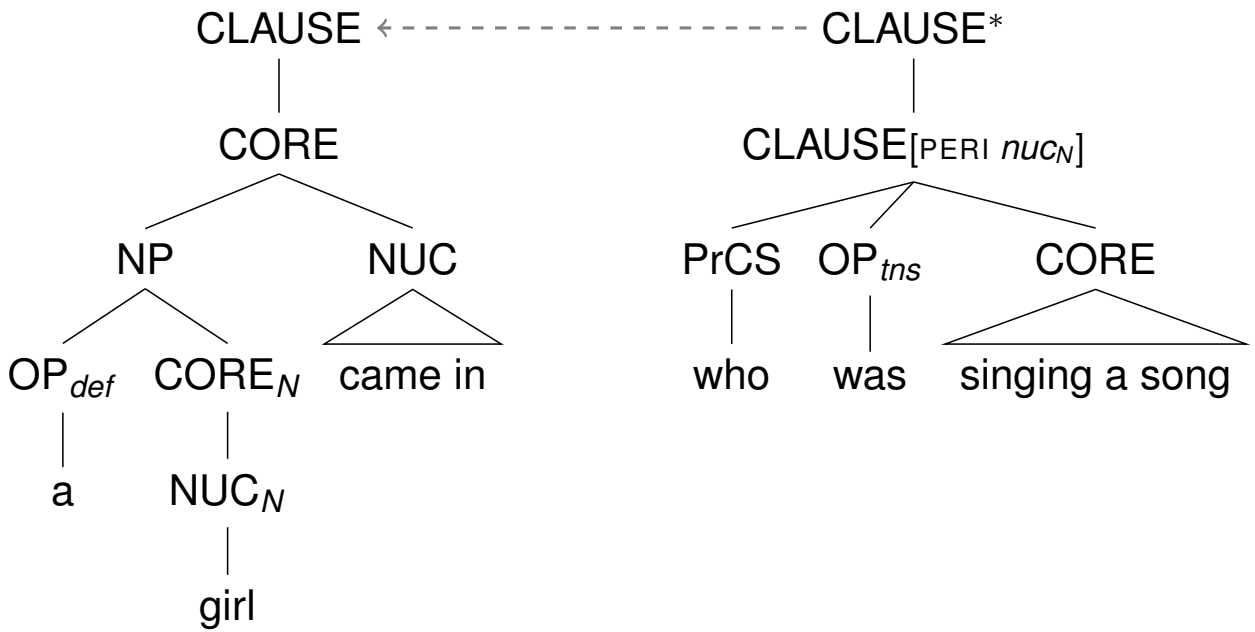

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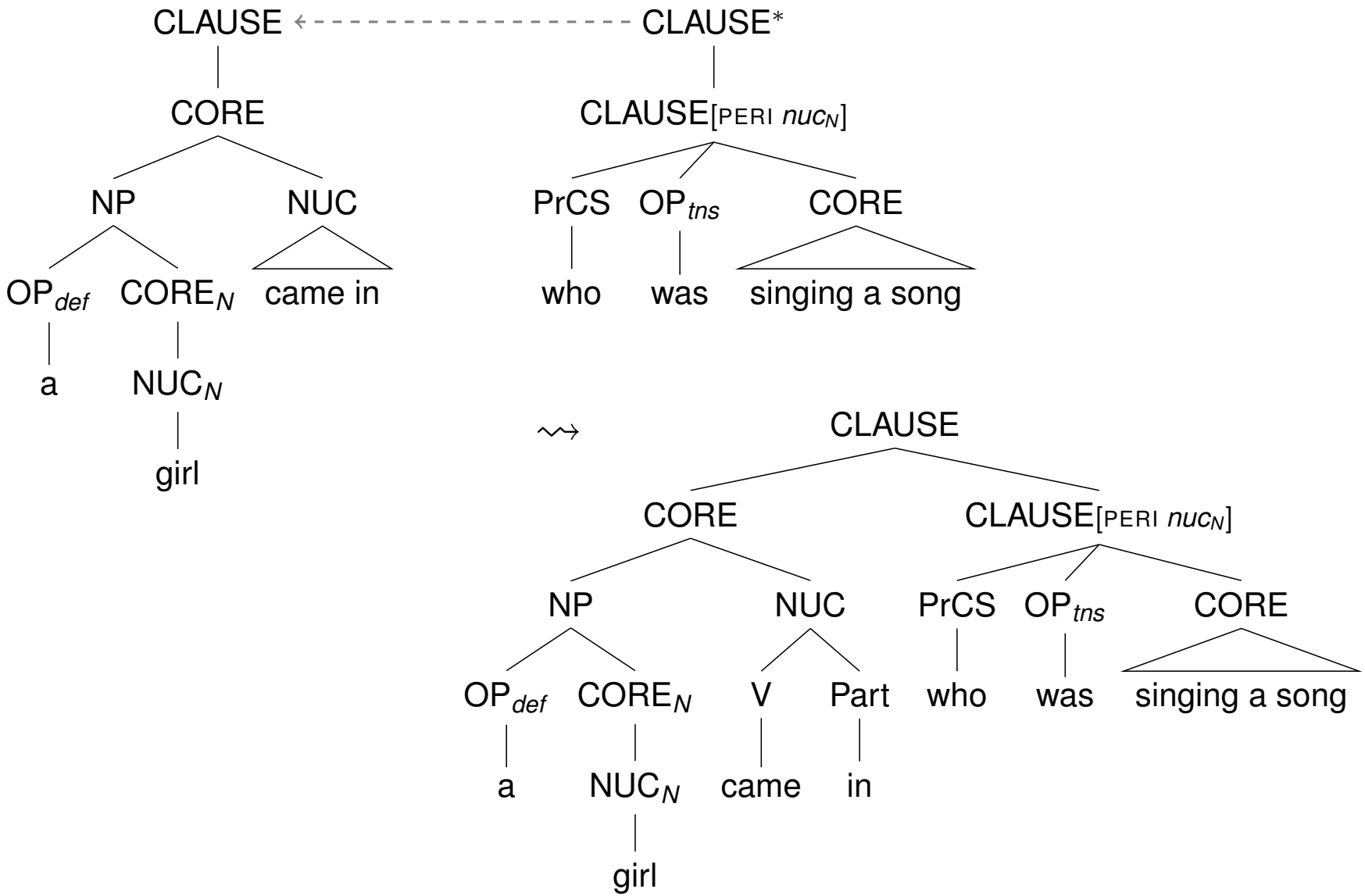

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Problems of analysis 1:

- No explicit connection between antecedent NP and relative clause.
- The link between the two must be established by some post-processing step of anaphora resolution.
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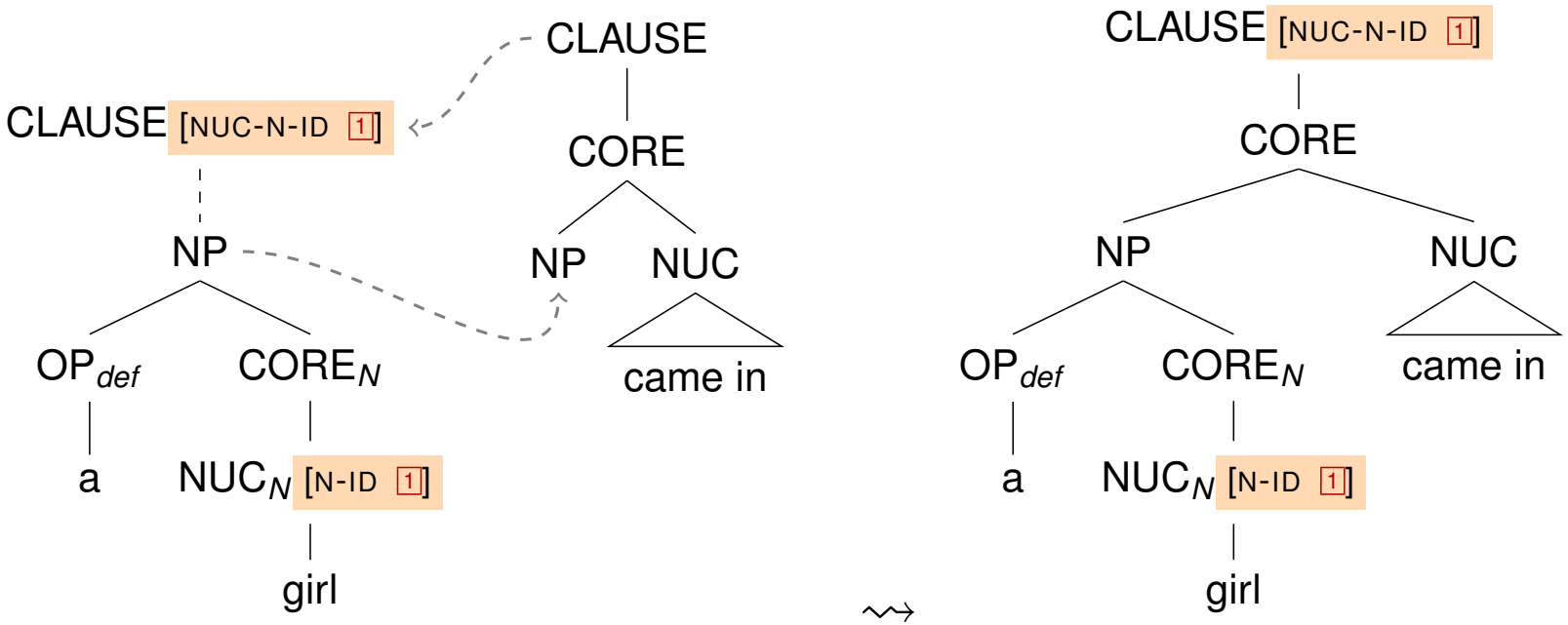
We can establish a connection by putting the NP antecedent node and the higher CLAUSE node into the same elementary tree, with a d-edge in between.

# Extraposed relative clauses: analysis

## Analysis 2: NPs provide landing sites for relative clauses



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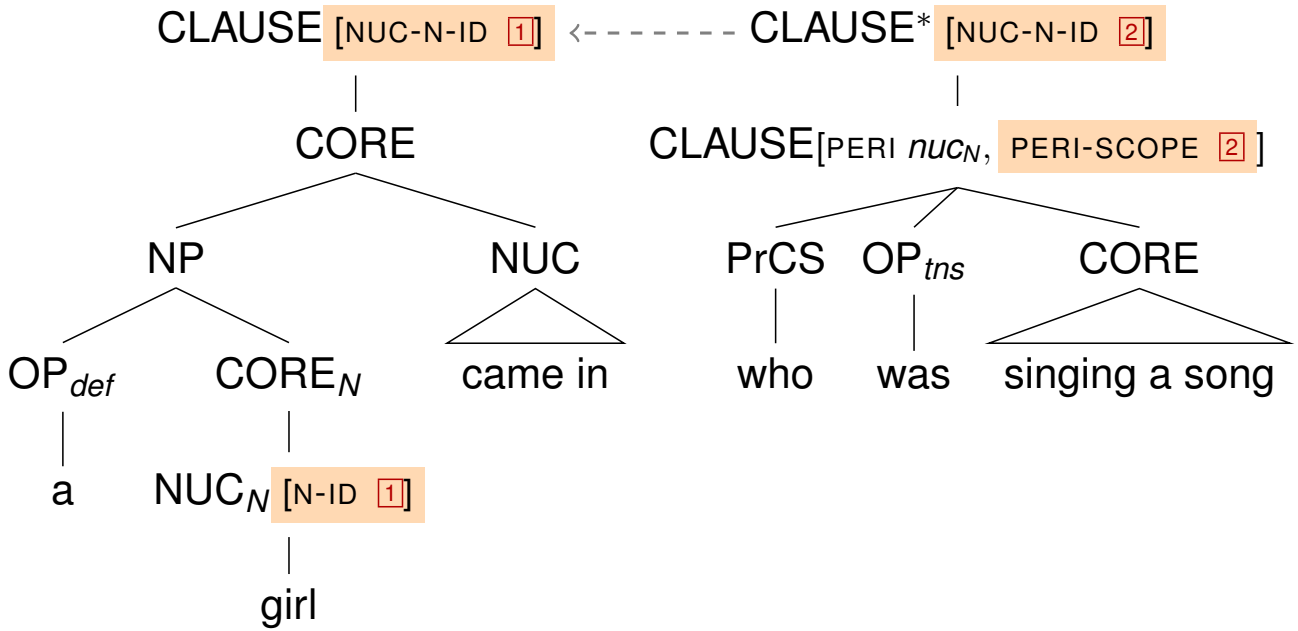

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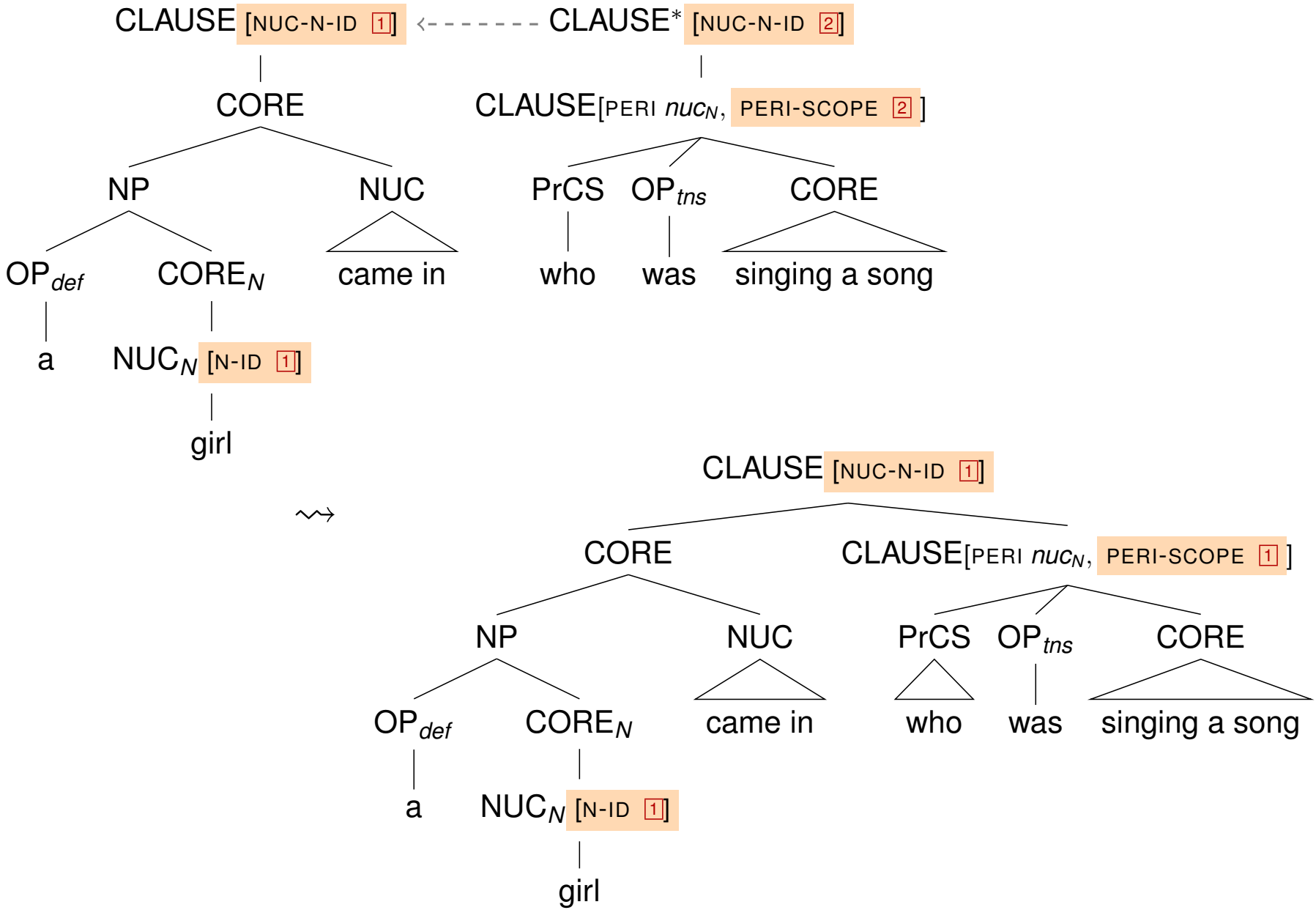

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(7) a. Someone picked some books up [which were lying on the table] [who really didn't want to]. Baltin (2006)
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- Technical problem: One has to find a way to avoid accidentally identifying the N-ID features of different $\text{NUC}_N$ nodes.

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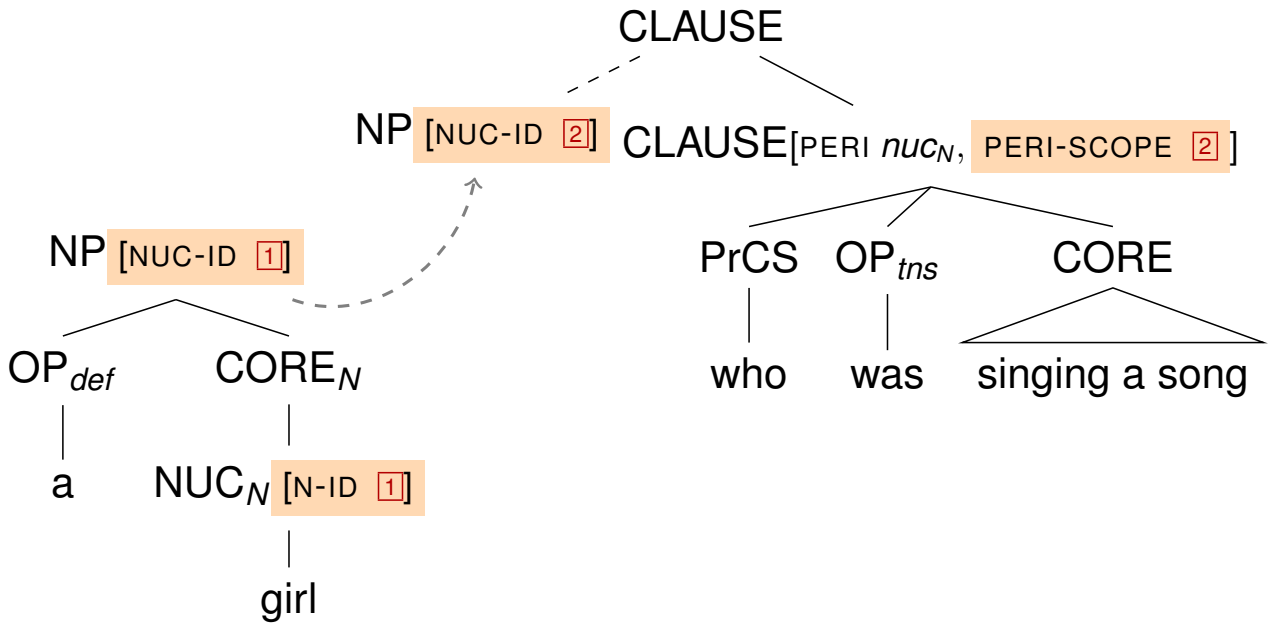

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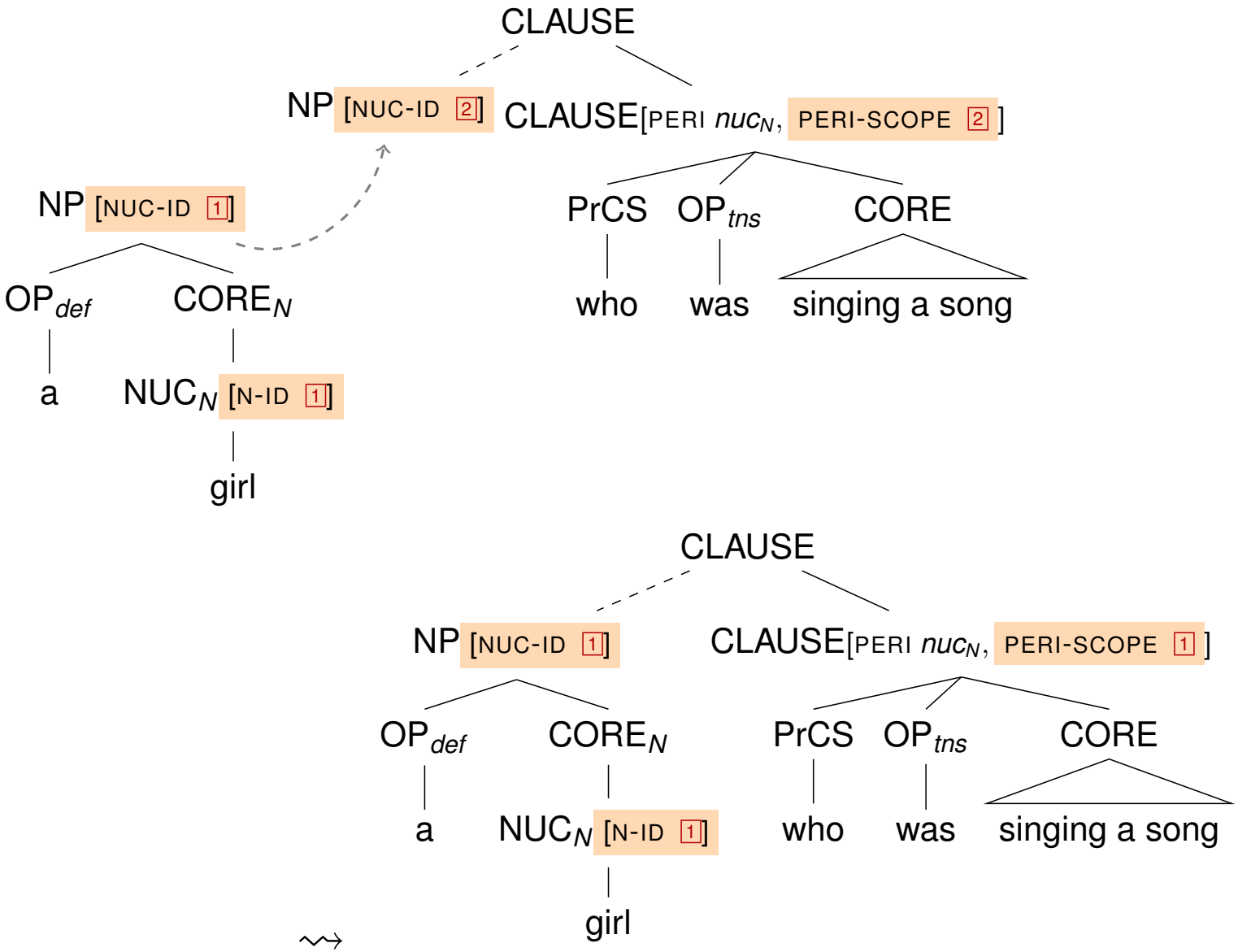

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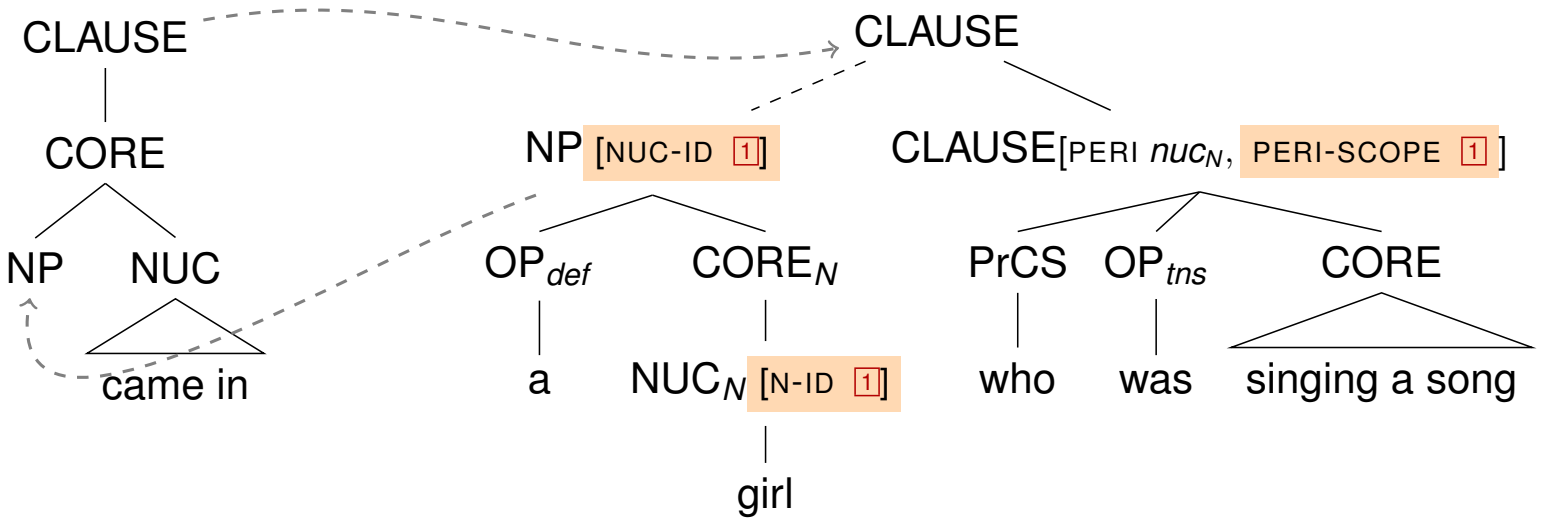

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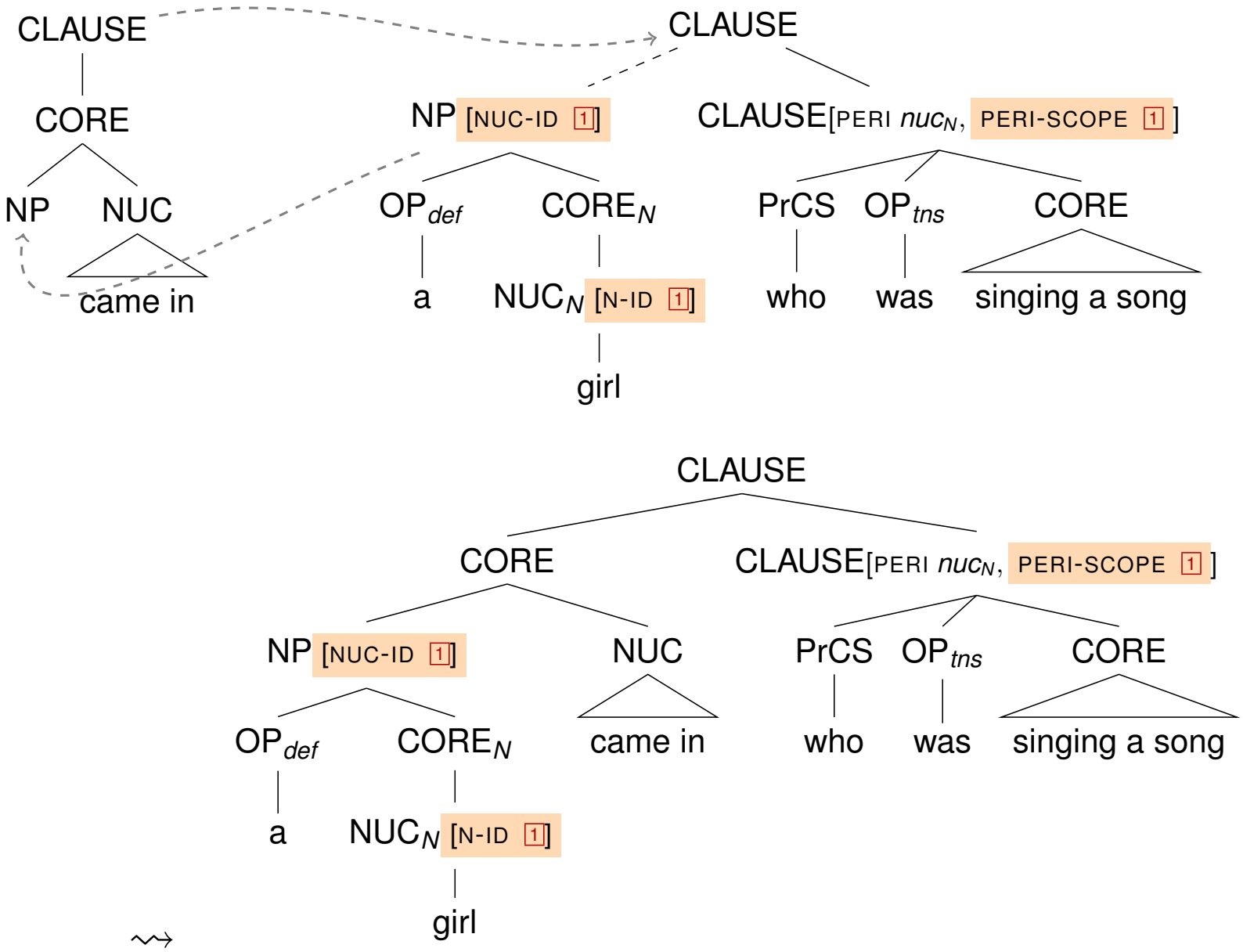

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(8) a. The theory of light that Newton proposed that everyone laughed at was more accurate than the one that met with instance acceptance. (McCawley, 1998, ex. 3c, p. 382)

b. He explained the theory of light to her that Newton proposed that everyone laughed at at the time.

(8b) has been confirmed grammatical by Curt and Peter.

# Obligatory (extraposed) relative clauses

Some determiners/pronouns, such as *derjenige* (“the one”) in German, require a relative clause (Alexiadou et al., 2000; Sternefeld, 2008).

(9) a. Derjenige (Läufer), der zuerst ins Ziel läuft, gewinnt.

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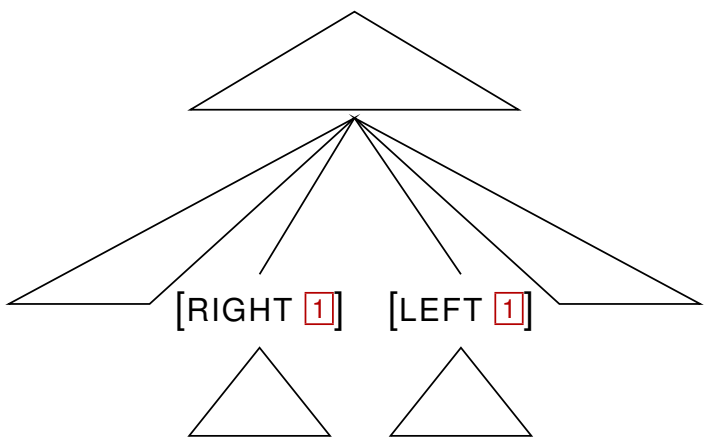
Idea: use percolating edge features in order to express the requirement for a relative clause.

# Obligatory (extraposed) relative clauses

Reminder: edge features (Kallmeyer & Osswald, 2017)

- Nodes can have special features LEFT and RIGHT.
- In the final derived tree, the LEFT feature of a node *v* unifies with the RIGHT feature of its immediate sister to the left.



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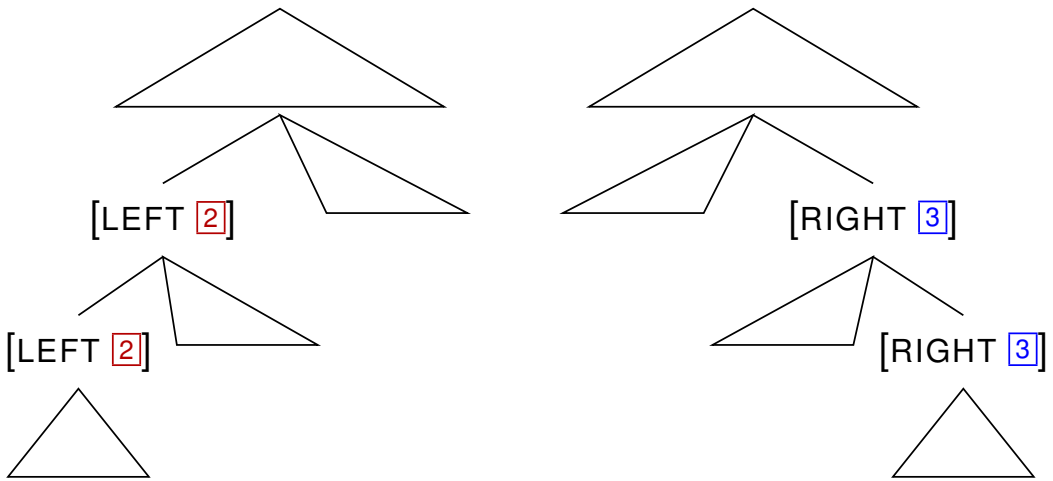
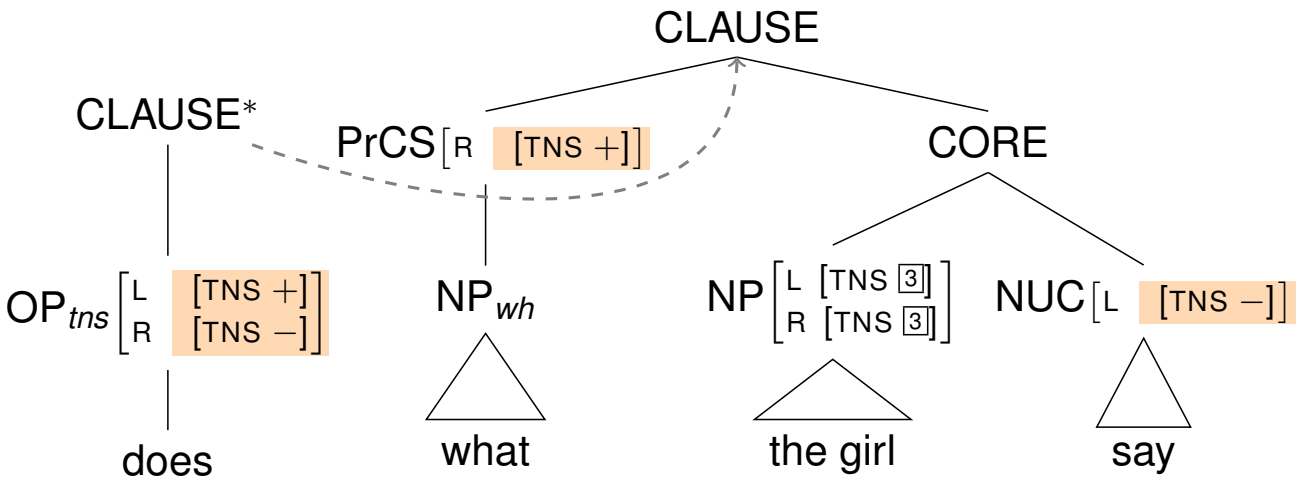
- The LEFT feature of a node $v$ on the left fringe unifies with the LEFT feature of the mother of $v$, provided this mother is not the root node of an elementary tree or the lower node of a d-edge. Similarly for RIGHT features on the right fringe.



# Obligatory (extraposed) relative clauses

Example: enforcing the adjunction of a tense operator



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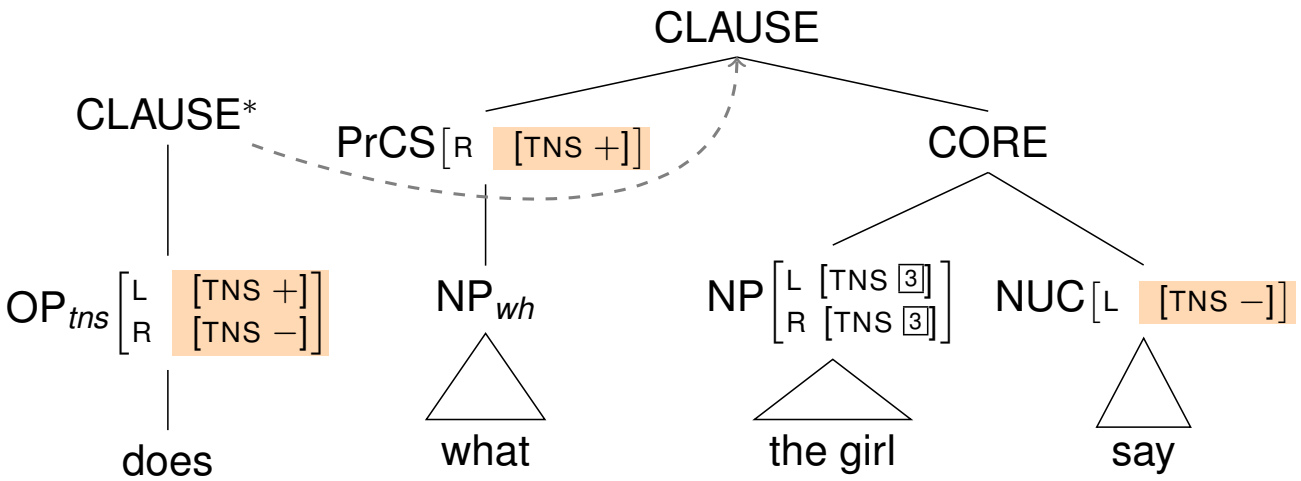
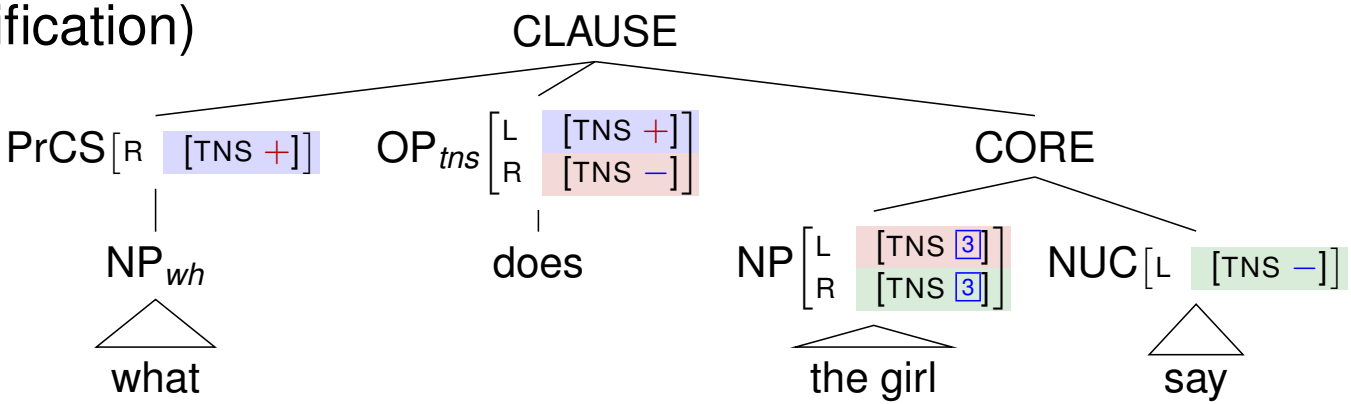



$\rightsquigarrow$ (before final unification)



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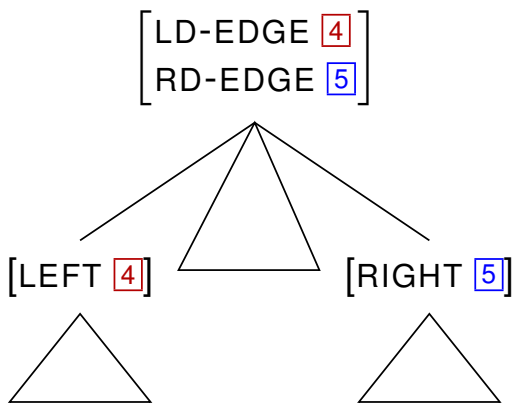
- Beyond the Kallmeyer & Osswald (2017), we introduce further node features L(EFT)-D(AUGHTER)-EDGE and R(IGHT)-D(AUGHTER)-E (LD-EDGE and RD-EDGE for short), for which the following holds: On the final derived tree, the L-DAUGHTER-EDGE feature of a node that has daughters unifies with the feature LEFT on the leftmost daughter and the feature R-DAUGHTER-EDGE unifies with the feature RIGHT on the rightmost daughter.



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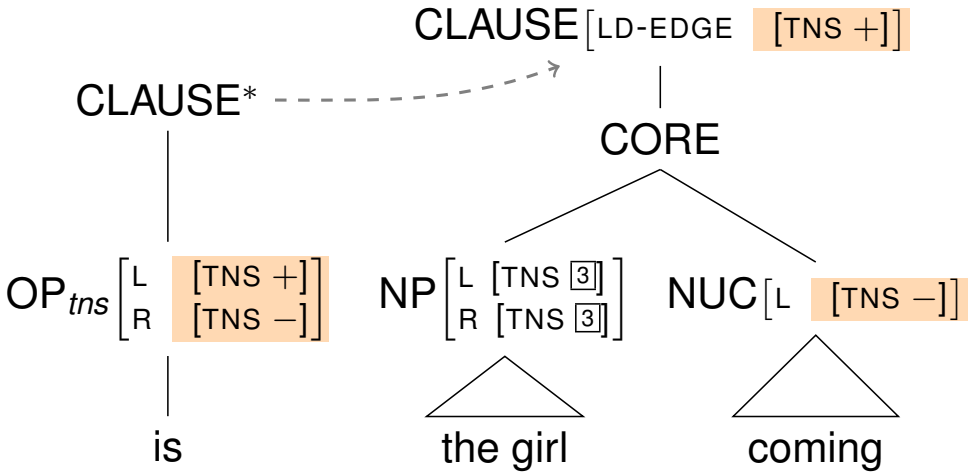

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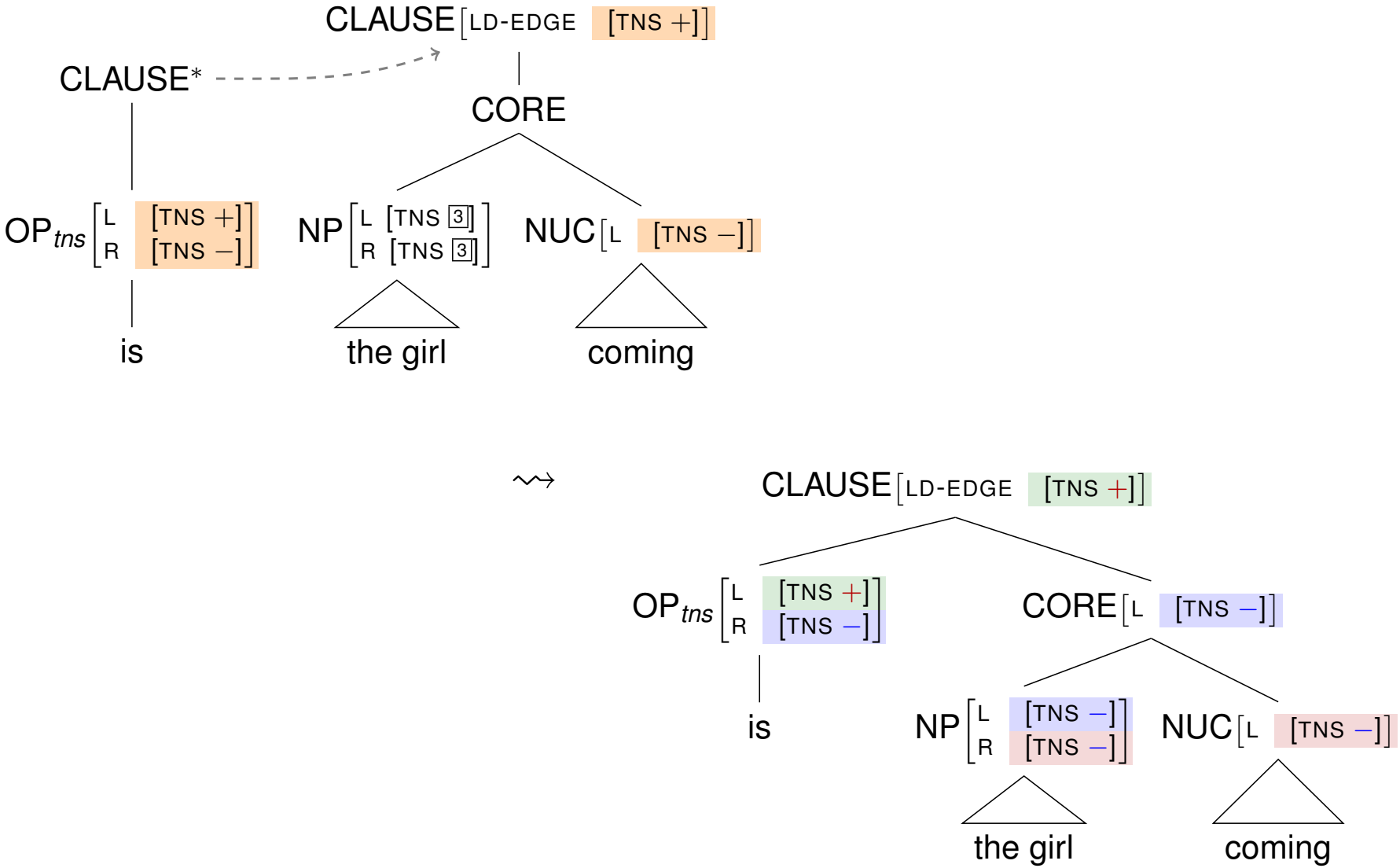

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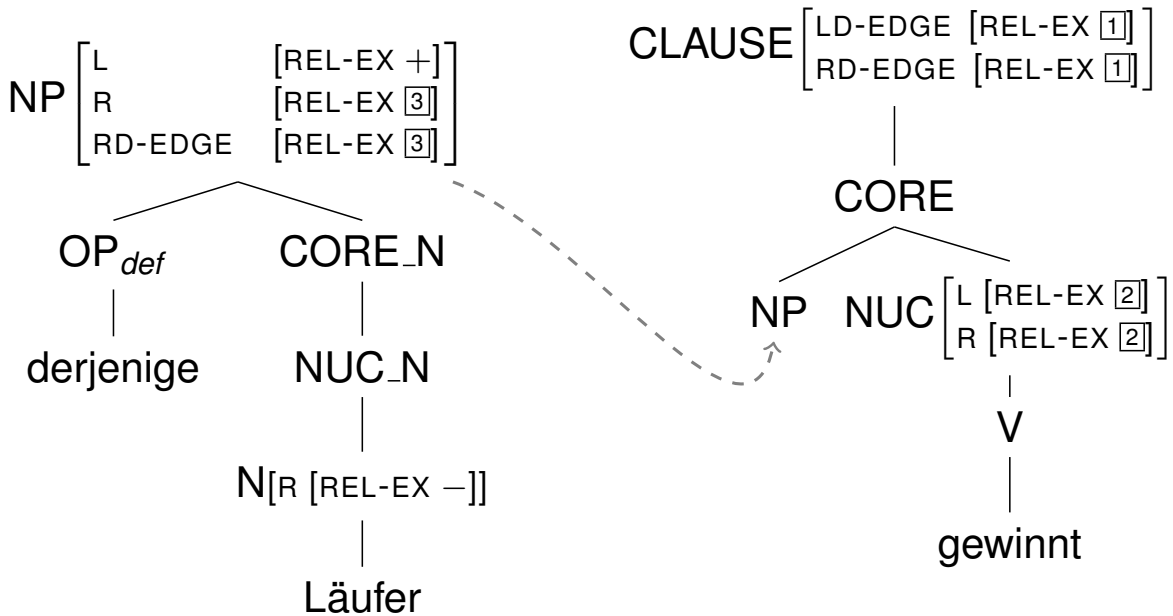
Obligatory relative clauses: we use a binary feature that expresses that a relative clause has been found, REL-CL-EXISTS or REL-EX for short.



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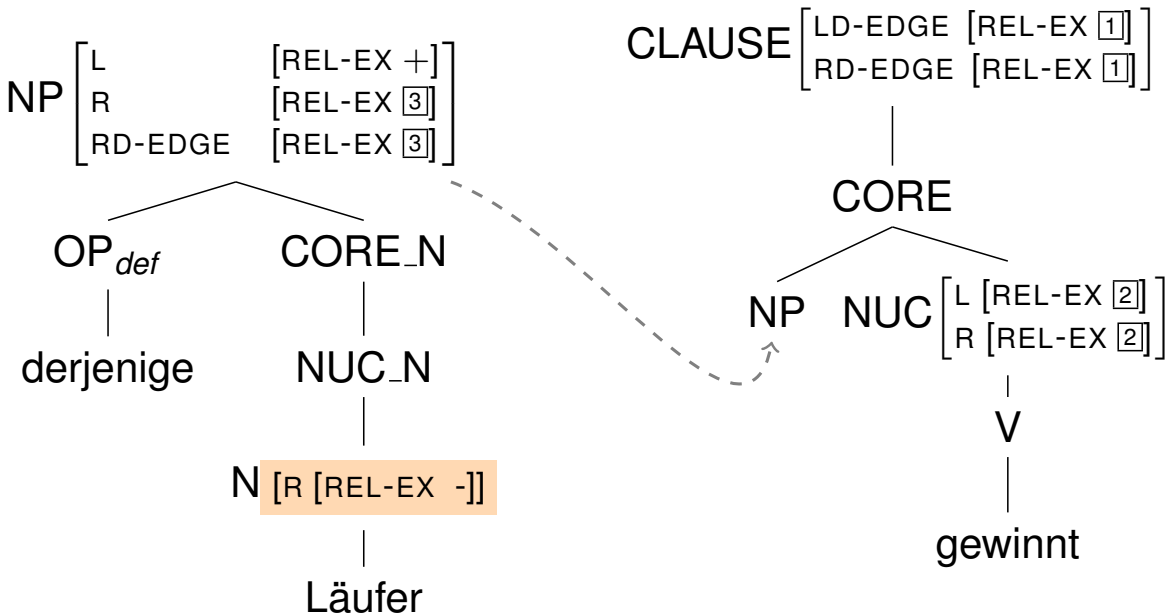


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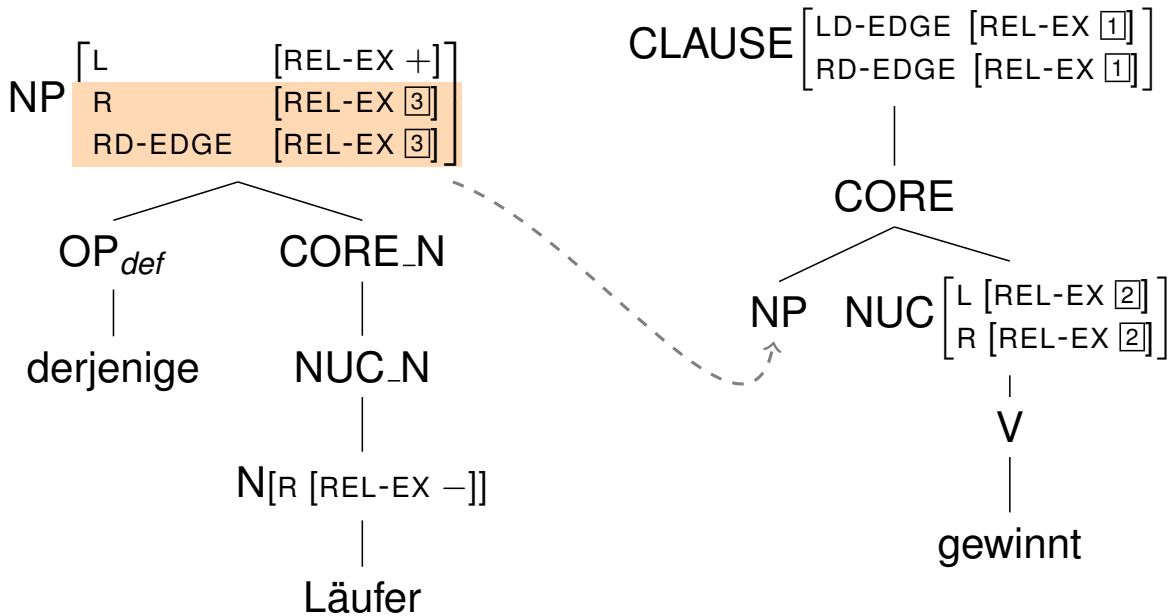


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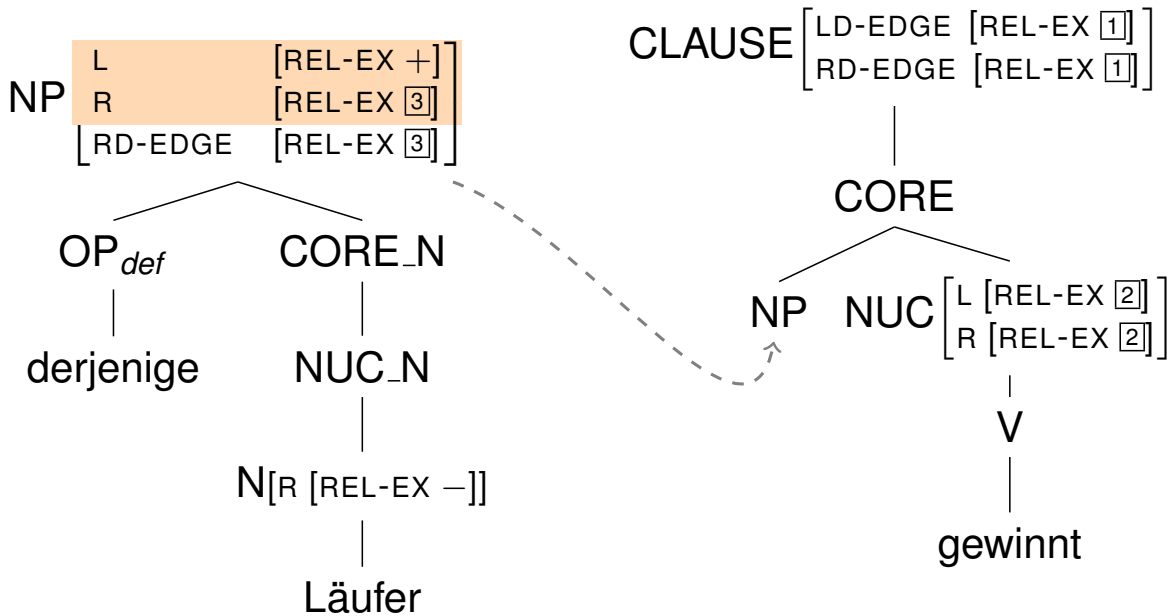

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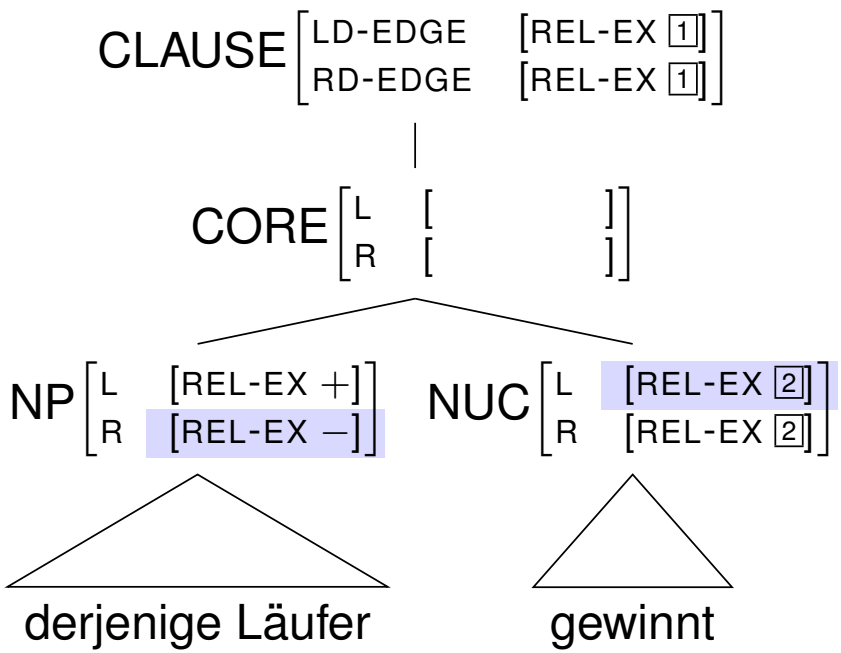

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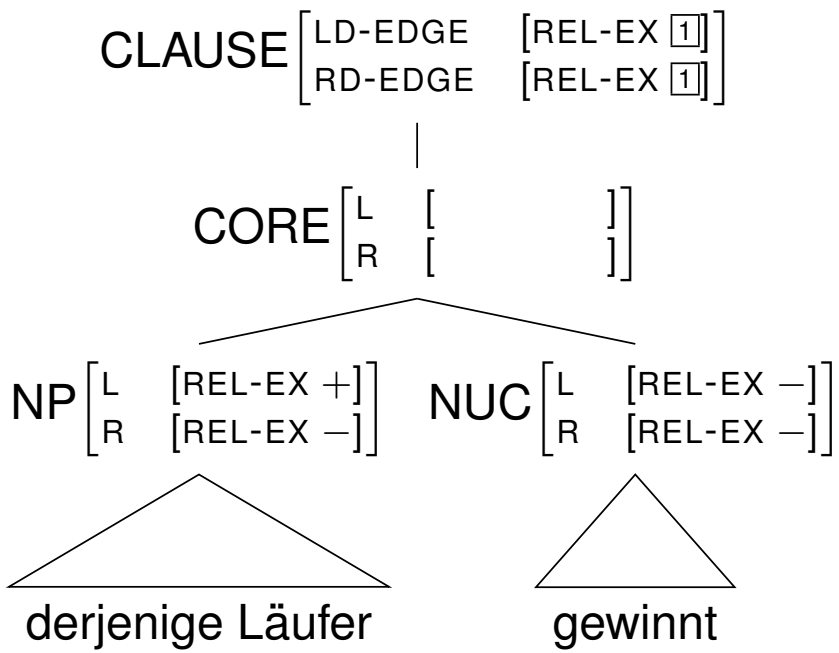

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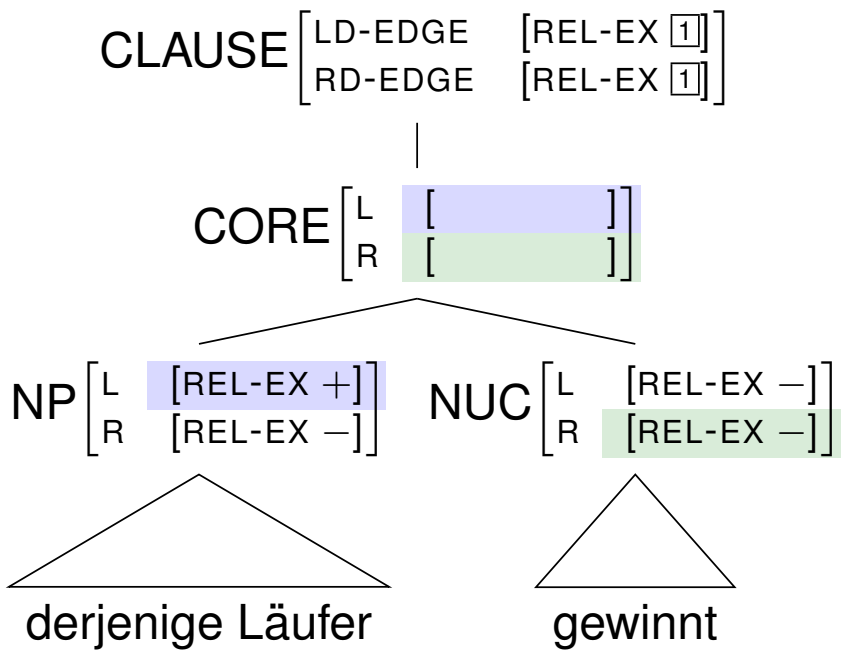

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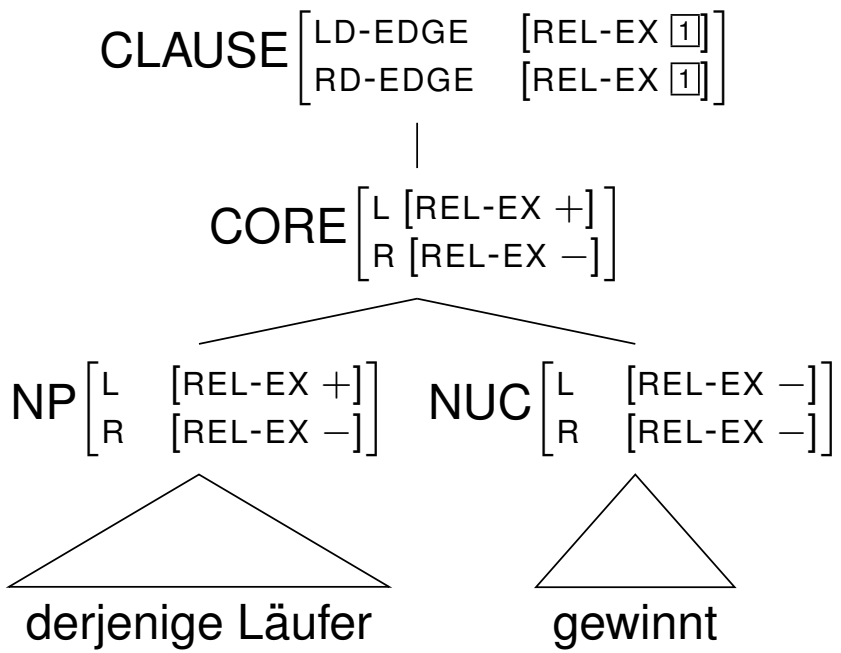

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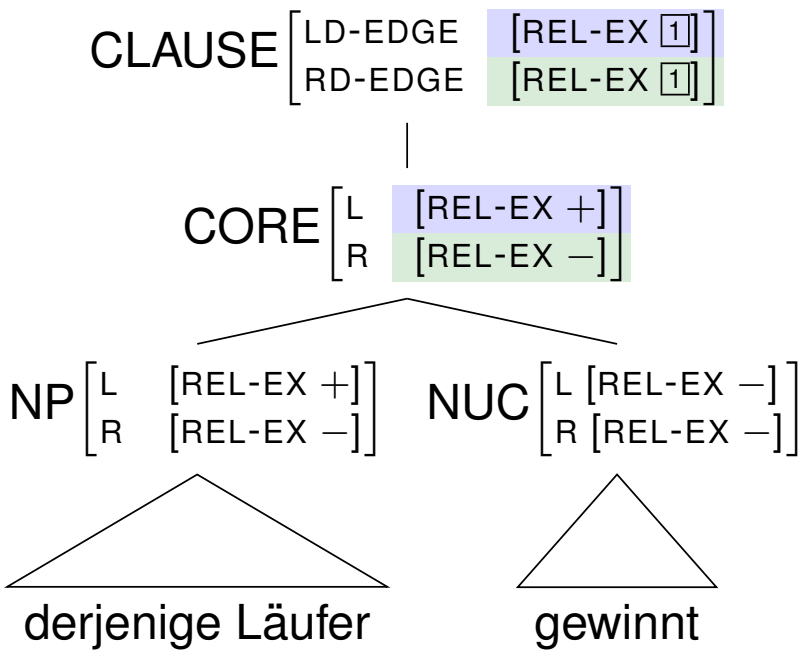

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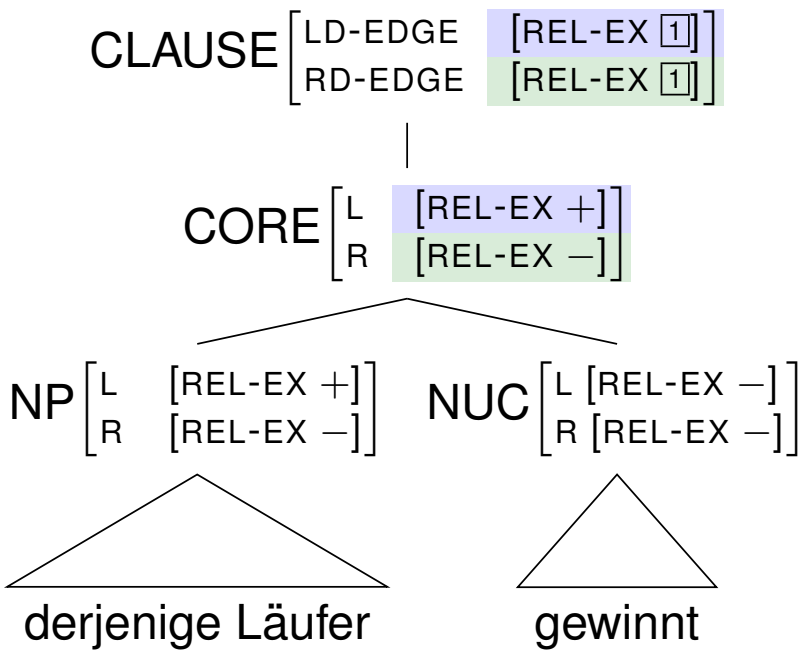
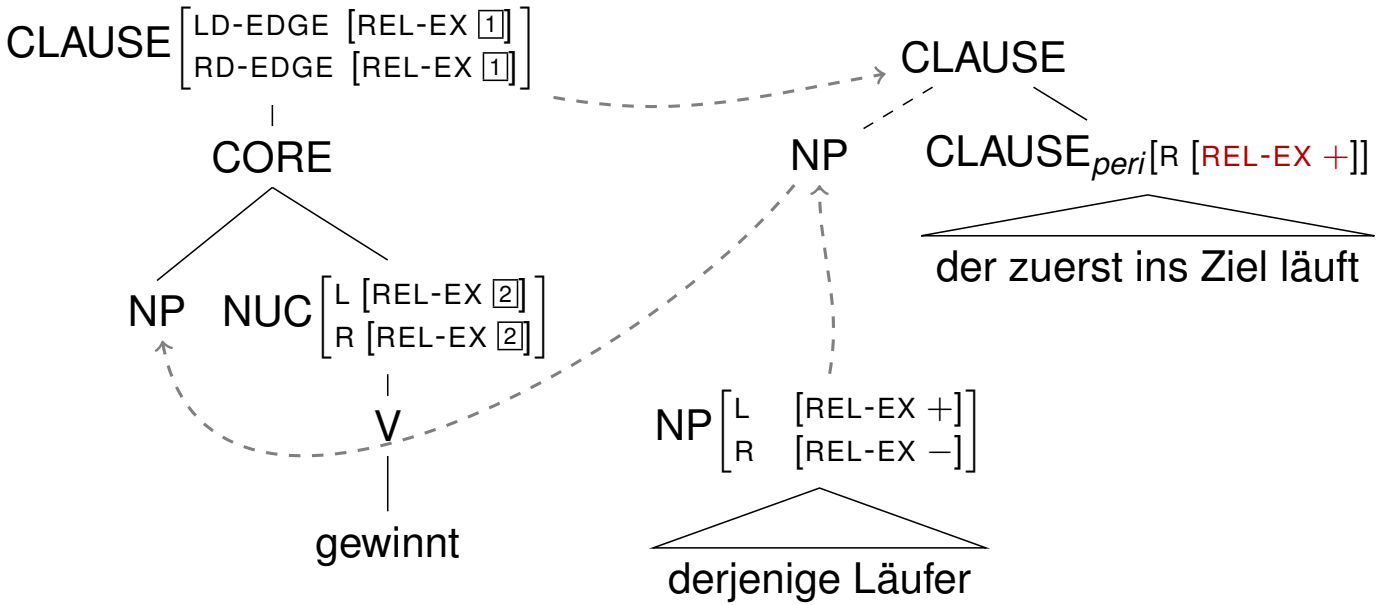



Unification failure because of conflicting values for 1

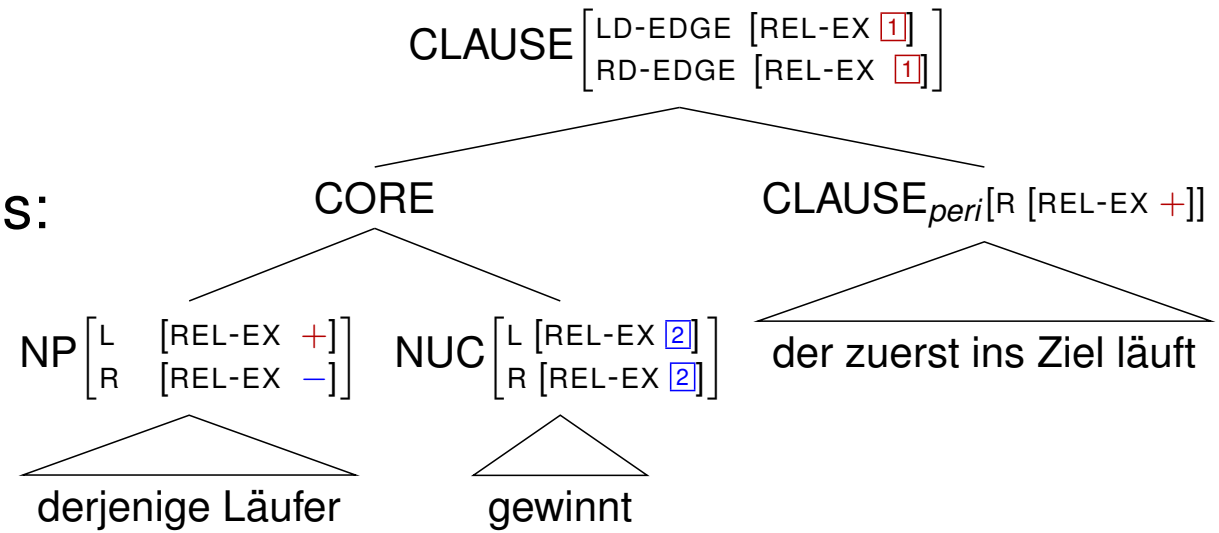
# Obligatory (extraposed) relative clauses

Adding a relative clause switches REL-EX on the right from − to +:



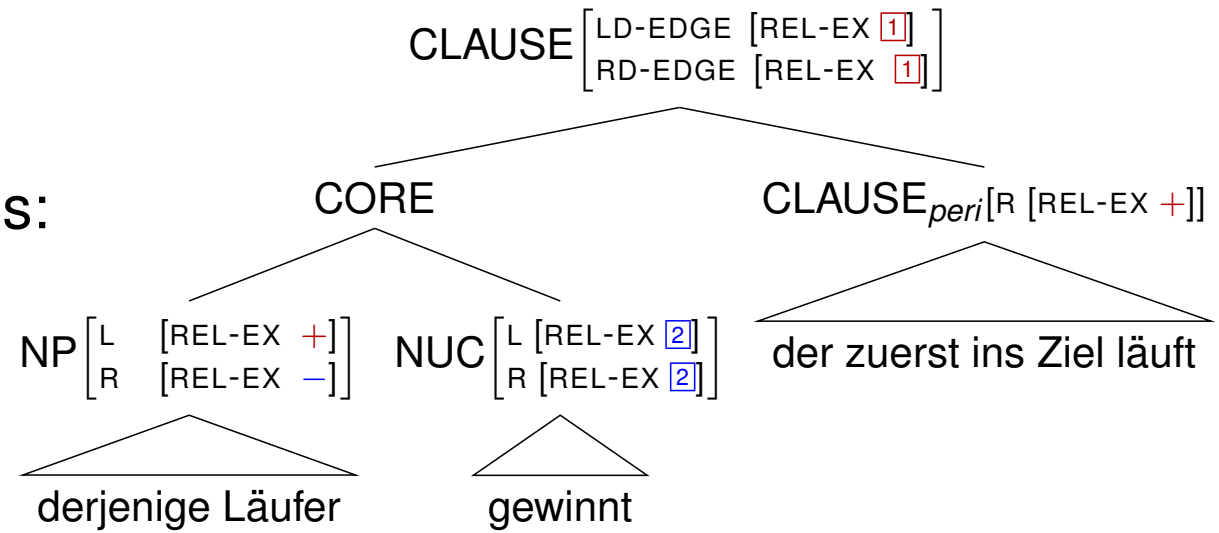
# Obligatory (extraposed) relative clauses

Before final unifications:

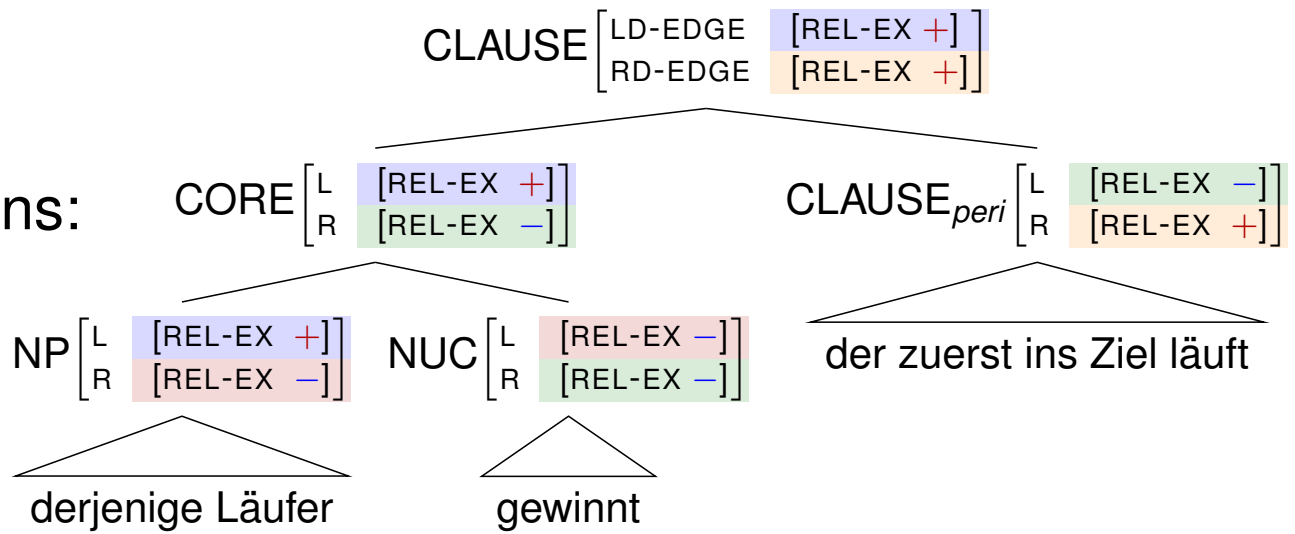


# Obligatory (extraposed) relative clauses

Before final unifications:




After final unifications:



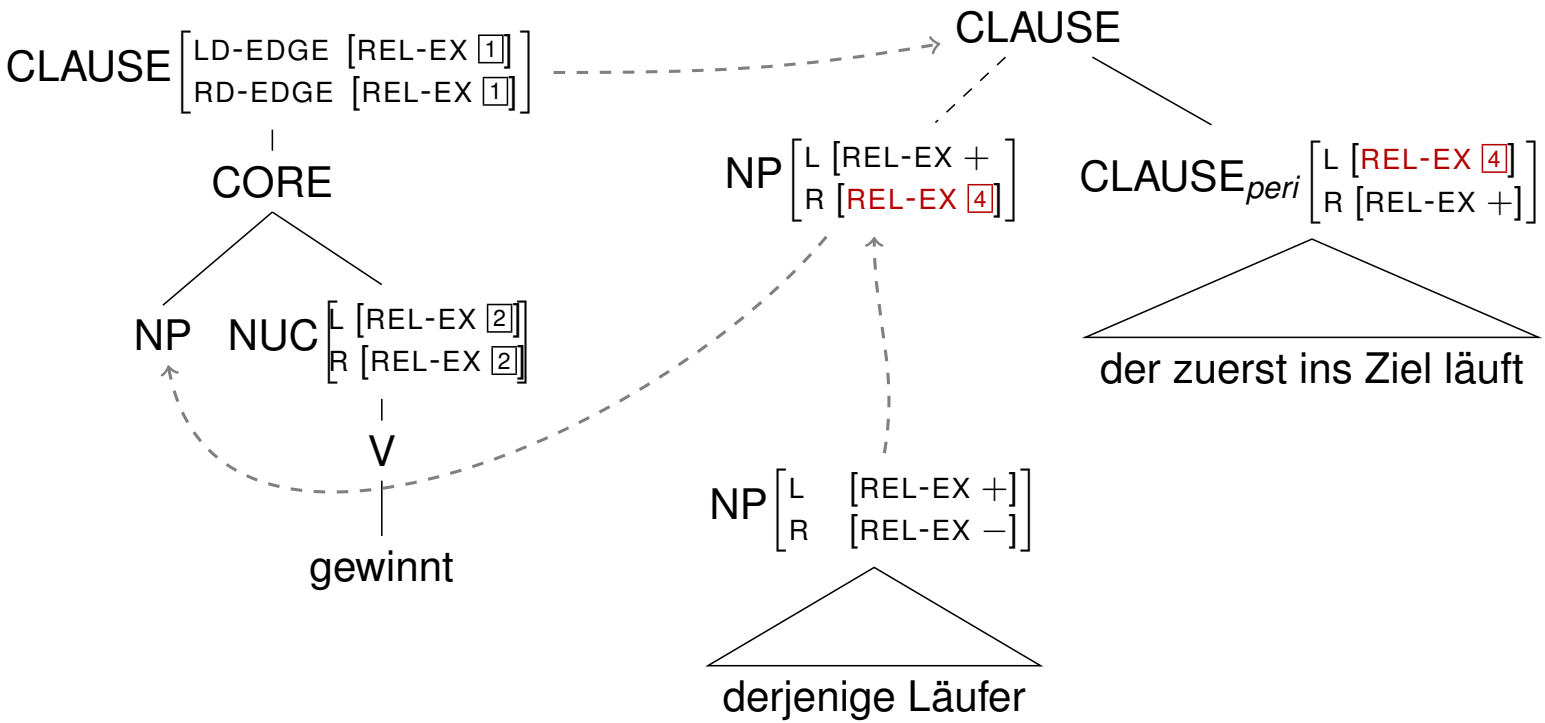
# Obligatory (extraposed) relative clauses

- This use of REL-EX makes sure that in a clause with a *derjenige*-NP, a relative clause is obligatory.
- **But**: This NP is not necessarily the antecedent of the relative clause. I.e., (10) incorrectly gets an analysis.

(10) *Der Junge gibt demjenigen Mädchen ein Buch, der zuerst den Raum betritt.

# Obligatory (extraposed) relative clauses

Enforcing substitution of correct antecedent NP:



# Conclusion

- Proposal of an RRG-analysis for extraposed relative clauses using the formalization as Tree Wrapping Grammar.
- Wrapping substitution is sufficiently non-local to account for the phenomenon while putting the antecedent NP and the relative clause into the same elementary tree.
- Edge features can be used to enforce adding a relative clause in case of a *derjenige*-NP.

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- Next steps: implementation of a German fragment using XMG and TuLiPA

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