Chapter 17

Coordination

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1 Introduction

The head of a construction is traditionally defined as the unit which determines the syntactic distribution and the meaning of the whole, and it also often the case that a dependent can be omitted, fronted, or extraposed while the head cannot (**zwicky85**). In coordination constructions something very different occurs. First, the category and distribution of a coordinate phrase is typically collectively determined by the conjuncts, not one particular conjunct nor by the coordination particle. Thus, an S coordination yields an S, a VP coordination yields a VP and so on, for virtually all categories.[1] This is perhaps clearer in cases like (1), where expressions such as *simultaneously*, *both*, *together* can be used to show that the entire bracketed string is interpreted as a complex unit denoting a plurality.

(1) a. [[Tom sang]$_\text{S}$ and [Mia danced]$_\text{S}$]$_\text{S}$ simultaneously.
     b. Often [[Kim goes to the beach]$_\text{VP}$ and [Sue goes to the city]$_\text{VP}$]$_\text{VP}$.

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[1]The exceptions include expletive pronouns (e.g. *It and there is no use*), which cannot be coordinated, and in fact coordinator expressions themselves, e.g. *You ordered a coffee and or or a tea?* The oddness of the former is presumably due to the fact that expletives are devoid of any meaning, and the oddness of the latter may be due to the conjuncts being of the wrong semantic type. See §4 for more on lexical coordination.

    c. Sue [[read the instructions]$_{VP}$ and [dried her hair]$_{VP}$]$_{VP}$, in twenty seconds.

    d. You can't simultaneously [[drive a car]$_{VP}$]$_{VP}$ and [talk on the phone]$_{VP}$]$_{VP}$ ∎

    e. Simultaneously [[shocked]$_A$ and [saddened]$_A$]$_A$, Robin decided to go home.

    f. Robin is both [[tall]$_A$ and [thin]$_A$]$_A$.

    g. [[Tom]$_{NP}$ and [Mia]$_{NP}$]$_{NP}$ agreed to jump into the water together.

Generally, a coordinate structure has the same grammatical function and category as the conjuncts: given a number of conjuncts of category *X*, the distribution of the coordinate constituent that is obtained is again the same as of an *X* constituent, what **pullumzwicky** refer as 'Wasow's Generalization'. In particular, this is what allows coordination to apply recursively:

(2)   a. [[Tom and Mary]$_{NP}$ or [Mia and Sue]$_{NP}$]$_{NP}$ got married.

       b. I can either [[sing and dance]$_{VP}$ or [sing and play the guitar]$_{VP}$]$_{VP}$.

       c. Either [[John went to Paris and Kim went to Brussels]$_S$ or [none of them ever left home]$_S$]$_S$.

Another piece of evidence in favor of a non-headed analysis comes from the fact that there is no typological correlation between the position of the coordinator and the head directionality **zwart** For example, in Zwart's survey of 136 languages where half are verb-final and half are verb-initial languages, verb-final languages overwhelmingly employ initial conjunction strategies. In particular, 119 of these languages have exclusively initial conjunctions, 12 languages exhibit both initial and final conjunctions, and only 4 have exclusively final conjunctions.

Finally, Coordination is also special in that the relationship between conjuncts is unlike adjunction (Levine 2001). Whereas adjuncts can in principle be displaced, conjuncts do not have any mobility, as (3) illustrates.

(3)   a. Because/Since Jane likes music, Tom learned to play the piano.

       b. *And Jane likes music, Tom learned to play the piano.

Thus, no conjunct can usually be said to be a dependent, or secondary. For example, reversing the order of the conjuncts in (4) causes no major change in meaning. Neither daughter can be said to be the head because no subordination dependency is established between conjuncts.

(4) a. Sam ordered a burger and Robin ordered a pizza.

b. Robin ordered a pizza and Sam ordered a burger.

To be sure, there are certain coordination structures which do not have such symmetric interpretations, as noted by **ross67** see also Goldsmith (1985), Lakoff (1986), and Levin & Prince (1986). Regardless, such constructions retain many of the properties that characterize coordinate structures, and therefore are likely coordinate just the same (Kehler 2002: Ch.5).

(5) a. Robin jumped on a horse and rode into the sunset.

b. Robin rode into the sunset and jumped on a horse.

For these reasons, HPSG adopts a rather traditional non-headed analysis of coordination, an approach going back to **bloom** and **ross67** and later adopted in many other frameworks such as **pesetsky gazdarc rodney** among many others. See **borsley94** Borsley & Jones (2005) and Chaves (2007: Ch.2) for more discussion about previous claims in the literature that coordination structures are headed. Finally, we note that the HPSG account is in agreement with **chom65** who argued against postulating complex syntactic representations without direct empirical evidence:[2]

> It has sometimes been claimed that the traditional coordinate structures are necessarily right-recursive (Yngve, 1960) or left-recursive (Harman, 1963, p. 613, rule 3i). These conclusions seem to me equally unacceptable. Thus to assume (with Harman) that the phrase "a tall, young, handsome, intelligent man" has the structure [[[[tall young] handsome] intelligent] man] seems to me no more justifiable than to assume that it has the structure [tall [young [handsome [intelligent man]]]]. In fact, there is no grammatical motivation for any internal structure, […] The burden of proof rests on one who claims additional structure beyond this (**chom65**)

As we shall see, the empirical evidence suggests that the simplest and most parcimonious structure for coordination is neither left- nor right-recursive. In this chapter we discuss how coordination is analyzed in HPSG, as well as issues that it faces.

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[2]In more recent times Chomskyan theorizing has assumed that all structures should be binary branching purely on conceptual 'economy' grounds; see (**Johnson:Lappin:99**) for criticism.

2 On the Syntax of Coordinate Structures

In this paper we refer to expressions like *and*, *either*, *or*, *but*, *let alone*, etc. as **coordinators** and the phrases that a coordinator can combine with as **coordinands**. Thus, in 'A or B' both A and B are coordinands and 'or' is the coordinator.

There are a wide range of coordination strategies in the languages of the world **haspelmath** In some languages no coordinand is accompanied by any coordinator (syndenton coordination; as in *We came, we saw, we conquered*), or one of the conjuncts is accompanied by a coordinator (monosyndenton coordination; as in *We came, we saw, and we conquered*). Other strategies involve marking multiple coordinands with a coordinator (polysindenton coordination; *We came, and we saw, and we conquered*) or all coordinands (omnysyndenton coordination; *Either you come or you go*). All of these are schematically depicted in (6); **Drellishak:Bender:05** for more discussion about how to accommodate such typological patterns in a computational HPSG platform.

(6)   a.   A, B, C   (asyndenton)

b.   A, B, *coord* C   (monosyndenton)

c.   A *coord* B *coord* C   (polysyndenton)

d.   *coord* A *coord* B *coord* C   (omnisyndenton)

Finally, single coordination strategy often serves to coordinate all types of constituent phrases, but in many languages different coordination strategies only cover a subset of the types of phrases in the language. For example, in Japanese the suffix *to* is used for nominal coordination and *te* is used for other coordinations.

In what follows we start by focusing on monosyndenton coordination. There are three possible structures one can assign to such coordinations, as Figure 1 illustrates. The binary branching approach goes back to **yngve** and is used in HPSG work such as Pollard & Sag (1994), **Yatabe:03 berthold03** Beavers & Sag (2004), **Drellishak:Bender:05 Abeille:05** and Borsley & Jones (2005), Chaves (2007), Chaves (2012), among others. The flat branching approach has also been assumed in HPSG, albeit less frequently. See for example **sagwasowbender** and **Sag:03**

The binary branching analysis requires two different rules, informally depicted in (7), and a special feature to prevent the coordinator to recursively apply to the last coordinand, e.g. **and and and Kim.* Otherwise, the two rules are unremarkable and are handled by the grammar like any other immediate dominance schema. See for example Beavers & Sag (2004) for a formalization.
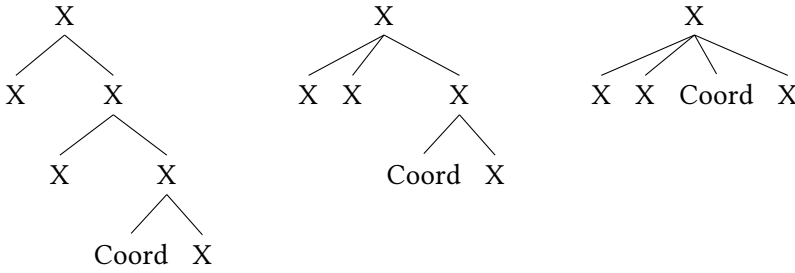
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Figure 1: Three possible headless analyses of coordination

(7)   a. $X_{crd+} \rightarrow$ *Coord* X_{crd-}
      b. $X \rightarrow X_{crd-}$ X_{crd+}

Notice that the hierarchical structure is not the same as the one advocated by **Kayne:94 johann** they both argue that coordination follows X-bar theory and that the conjunction is the head of the construction (see HPSG and Minimalism chapter for discussion). In HPSG, even though one of the conjuncts (or more) may combine with a conjunction, this subconstituent is not the head of the construction, which is considered as unheaded. The two analyses are contrasted in Figure 2.
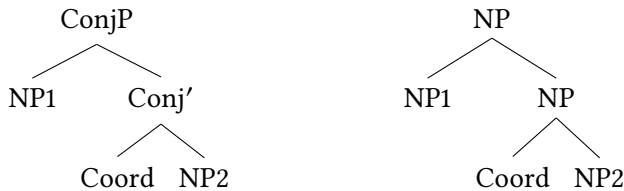

Figure 2: Binary-branching analyses of coordination, headed and non-headed

Similarly, the flat analysis where the coordinator and the coordinand attach to each other requires two rules well (where $n \geq 1$):

(8)   a. $X_{crd+} \rightarrow$ *Coord* X_{crd-}
      b. $X \rightarrow X^1_{crd-}$ ... X^n_{crd-} X_{crd+}

However, the flat analysis requires only one rule, and no special features at all, as (2) illustrates.

(9) $X \rightarrow X^1 ... X^n$ *Coord* X_{n+1}

That said, there are some reasons for assuming that the coordinator does in fact combine with the coordinand, as in (2). First, in some languages of the world the coordinator is a bound morpheme instead of a free morpheme. Second, as **ross67** originally noted, the natural intonation break occurs before the coordination lexeme rather than between the coordinator and the coordinand, so that a prosodic constituent is formed. Although phrosodic phrasing is not generally believed to always align with syntactic phrasing, the fact that the coordinator prosodifies with the coordinand suggests that it forms a unit with it.

The analysis in (2) can be formalized in HPSG as shown in (10), using parametric lists (Pollard & Sag 1994) to enforce that all conjuncts structure-share the morphosyntactic information.

(10)   Coordination Construction (preliminary)

$$coord\text{-}phr \rightarrow \begin{bmatrix} \text{SYNSEM} \begin{bmatrix} \text{CAT} \boxed{1} \end{bmatrix} \\ \text{DTRS} \left\langle \begin{bmatrix} \text{SYNSEM} \begin{bmatrix} \text{CAT} \boxed{1} \end{bmatrix} \end{bmatrix} \right\rangle \oplus \textit{ne-list} \left(\begin{bmatrix} \text{SYNSEM} \begin{bmatrix} \text{CAT} \boxed{1} \end{bmatrix} \end{bmatrix} \right) \end{bmatrix}$$

The constraint forcing all daughters to be of the same category is excessive, as we shall see below, and this will have to undergo a revision. For now, we are focusing on standard coordinations.

In order to account for the fact that different kind of coordination strategies are possible, **Mouret:05** defines three subtypes of *coord-phr*, assuming a lexical feature COORD to distinguish between coordination types:[3]

(11) $simple\text{-}coord\text{-}phr \rightarrow \begin{bmatrix} \text{DTRS} \left\langle \begin{bmatrix} \text{COORD} & nil \end{bmatrix} \right\rangle \oplus \textit{ne-list} \left(\begin{bmatrix} \text{COORD} \boxed{1}crd \end{bmatrix} \right) \end{bmatrix}$

$omnisyndetic\text{-}coord \rightarrow \begin{bmatrix} \text{DTRS} \ \textit{ne-list} \left(\begin{bmatrix} \text{COORD} \boxed{1}crd \end{bmatrix} \right) \end{bmatrix}$

$asyndetic\text{-}coord \rightarrow \begin{bmatrix} \text{DTRS} \ \textit{ne-list} \left(\begin{bmatrix} \text{COORD} & none \end{bmatrix} \right) \end{bmatrix}$

Here, we assume that the value of COORD must be typed as *coord*, and that the latter has various sub-types as shown in Figure 3.

Thus, simple (mononyndetic) coordinations are those where all but the last coordinand has combined with a coordinator, omnisyndetic coordinations are those where all coordinands have combined with a coordinator, and likewise, asyndetic coordinations are those where none of the coordinands have combined

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[3]Mouret's formulation is slightly different in that the relevant feature is instead called CONJ, and a slightly different type hierarchy is assumed, with negative constraints like CONJ ≠ *nill* are employed instead of COORD *crd*. The current formulation is more in line with standard practice of avoiding negative constraints. Similar liberty is taken in subsequent constraints, for exposition purposes.

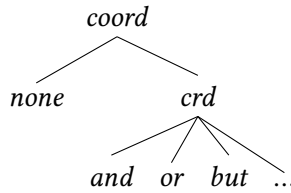*Draft of 19th September 2019, 10:54*

Figure 3: Coordinator sub-types

with a coordinator. We turn to the analysis of coordinators. In other words, what exactly are words like *and*, *or*, and others, and how do they combine with coordinands?

2.1 The status of coordinator expressions

In HPSG, coordinators are sometimes analyzed as markers (**Drellishak:Bender:05;** Beavers & Sag 2004). In such a view, the coordinator's lexical entry does not select any arguments, since it has no arguments. In (**??**) we show the lexical entry for the conjunction, using current HPSG feature geometry. Note that the MRKG value of of the coordinator is the same as the coordinand's. Thus, if *and* coordinates S nodes that are MRKG *that* (i.e. CPs) then the result will be an S that is also MRKG *that*, and so on, for any given value of MRKG.

(12)
$$\begin{bmatrix} \textit{coord-lexeme} \\ \text{PHON} \quad \langle \textit{and} \rangle \\ \\ \text{SYNSEM} \begin{bmatrix} \text{CAT} \begin{bmatrix} \text{HEAD} \begin{bmatrix} \textit{coord} \\ \text{SEL} \begin{bmatrix} \text{SYNSEM} \begin{bmatrix} \text{CAT} \begin{bmatrix} \text{COORD} \textit{none} \\ \text{MRKG} \boxed{1} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix} \\ \text{COORD} \textit{and} \\ \text{MRKG} \quad \boxed{1} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

This sign imposes constraints on the head sign it combines with via the feature SEL, the same feature that allows other markers and adjuncts in general to combine with their hosts. The syntactic construction that allows such elements with their selected heads is the Head-Functor Construction in (2.1). Since the second daughter is the head, the value of the mother's HEAD feature will have to be the same as the head daughter's, as per the Head Feature Principle.

(13)

$$\textit{head-func-cxt} \rightarrow \begin{bmatrix} \text{SYNSEM} & \text{CAT} & \begin{bmatrix} \text{VAL} & \boxed{0} \\ \text{COORD} & \boxed{1} \\ \text{MRGK} & \boxed{3} \end{bmatrix} \\ \text{HD-DTR} & \boxed{2} \\ \text{DTRS} & \left\langle \begin{bmatrix} \text{SYNSEM} & \text{CAT} & \begin{bmatrix} \text{SEL} & \boxed{2} \\ \text{COORD} & \boxed{1} \\ \text{MRKG} & \boxed{3} \end{bmatrix} \end{bmatrix}, \boxed{2}\begin{bmatrix} \text{SYNSEM} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{VAL} & \boxed{0} \end{bmatrix} \end{bmatrix} \end{bmatrix} \right\rangle \end{bmatrix}$$

Thus, the conjunction projects an NP when combined with an NP, an AP when combined with an AP, etc., as Figure 4 illustrates.
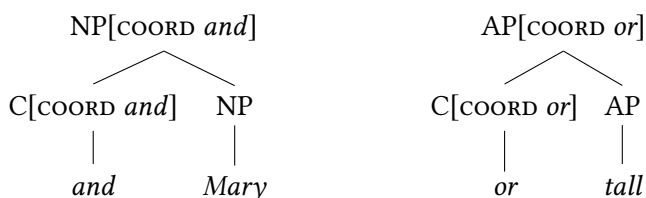

Figure 4: Coordinate marking constructions

An alternative HPSG account that yields almost the same representation through▉ different means is adopted by **Abeille:03 Abeille:05 Mouret:07** and **Bilbiie:17** and others, instead takes coordinators to be *weak heads*, i.e. heads which inherit most of their syntactic properties from their complement, like argument-marking prepositions, for example. Thus, the coordinator combines with coordinands via the same headed constructions that license non-coordinate structures. It preserves the Marking feature when conjuncts are themselves marked. The conjunction takes the adjacent conjunct as a complement. This captures its being first in head initial languages like English, and its final position in head final languages like Japanese.

(14) a. Kim [and Lee] (English)
      b. Lee-to Kim (Japanese)
          'Kim and Lee'

Since it is a weak head, it inherits most of its syntactic features (HEAD, MARK-ING, XARG) from its complement, and adds its own COORD feature. The relevant constraint over all such coordinator lexemes is shown in (15).

(15)
$$
\begin{bmatrix}
\textit{coord-lexeme} \\
\text{PHON} \quad \langle \textit{and} \rangle \\
\text{SYNSEM} \quad \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \boxed{0} \\ \text{COORD} & \textit{and} \\ \text{MRKG} & \textit{none} \end{bmatrix} \end{bmatrix} \\
\text{ARG-ST} \quad \boxed{1} \oplus \left\langle \begin{bmatrix} \text{SYNSEM} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \boxed{0} \\ \text{XARG} & \boxed{1} \end{bmatrix} \end{bmatrix} \end{bmatrix} \right\rangle
\end{bmatrix}
$$

The 'weak head' analysis is illustrated in Figure 5. Here, the category of the coordinator, the conjunct and of the mother node are the same, because the co-ordinator's head value is lexically required to be structure-shared with the head value of its valents.
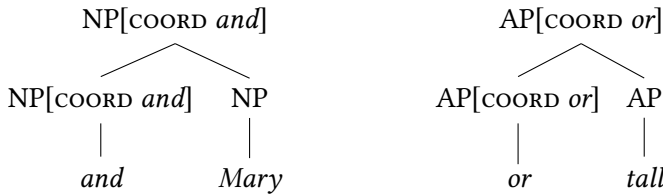

Figure 5: Coordinate weak-head constructions

Before moving on, we note that the 'weak head' analysis of coordinators makes certain problematic predictions that the marker analysis in (2.1) does not make. Since coordinands are selected as arguments in the former approach, additional assumptions need to be made in order to prevent Principle extraction of conjuncts as in (2.1), and to prevent anaphoric bindings like (2.1) from being ruled out as ungrammatical by Binding Theory. If coordinands are in ARG-ST then they are expected to be extractable (see Borsley & Crysmann (2019), Chapter 14 of this volume and Chaves (2019), Chapter 16 of this volume), and subject to the o-command constraint that governs anaphora (see Branco (2019), Chapter 21 of this volume).

(16) *Which boy did you compare _ and Robin?
      (cf. with *which boy did you compare _ with Robin?*)

(17) a. We invited [[Betsy's$_i$ mother] and [her$_i$]] to the ceremony.
          (**gazd1982**)
      b. I wish to inform [[him$_i$] and [all of Dr. Phil$_i$'s viewers] that real coun-
          seling sessions take place behind closed doors, not in TV.
          (Chaves 2007)

For this reason, the members of ARG-ST of the coordinator are typed as *canonical* by **Abeille:03** to prevent their extraction, analogously to how prepositions in most languages must prevent their complements from being extracted, unlike English and a few other languages.

2.2 Correlative coordination

Having discussed standard coordination structures, we now move on to cases where multiple inter-dependent coordinators are present, such as *either … or …*, *neither … nor …*, and *both … and …*. Given the linearization flexibility of the first coordinator, they can be analyzed in English as adverbials rather than as true coordinators:

(18)   a.   Either Fred bought a cooking book or he bought a gardening magazine.
       b.   Fred either bought a cooking book or he bought a gardening magazine.
       c.   Fred can either buy a cooking book or he can buy a gardening magazine.

(19)   a.   John will read both the introduction and the conclusion.
       b.   John will both read the introduction and the conclusion.

In French, as in other Romance languages, the conjunction itself can be reduplicated, and it is obligatory for some conjunctions (*soit* 'or' in French) **Mouret:05**

(20)   a.   Jean lira et l'introduction et la conclusion.
             Jean read.fut and the introduction and the conclusion
       b.   *Jean et lira l'introduction et la conclusion
             Jean and read.fut the introduction and the conclusion
       c.   Jean lira *(soit) l'introduction soit la conclusion
             Jean read.fut or the introduction or the conclusion

Thus, there are different structures for different types of correlative, as Figure 6 illustrates. The one on the left is for correlatives that exhibit adverbial properties and the one on the right is for correlatives that do not. See **Bilbiie:08** for arguments that both types are attested in Romanian.

The correlative coordinate structure on the right can be straightforwardly accounted for in the approach in **Mouret:05** as illustrated in (21). See however §2.2 for more discussion of correlative constructions in a broader context, beyond coordinate correlatives.
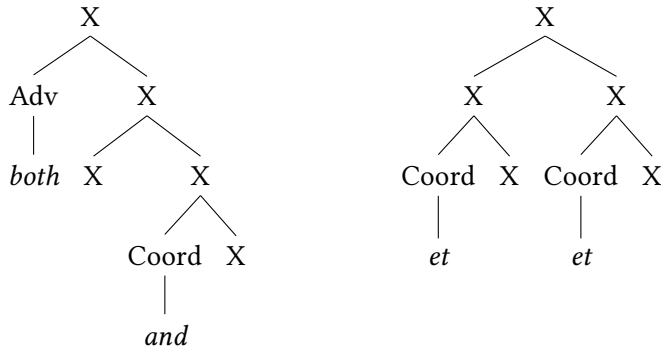
Figure 6: Two possible structures for correlative coordination

(21) *et-et-phr* → $\left[\text{DTRS } \left\langle \left[\text{COORD } et\right], \left[\text{COORD } et\right]\right\rangle \right]$

When there is no overt conjunction, it is not always clear whether a binary clause construction is coordinate or not. Comparative correlatives such as (22) have been analyzed as coordinate by **culijack** for English and as universally subordinate by **dikken**

(22) The more I read, the more I understand.

On the semantic side, the interpretation is something like: 'if I read more, I understand more'. **Abeille:06 Abeille:Borsley:08** propose that they are are coordinate in some languages, and subordinate in others. In English, one can add the adverb *then*, whereas in French, one can add the conjunction *et* ('and'). In English, the first clause can also be used as a standard adjunct (23).

(23) a. The more I read, then the more I understand.
      b. Plus je lis (et) plus je comprends.
          More I read (and) more I understand.
      c. I understand more, the more I read.

As shown by **culijack** the second clause show matrix clause properties, not the first one:

(24) a. The more we eat, the angrier you get, don't you?
      b. *The more we eat, the angrier you get, don't we?

Syntactic parallelism seems to be stricter in French, for example clitic inversion or extraction must take place out of both clauses at the same time (**Abeille:Borsley:08**).

(25) a. Paul a   peu de temps: aussi plus vite commencera-t-il, plus vite
          Paul has little of time   so   more fast start.FUT-he   more fast
          aura-t- il fini.
          aux.FUT he finish.PPART

          'Paul has little time left: so the faster he starts, the faster he will
          finish'

      b. C'   est un livre que plus tu lis,   plus tu apprécies.
          this is a   book COMP more you read.2SG, more you appreciate.2SG

          'This is a book that the more you read the more you like.'

In Spanish, they come in two varieties: one that can be analyzed as subordinate
(a) and one that can be analyzed as coordinate (b). These are illustrated in (26a,b),
respectively.

(26) a. Cuanto   más leo,   (tanto)   más entiendo.
          how-much more ead.1SG, (that-much) more understand.1SG

          'The more I read, the more I understand'

      b. Más leo   (y) más entiendo.
          more read.1SG (and) more understand.1SG

          'The more I read, the more I understand'
          (**Abeille:Borsley:Espinal:06**)

Be they coordinate or subordinate, they are special kinds of construction: they
are binary, with a fixed order : the meaning changes if the order is reversed (a).
The internal structure of each clause is also special. In English, it must start
with 'the' and a comparative phrase (b), which may belong to a long distance
dependency (c), and can be analyzed as extracted. Each clause must be finite and
allow for copula omission (d).

(27) a. The more I understand, the more I read.
      b. *I understand (the) more, I read (the) more.
      c. The more I manage to read, the more I start to understand.
      d. The more intelligent the students, the better the marks.

Comparative clauses are a special subtype of finite clause, starting with a com-
parative phrase. **Abeille:Borsley:Espinal:06 Borsley:11** define a CORREL feature
which is a LEFT EDGE feature (see the EDGE feature in **Bonami:2004** for French
liaison). Assuming a degree word *the*, which can only appear as a specifier of

a comparative word, **Borsley:11** defines the-clause as a subtype of head-filler-phrase with [CORREL *the*]; see also Sag (2010).

Comparative correlatives belong to a more general class of (binary) correlative constructions, including *as … so …*, and *if … then …* constructions in (**Borsley:11**; Borsley 2004) [4] Correlative constructions can be defined as follows, where *correl-construction* is a sub-type of *declarative-clause* and the feature CORREL introduces a *correl* type hierarchy analogous to that of *coord* in Figure 3 above. The construction in (28) thus states that all correlative constructions have in common the fact that both daughters are marked by a special expression.

(28)

$$
\textit{correl-construction} \rightarrow
\begin{bmatrix}
\text{SYNSEM} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{finite} \\ \text{CORREL} & \textit{none} \end{bmatrix} \end{bmatrix} \\
\text{DTRS} & \left\langle \begin{bmatrix} \text{SYNSEM} & [\text{CAT} [\text{CORREL} \; \textit{corr-mrk}]] \end{bmatrix}, \\ \begin{bmatrix} \text{SYNSEM} & [\text{CAT} [\text{CORREL} \; \textit{corr-mrk}]] \end{bmatrix} \right\rangle
\end{bmatrix}
$$

Naturally, *correl-construction* has various sub-types, each imposing particular patterns of correlative marking, including coordinate correlatives. More specifically, this family of constructions comes in two varieties: asymmetric (for the subordinate ones, like English comparative correlatives and Spanish type a correlatives), and symmetric for coordinate ones, like French comparative correlatives and Spanish type b correlatives). The symmetric subtype inherits from clausal-coordination-phrase, while the asymmetric one inherits from the head-adjunct-phrase as seen in Figure 7.

Thus, asymmetric English comparative correlatives can be defined as in (29), where *the* is a sub-type of *corr-mrk* (i.e. is a coordinate marker).

(29)

$$
\textit{asymmetric-cc-cx} \rightarrow
\begin{bmatrix}
\text{HD-DTR} & \boxed{1} \\
\text{DTRS} & \left\langle \begin{bmatrix} \text{SYNSEM} & [\text{CAT} [\text{CORREL} \; \textit{the}]] \end{bmatrix}, \\ \boxed{1} \begin{bmatrix} \text{SYNSEM} & [\text{CAT} [\text{CORREL} \; \textit{the}]] \end{bmatrix} \right\rangle
\end{bmatrix}
$$

Similarly, symmetric French comparative correlatives can be defined as in (30), where *et* and *compar* are subtypes of *corr-mrk* and *none* is the sub-type of *correl* indicating the absence of correlative marking.

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[4]This does not handle Hindi type correlatives, which differ in that only the first clause is introduced by a correlative word, and the first clause is mobile and optional; see Pollard & Sag (1994: 228) for an analysis.
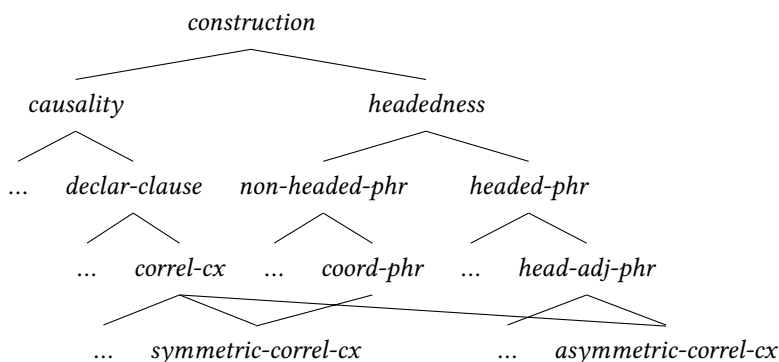
Figure 7: Type hierarchy for correlative constructions

(30)

$$symmetric\text{-}cc\text{-}cx \rightarrow \left[\text{DTRS} \left\langle \begin{bmatrix} \text{SYNSEM} \left[\text{CAT} \left[\text{CORREL} \quad compar \right] \right] \end{bmatrix}, \\ \begin{bmatrix} \text{SYNSEM} \left[\text{CAT} \begin{bmatrix} \text{COORD} \quad none \vee et \\ \text{CORREL} \quad compar \end{bmatrix} \right] \end{bmatrix} \end{bmatrix} \right\rangle \right]$$

A more complete analysis would take into account the semantics as well (Sag 2010). From a syntactic point of view, HPSG seems to be in a good position to handle both the general properties and the idiosyncrasy of the CC construction, as well as its crosslinguistic variation. See **Borsley**:11 for a comparison with a tentative minimalist analysis.

3 Phrasal coordination and feature resolution

The coordination construction in (10), repeated below in (31), requires the value of CAT to be structure-shared across the coordinands and the mother node. Given the large number of features within CAT, such a constraint makes a series of predictions and mispredictions.

(31) COORDINATION CONSTRUCTION (preliminary)

$$coord\text{-}phr \rightarrow \begin{bmatrix} \text{SYNSEM} \begin{bmatrix} \text{CAT} \; \boxed{1} \end{bmatrix} \\ \text{DTRS} \left\langle \begin{bmatrix} \text{SYNSEM} \begin{bmatrix} \text{CAT} \; \boxed{1} \end{bmatrix} \end{bmatrix} \right\rangle \oplus ne\text{-}list \left(\begin{bmatrix} \text{SYNSEM} \begin{bmatrix} \text{CAT} \; \boxed{1} \end{bmatrix} \end{bmatrix} \right) \end{bmatrix}$$

Requiring that the coordinands and the mother node all have identical CAT entails, for example, that all valence constraints are identical. Thus, in VP coordination all nodes have an empty COMPS list and share exactly the same singleton

subj list, as illustrated in Figure 8. Thus, nothing needs to be said from the semantic composition side: the verbs will have to share exactly the same referent for their subject. The same goes for any other combination of categories, of whatever part-of-speech.
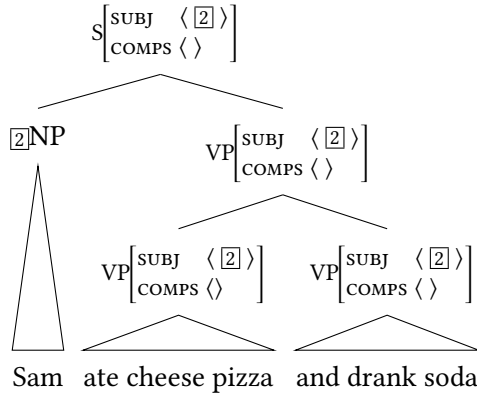

Figure 8: Valence identity in coordination

All the unsaturated valence arguments become one and the same for all coordinands, and it becomes impossible to have daughters with different subcategorization information. For example, if one daughter requires a complement while the other does not, cat identity is impossible. This correctly rules out a coordination of VP and V categories like the one in (32a), or S and VP as in (32b):

(32)   a.   *Fred [read a book]$_{COMP\langle\rangle}$ and [opened]$_{COMP\langle NP\rangle}$.
       b.   *Fred [she has a hat]$_{SUBJ\langle\rangle}$ and [smiled]$_{SUBJ\langle NP\rangle}$.

But there is other information in cat besides valence. For example, the head feature vform encodes the verb form, not tense or aspectual information. The coordination of inconsistent vform values is ruled out as ungrammatical as seen in (33), while consistent values of vform are accepted as illustrated by (34).

(33)   a.   *Tom [whistled]$_{VFORM\,fin}$ and [walking]$_{VFORM\,prp}$.
       b.   *Sue [buy something]$_{VFORM\,prs}$ and [came home]$_{FORM\,fin}$.

(34)   a.   Tom [is married]$_{VFORM\,fin}$ and [bought a house in the suburbs]]$_{VFORM\,fin}$ ∎
       b.   Sue [buys groceries here]$_{VFORM\,fin}$ and [could be interested in working with us]$_{VFORM\,fin}$.

c. Dan [protested for two years]$_{\text{VFORM }fin}$ and [will keep on protesting]$_{\text{VFORM }fin}$ ∎

Yet another feature that resides in the CAT value of verbal expressions is the head feature INV, which indicates whether a given verbal expression is invertable or not. Hence, inverted structures cannot be coordinated with non-inverted ones:

(35)   a.   [Sue has sang in public]$_{\text{INV}-}$ and [Kim has tap-danced]$_{\text{INV}-}$?
       b.   * [Sue has sang in public]$_{\text{INV}-}$ and [has Kim tap-danced$_{\text{INV}+}$?

(36)   a.   [Elvis is alive]$_{\text{INV}-}$ and [there was a CIA conspiracy]$_{\text{INV}-}$?
       b.   * [Elvis is alive]$_{\text{INV}-}$ and [was there a CIA conspiracy]$_{\text{INV}+}$?

But the inverted clause precedes the non-inverted one, then such coordinations become somewhat more acceptable. In fact, Huddleston & Pullum (2002:1332-3) note attested cases like (37).

(37)   Did you make your own contributions to a complying superannuation fund and your assessable income is less than $31,000?

A similar problem arises for the feature AUX, which distinguishes auxiliary verbal expressions from those that are not auxiliary:

(38)   a.   [I stayed home]$_{\text{AUX}-}$ but [Fred could have gone fishing]$_{\text{AUX}+}$.
       b.   [Tom went to NY yesterday]$_{\text{AUX}-}$ and [he will return next Tuesday]$_{\text{AUX}+}$ ∎
       c.   Fred [sang well]$_{\text{AUX}-}$ and [will keep on singing]$_{\text{AUX}+}$.

However, this problem vanishes in the account of the English Auxiliary System detailed in **SagEtAl20** since in that analysis the feature AUX does not indicate whether the verb is axuliliary or not. Rather, the value of AUX for auxiliary verbs is resolved by the construction in which the verb is used. Since all the constructions in (38) are canonical VPs (e.g. non-inverted), then all the conjuncts in (38) are specified as AUX−, in the **SagEtAl20** analysis.

Similarly, argument-marking PPs cannot be coordinated with modifying-PPs simply because the former are specified with different PFORM and SELECT values. This explains the contrast in (39). The first PP is the complement that *rely* selects but the second is a modifier. Thus, they have different CAT values and cannot be coordinated.

(39)   a.   Kim relied on Mia on Sunday.
       b.   *Kim relied on Mia and on Sunday.

Consequently, it is in general not possible to coordinate argument marking PPs headed by different prepositions, simply because they bear different PFORM values as shown in (40).

(40)   a. *Kim depends [[on Sandy]$_{\text{PFORM } on}$ or [to Fred]$_{\text{PFORM } to}$]?
        b. *Kim is afraid [[of Sandy]$_{\text{PFORM } of}$ and [to Fred]$_{\text{PFORM } to}$].

Similarly, adjectives that are specified as PRED+ cannot be coordinated with PRED- adjectives, without stipulation:

(41)   a. *I became [former]$_{\text{PRED}-}$ and [happy]$_{\text{PRED}+}$
        b. *He is [happy]$_{\text{PRED}+}$ and [Fred]$_{\text{PRED}-}$.
        c. *[Mere]$_{\text{PRED}-}$ and [happy]$_{\text{PRED}+}$, Fred rode on into the sunset.

Since case information is also part of CAT, it follows that conjuncts must be consistent as in (42).[5] Many other examples of CAT mismatches exist, but the aforegoing list suffices to illustrates the breadth of predictions that follow from the feature geometry of CAT and the constraints imposed by the coordination construction.

(42)   a. *I saw [her$_{acc}$ and he$_{nom}$].
        b. *He likes [she$_{nom}$ and me$_{acc}$].

Of course, mispredictions also exist. We already discussed one, concerning the feature INV, but there are others. For example, requiring that the GAP value of the coordinands be the same readily predicts Coordinate Structure Constraint effects like (43), but it incorrectly rules out asymmetric coordination violation cases like (44).

(43)   a. [To him]$_{\boxed{1}NP}$ [Fred gave a football __]$_{\text{GAP}\langle\boxed{1}\rangle}$ and [Kim gave a book __]$_{\text{GAP}\langle\boxed{1}\rangle}$
        b. *[To him]$_{\boxed{1}NP}$ [Fred gave a football__]$_{\text{GAP}\langle\boxed{1}\rangle}$ and [Kim gave me a book]$_{\text{GAP}\langle\rangle}$ ∎
        c. *[To him]$_{\boxed{1}NP}$ [Fred gave a football to me]$_{\text{GAP}\langle\rangle}$ and [Kim gave a book __]$_{\text{GAP}\langle\boxed{1}\rangle}$

(44)   a. It offers [something]$_{\boxed{1}NP}$ [that every kid wants __]$_{\text{GAP}\langle\boxed{1}\rangle}$ and [that every parent tries to help their child to achieve __]$_{\text{GAP}\langle\boxed{1}\rangle}$

---

[5]There are nonetheless collocational cases where the distribution of pronouns defies this pattern, due to presumably prescriptive forces; see **grano BINOMIALBOOK**.

    b. *It offers [something]$_{[1]NP}$ [that every kid wants _]$_{GAP\langle[1]\rangle}$ and [that every parent tries to help their child to achieve it]$_{GAP\langle\rangle}$

    c. *It offers [something]$_{[1]NP}$ [that every kid wants it]$_{GAP\langle\rangle}$ and [that every parent tries to help their child to achieve _]$_{GAP\langle[1]\rangle}$

Chaves (2012) argues that, since there are no independent grounds to assume that asymmetric coordination is anything other than coordination, the coordination construction must not impose GAP identity across conjuncts. Rather, the Coordinate Structure Constraint, and its asymmetric exceptions are best analyzed as pragmatic in nature, as Kehler (2002) argues. See Borsley & Crysmann (2019), Chapter 14 of this volume for more discussion. In practice this means that the coordination construction should impose identity of some of the features in CAT, though not all.

Like in the case of locally specified valents, the category of the extracted phrase is also structure-shared in coordination. Hence, case mismatches like (45) are correctly ruled out.

(45)   a. *[Him]$_{acc}$, [all the critics like to praise _]$_{GAP\langle NPacc\rangle}$ but [I think _ would probably not be present at the awards]$_{GAP\langle NPnom\rangle}$

There are, however, cases where the case of the ATB-extracted phrase can be syncretic as in (3), due to Levine et al. (2001).

(46)   a. Robin is someone who$_i$ even [good friends of _ $_i$] believe _ $_i$ should be closely watched.

    b. We went to see [a movie]$_{[1]nom\_acc}$ [which the critics praised _]$_{GAP\langle[1]\rangle}$ but [that Fred said _ would probably be too violent for my taste]$_{GAP\langle[1]\rangle}$

The feature CASE is responsible for identifying the case of nominal expressions. Pronouns like *him* are specified as *acc(usative)*, and pronouns like *I* are *nom(inative)*, and expressions like *who* or *Robin* are left underspecified for case. According to Levine et al. (2001: 207), the case system of English involves the hierarchy in Figure 9.

Verbs subcategorize for *s-nom* NP subjects and *s-acc* NP complements. Most nouns and some pronouns like *who* and *what* are underspecified for case, and thus typed as *case*, which makes them consistent with both nominative and accusative positions. Hence, *a movie* can be simultaneously be required to be simultaneously consistent with S-NOM and S-ACC, by resolving into syncretic type *nom_acc*, which is a subtype of both *s-nom* and *s-acc*. Pronouns like *him* and *her* are specified as *acc* and therefore are not compatible with the *nom_acc* type. The
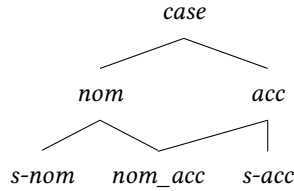
Figure 9: Type hierarchy of (structural) case assignments

same goes for *nom* prononouns like *he* and *she*, etc. Hence, the problem of case syncretism is easily solved.

A much thornier issue concerns agreement. According to Pollard & Sag (1994), agreement information is introduced by INDEX feature in semantics, not morphosyntax. Hence, different expressions with inconsistent person, gender and number specifications are free to combine. But **wechsler** have also argued that there should be a distinct feature called CONCORD, which is morphosyntactic in nature (See Wechsler (2019), Chapter 6 of this volume). The motivation for this move, is that there are languages which display hybrid agreement:

(47) Ta   dobra   deca   su   doš-l-a
      that.SING-FEM goodSING.FEM children AUX3-PL comePPRT.PN

      'Those good children came'
      (**wechsler**)

The collective noun *deca* ('children') triggers feminine singular (morphosyntactic) agreement on NP-internal items, in this case the determiner ɪta ('that') and the adjective *dobra* ('good'). Semantic agreement (i.e. Concord), on the other hand, is seen in the verb *su*, which is inflected for third person plural, in agreement with the semantic properties of the subject *deca*. The two kinds of agreement are also visible in English:

(48) a. This/*These committee made a decision.
      b. The committee have/has made a decision.

This predicts that inconsistent CONCORD specifications are not possible:

(49) * These committee have arrived and has made a decision.

Since (morphosyntacic) agreement is not recorded in CAT, it follows that the resolution of agreement information in coordination must be processed elsewhere

in the grammar. There are usually strict and non-trivial constraints involved in determining what the agreement of the mother node is given that of the coordinands. We turn to this problem below.

3.1 Agreement

In case of conjuncts with conflicting agreement values, resolution strategies are observed crosslinguistically. For example, a coordination with a 1st person ist 2st person, a coordination, with 2d person (and no 1st person) is 2d person. Zwicky 1977 calls it the 'person hierarchy' :

(50) a. Paul and I like ourselves.
      b. Paul and you like yourselves.

In gender marking languages, coordination with conflicting gender values is often resolved to the masculine, at least for animates (**Corbet91**). This is illustrated in (51), for Portuguese.

(51) a. o homem e a mulher modernos
          the.MSG man.MSG and the.FSG woman.FSG modern.MPL
          'the modern man and woman'
      b. morbidez e morte prematuras
          mobidity.FSG and death.FSG premature.FPL premature morbidity and death
          (**Villavicencio:Sadler:ea:05**)

To keep unification as a combining operation, **Sag:03** proposes that 1st person is a supertype of 2d person which is itself a supertype of 2rd. Addressing gender resolution, **Aguila:Crysmann:18** propose a list-based encoding of person and gender values, and list concatenation as a combining operation. they crucially distinguish between a feature itself and its resolution potential. Masc has a non empty list and fem has an empty list, the coordination of masc and fem yields a non empty list, hence masc. Person use two lists ME and YOU, 1st person has a non empty ME list, 2d person has an empty ME list and a non empty YOU list, 3rd person has both empty lists. This enables person and gender resolution by list concatenation over conjuncts, and it has been implemented in a LKB grammar of French.

3.1.1 Closest Conjunct agreement

As observed by **Corbet91** many languages including Romance, Celtic, Semitic and Bantu languages, also have another strategy, namely partial agreement with only one conjunct, the one closest to the target, called closest conjunct agreement (CCA). In the following example, again from Portuguese, the determiner and prenominal adjective agree with the first Noun (a) and the postnominal adjective with the last Noun (b).

(52) a. suas   próprias reações   ou julgamentos
          his.FPL own.FPL reactions.FPL or judgements.MPL

          'his own reactions or judgements'
          (Villavicencio:Sadler:ea:05)

      b. Esta   cancão   anima   os   corações   e   mentes
          This.FSG song.FSG animates the.MPL hearts.MPL and minds.FPL
          brasileiras.
          Brazilian.FPL

          'This song animates Brazilian hearts and minds'
          (Villavicencio:Sadler:ea:05)

For French determiners and attributive adjectives, **An:Abeille:17 (Abeille:An:Shiraishi:18)**▉ show on the basis of corpus data and experiments that number agreement may also obey CCA. As far as gender is concerned, prenominal adjectives always obey CCA while postnominal ones half of the time (in contemporary French). In (a), the determiner can be singular (CCA) or plural (resolution), while in (b), CCA (feminine Det) is obligatory. In (c), the postnominal adjective can be masculine (resolution) or feminine (CCA), with the same meaning.

(53) a. Votre/ Vos   nom et   prénom
          your.SG/PL name.MSG and forname.MSG

          'your name and first name'
          (An:Abeille:17)

      b. Certaines / *Certains régions   et départements
          certain.FPL/*MPL   region.FPL and department.MPL

          'certain regions and departments'
          (Abeille:An:Shiraishi:18)

      c. Des départements et régions   importants/importantes
          some department.MPL and region.FPL important.MPL/FPL

          'some important departments and regions'

As proposed by **wechsler** HPSG distinguishes two agreement features : CON-CORD is used for morphosyntactic agreement and INDEX is used for semantic agreement (see Wechsler (2019), Chapter 6 of this volume). Moosally (1999) proposes an account of single conjunct predicate-argument agreement in Ndebele, which she analyses as Index agreement. She has a version of the following constraint that shares the Index value of the (nominal) coordination with that of the last Conjunct:

referecne missing

(54)

$$nom\text{-}coord\text{-}phrase \rightarrow \begin{bmatrix} \text{INDEX} & \boxed{1} \\ \text{DTRS} & \langle [\ ], ..., [\text{INDEX}\ \boxed{1}] \rangle \end{bmatrix}$$

But in other languages, such as Welsh, there is evidence that the INDEX of the coordinate structure is resolved, even though predicate-argument agreement is controlled by the closest conjunct.

(55) Dw i a Gwenllian heb gael ein talu.
      be.1SG I and Gwenllian.3SG without get Cl.1PL pay
      'Gwenllian and I have not been paid'
      (Sadler 2003, 12)

This is why (Borsley 2009) proposes that CCA is superficial in Welsh and uses linearization domain to handle partial agreement (between the initial verb and the first conjunct, which are not sisters). On the other hand, determiner and (attributive) adjective agreement in Romance involves the CONCORD feature. (**Villavicencio:Sadler:ea:05**) propose two additional features : LAGR (for the left most conjunct) and RAGR (for the right most conjunct). Nouns have the same value for CONCORD, LAGR and RAGR.

(56)

$$nom\text{-}coord\text{-}ph \rightarrow \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \text{LAGR} & \boxed{1} \\ \text{RAGR} & \boxed{2} \end{bmatrix} \\ \text{DTRS} & \langle [\text{LAGR}\ \boxed{1}], ..., [\text{RAGR}\ \boxed{2}] \rangle \end{bmatrix}$$

(57)

$$noun \rightarrow \begin{bmatrix} \text{LAGR} & \boxed{1} \\ \text{RAGR} & \boxed{1} \\ \text{CONCORD} & \boxed{1} \end{bmatrix}$$

Attributive adjectives constrain the agreement features of the noun they modify (via the MOD feature). One may distinguish two types for prenominal and postnominal adjectives, by the binary LEX ± feature (**Sadler:Arnold:94**) or by the WEIGHT light/non-light feature (**Abeille:Godard:99**). In this perspective, each has its agreement pattern, which we simplify as follows, using '∨' to express a

disjunction of feature values:

(58)
$$prenominal\text{-}adj \rightarrow \begin{bmatrix} \text{CONCORD} & \boxed{1} \\ \text{SEL} & [\text{LAGR } \boxed{1}] \end{bmatrix}$$

(59)
$$postnominal\text{-}adj \rightarrow \begin{bmatrix} \text{CONCORD} & \boxed{1} \vee \boxed{2} \\ \text{SEL} & \begin{bmatrix} \text{CONCORD} & \boxed{1} \\ \text{RAGR} & \boxed{2} \end{bmatrix} \end{bmatrix}$$

In the absence of coordination, these constraints apply vacuously, since CON-CORD, LAGR and RAGR all share the same values. If CCA needs to take place to the right and to the left, it is difficult to handle in Minimalism which views agreement as a directional operation between a target (with uninterpretable features) and a c-commanded probe (with interpretable features).

4 Lexical coordination

While conjuncts have often been assumed to be phrasal (see for example **Kayne:94**▌ and **bruening** a.o.), **Abeille:06** gives several arguments in favor of lexical coordination. In some contexts, words are allowed but not full phrases. In English, it is the case with prenominal adjectives and postverbal particles. See **Abeille:06** for similar examples with various categories in different languages. Most English attributive are prenominal unless they have a complement. Although the prenominal position is not allowed for full AP, it is possible for coordinate adjectives.

(60) a. A tall / proud man
      b. *A [taller than you] man
      c. *A [proud of his work] man
      d. A [big and tall] man

As observed by **hpsg1** a particle may project a PP after the nominal complement, but not before; but coordination is possible, at least for some speakers.

(61) a. Paul turned (*completely) off the radio.
      b. Paul turned the radio (completely) off.
      c. Paul was turning [on and off] the radio all the time.

While phrasal coordination can conjoin unlike categories (see below), it is not the case with lexical coordination:

(62)   a. Paul is [head of the school] [and proud of it].
       b. # Paul is [head and proud] of the school.

On the semantic side, lexical coordination is more constrained than phrasal one. With *and*, two lexical verbs, sharing a preverbal clitic in French, must share the same verbal root, and in Spanish, they must refer to the same event (**Bosque:86**).

(63)   a. Je te [dis et redis] que tu as   tort.
           I   you tell and retell that you have wrong

           'I'm telling you that you are wrong'

       b. # Je te [dis et   promets] que tu   as   tort.
           I you tell and promise that   you have wrong

           'I'm telling and promising you that you are wrong'

       c. Lo [compro y   vendio] en una sola   operacion.
           It buy.1SG and sell.1SG in a   single operation

           'I buy and sell it in one single operation'

       d. *Lo compro hoy   y   vendio mañana.
           It   buy.1SG today and sell.1SG tomorrow

           'I buy it today and sell it tomorrow'

Some apparent cases of lexical coordination may be analyzed as right-node raising (Beavers & Sag 2004). They differ semantically and prosodically, however: with typical RNR, the two conjuncts must stand in contrast to one another, and do not have to refer to the same event. With RNR there must be a prosodic boundary at the ellipsis site (see Chaves (2014) and Nykiel & Kim (2019), Chapter 20 of this volume). In French, the first conjunct cannot end with a clitic article or with a weak preposition as in (64b,c),

(64)   a. Tout le monde dit et je te promets [que tu as tort].
           'everyone says and I promise you [that you are wrong]'

       b. *Paul cherche le, et Marie connaît la responsable.
           'Paul looks for the.MSG and Marie knows the.FSG responsible'

       c. *Paul parle de, et Marie discute avec Woody Allen.
           'Paul speaks of and Marie talks with Woody Allen'

Draft of 19th September 2019, 10:54

No such boundary occurs before the conjunction in lexical coordination. Thus, in French, clitic articles or weak prepositions can be conjoined, with a shared argument (**Abeille:06**):

(65)   a.   Paul cherche [le ou   la] responsable
               Paul looks   for the.MSG or the.FSG   responsible
               'Paul is looking for the man or woman in charge'

       b.   Un film [de et   avec] Woody Allen
               a   film by and with Woody Allen

       c.   ?? un film [de mais sans]   Woody Allen
                a   film by but   without Woody Allen

Not all conjunctions are felicitous with lexical coordination; *but*, for example is less felicitous than *and* or *or*. Analyzing the conjunction as a 'weak' head (see above), the sub-type for lexical coordination has to allow for the coordination of items waiting for complements: the conjunction (this is done by concatenation of ARG-ST lists like for complex predicates, see Godard & Samvelian (2019), Chapter 12 of this volume). It thus inherits all the dependents of the word it combines with.

(66)

$$
\textit{lex-coord} \rightarrow
\begin{bmatrix}
\text{HEAD} & \boxed{0} \\
\text{WEIGHT} & \boxed{3}\,\textit{light} \\
\text{ARG-ST} & \boxed{1} \oplus \left\langle
\begin{bmatrix}
\text{HEAD} & \boxed{0} \\
\text{WEIGHT} & \boxed{3} \\
\text{ARG-ST} & \boxed{1} \oplus \boxed{2}
\end{bmatrix}
\right\rangle \oplus \boxed{2}
\end{bmatrix}
$$

The construct resulting from the coordination of lexical elements has hybrid properties: as a syntactic construct, it must be a phrase, but it also behaves as a word : coordinate verbs behave as lexical heads, coordinate adjectives may occur in positions ruled out for phrases. To overcome this apparent paradox, **Abeille:06** analyses it as an instance of "light" phrase, following the WEIGHT theory of **Abeille:Godard:2000** and **Abeille:Godard:2004** Light elements can be words or phrases, and can have a restricted mobility (see Müller (2019), Chapter 10 of this volume). For example prenominal modifiers can be constrained to be [WEIGHT light]. In this theory, light phrases can be coordinate phrases or head-adjunct phrases, provided all their daughters are light as Figure 10 illustrates.
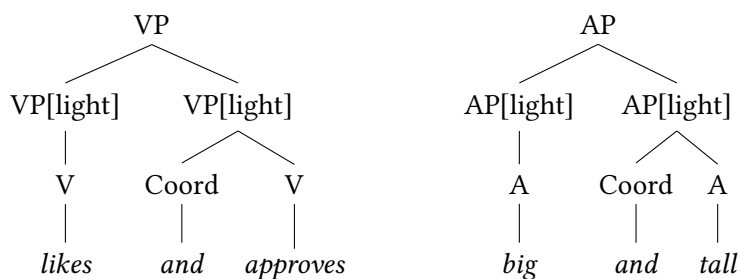
Figure 10: Examples of lexical coordination

5 Coordination of unlike categories

The coordination construction in (10), repeated below as (67), requires that the categories being coordinated are the same.

(67)   COORDINATION CONSTRUCTION (preliminary)

$$coord\text{-}phr \rightarrow \begin{bmatrix} \text{SYNSEM} \begin{bmatrix} \text{CAT} \boxed{1} \end{bmatrix} \\ \text{DTRS} \Big\langle \begin{bmatrix} \text{SYNSEM} \begin{bmatrix} \text{CAT} \boxed{1} \end{bmatrix} \end{bmatrix} \Big\rangle \oplus \textit{ne-list} \Big(\begin{bmatrix} \text{SYNSEM} \begin{bmatrix} \text{CAT} \boxed{1} \end{bmatrix} \end{bmatrix} \Big) \end{bmatrix}$$

However, there is some evidence that this requirement is excessive. Consider the coordinations in (68), from Gazdar et al. (1985), **bayer rodney2** among others. Such data raise pose a classic syntactic problem: what is the part of speech and categorial status of the bracketed constituents?

(68)   a. Kim is [alone and without money].
           [AP & PP]

       b. Pat is [a Republican and proud of it].
           [NP & AP]

       c. Jack is [a good cook and always improving].
           [NP & VP]

       d. What I would love is [a trip to Fiji and to win $10,000].
           [NP & VP]

       e. That was [a rude remark and in very bad taste].
           [NP & PP]

       f. Chimpanzees hunt [frequently and with an unusual degree of success].
           [AdvP & PP]

g. I'm planning [a four-month trip to Africa and to return to York afterwards].
[NP & VP]

As **jacobson** pointed out, it is clear that the features of the mother are not simply the intersection of the features of the conjuncts. Verbs like *remain* are compatible with both AdjP and NP complements whereas *grew* is only compatible with AdjPs. This is shown in (69). Crucially, however, the information associated with the phrase *wealthy and a Republican* somehow allows *grew* to detect the presence of the nominal, as (70a) illustrates, even when the verbs are coordinated, as in (70b–d)

(69) a. Kim remained/grew wealthy.
b. Kim remained/*grew a Republican.

(70) a. Kim remained/*grew [wealthy and a Republican].
b. Kim grew and remained wealthy.
c. * Kim grew and remained a Republican.
d. * Kim grew and remained [wealthy and a Republican].

A number of influential accounts in Type-logical grammar (**morrill90**; **morrill94; bayer**) have used one of the rules of inference from propositional calculus in order to deal with coordination of unlikes phenomena, namely, disjunction introduction (or addition): from *P* one can infer *P* ∨ *Q*. Thus, by assuming that categories like NP, PP and so on can also be disjunctive, the grammar allows an expression of type 'NP' to lead a double life as an 'NP ∨ PP' expression, or the type 'AP' to be taken as an 'AP ∨ PP ∨ NP' and so on. This kind of approach has been adopted in various forms into HPSG, see for example **Daniels02** and **Yatabe:04** Related work aims to achieve the same result using type-underspecification, such as **sag** Other, more exploratory work, views coordination of unlike categories as the result of parts-of-speech being gradient and phenomenal rather than hard-coded into the type signature (**bookivan**). In the latter work, all coordination of unlikes boils down to coordination of like categories.

Other work, like **berthold0 yatabe** Beavers & Sag (2004), **chaves06** argue that coordination of unlikes can be explained by a deletion operation that omits the left periphery of non-initial conjuncts, illustrated in (71).

(71) a. Tom gave a book to Mary, and ~~gave~~ a magazine to Sue.

b. He drinks coffee with milk at breakfast and ~~drinks coffee with~~ cream in the evening.
(**hudson84**)

c. There was one fatality yesterday, and ~~there were~~ two others on the day before.
([Chaves 2007](): 339).

d. I see the music as both going backward and ~~going~~ forward.
[http://pdxjazz.com/dave-holland; 20 December 2010]

In such a view, (68) are verbal coordinations where the verb (or the verb and the subject) has been deleted (e.g. *Kim is alone and ~~is~~ without money*). The problem is that left-periphery ellipsis cannot fully explain coordination of unlikes phenomena. For example, there is no elliptical analysis of data like (72). [Levine (2011)]() offers arguments against the coercion account of Chaves (2006), and against the existence of left-periphery ellipsis. See **yatabe12** for a reply.

(72) a. Simultaneously shocked and in awe, Fred couldn't believe his eyes.

b. Both tired and in a foul mood, Bob packed his gear and headed North.
(**chaves06**)

c. Both poor and a Republican, *no one* can possibly be.

d. Dead drunk and yet in complete control of the situation, *no one* can be.
([Levine 2011]())

Further problems for an ellipsis account of coordination of unlikes phenomena are posed by the position of the correlative coordinators *both*, *either* and *neither* in (73).

(73) a. Isn't this both illegal and a safety hazard?

b. It's both odd and in very poor taste to have a fake wedding.

c. Who's neither tired nor in a hurry?

d. Isn't she either drunk or on medication?

If (73a) is an elliptical coordination like *isn't this both illegal and ~~isn't this~~ a safety hazard*, then the location of *both* is unexpected. Instead of occurring before the first conjunct, it is realized inside the first conjunct. Crucially, the non-elided counterparts are not grammatical, e.g. **isn't this both illegal and isn't this a safety hazard?* The same issue is raised by (73b,c). In an elliptical account one would

have to stipulate that *both* can only float in the presence of ellipsis, which is unmotivated. In sum, left-periphery ellipsis does not offer a complete account of coordination of unlikes, and underspecification accounts are more promising.

6 Non-constituent Coordination

The fact that not all coordination of unlike categories can be reduced to deletion does not entail that deletion is possible, or that no phenomena involve deletion. Consider for example the constructions in (74), all of which involve non-canonical (i.e. non-constituent) coordination, some of which were already discussed above. We refer the reader to Nykiel & Kim (2019), Chapter 20 of this volume for more discussion about other types of ellipsis.

(74)   a.   Tom gave a book to Mary, and a magazine to Sue.
             (Argument Cluster Coordination)
       b.   Tom loves – and Mary absolutely hates – spinach dip.
             (Right-Node Raising)
       c.   Tom knows how to cook pizza, and Fred – spaghetti.
             (Gapping)

Some authors regard Argument cluster coordination as elliptic (**yatabe01**; **Crysmann:04**; Beavers & Sag 2004) others regard them as base-generated (**mouret**). In the former, phonological material in the left periphery of the non-initial conjunct that is identical phonological material in the left periphery of the initial conjunct is allowed to be not present in the mother node. This can be achieved by adding the constraints in (75) to the coordination construction, here shown in the binary-branching format, for perspicuity. Some accounts operate directly on PHON, others apply to DOM elements instead. See Müller (2019), Chapter 10 of this volume.

(75)
$$\textit{coord-phr} \Rightarrow \begin{bmatrix} \text{PHON} \; \boxed{1} \oplus \boxed{2} \oplus \boxed{3} \\ \text{DTRS} \; \left\langle \left[\text{PHON} \; \boxed{1} \oplus \boxed{2} \right]_{ne-list} \right], \left[\text{PHON} \; \boxed{1} \oplus \boxed{3} \right]_{ne-list} \right\rangle \end{bmatrix}$$

If $\boxed{1}$ is resolved as the empty list then no ellipsis occurs, but if $\boxed{1}$ then ellipsis occurs, as illustrated in Figure 11. In other formulations, what is elided are morphophonological linearization domain units; see **chaveslp**

This approach is motivated by the existence of ambiguity in sentences like (76), from Beavers & Sag (2004) and **chaves06** Because (76a) involves a one-time predicate, the ellipsis must include the subject phrase, otherwise the intepretation is
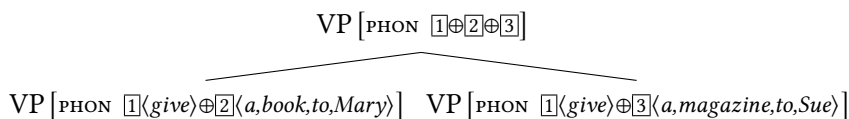
$$\text{VP}\left[\text{PHON } \boxed{1}\oplus\boxed{2}\oplus\boxed{3}\right]$$

$$\text{VP}\left[\text{PHON } \boxed{1}\langle give\rangle\oplus\boxed{2}\langle a,book,to,Mary\rangle\right] \quad \text{VP}\left[\text{PHON } \boxed{1}\langle give\rangle\oplus\boxed{3}\langle a,magazine,to,Sue\rangle\right]$$

Figure 11: Analysis of '*give a book to Mary and ~~give~~ a magazine to Sue*'

such that the same two trees are cut down twice. In contrast, (76b) does not involve a one-time predicate, and thus is it possible for the ellipsis to simply involve the verb.

(76) a. Two trees were cut down by Robin in July and by Alex in September.
          (Two trees were cut down by Robin in July and ~~two trees were cut down~~ by Alex in September.

      b. Two trees were photographed by Robin in July and by Alex in September.
          (Two trees were photographed by Robin in July and ~~photographed~~ by Alex in September)

In the non-elliptical analysis of such data, the missing material is recovered from the preceding conjunct. For example, Mouret proposes a rule along the lines of (6). Here, a new head feature CLUSTER is introduced, which takes as its value the list of synsem description of the daughters.

(77)
$$ac\text{-}cx \Rightarrow \begin{bmatrix} \text{HEAD} & \left[\text{CLUSTER} \left\langle \boxed{1}...\boxed{n}\right\rangle\right] \\ \text{DTRS} & \left\langle \left[\text{SYNSEM } \boxed{1}\right],...\left[\text{SYNSEM } \boxed{n}\right]\right\rangle \end{bmatrix}$$

Mouret defines argument-clusters as instances of some underspecified non-headed construction *ac-cx* with one daughter or more. The construction is valence saturated. He also postulates a lexical rule that allow a ditransitive verb to take a CLUSTER as complement (this rule will also allow clusters for complements and adjuncts, assuming the latter are included in the COMPS list).

(78)
$$\left[\text{COMPS}\left\langle[\text{CAT 1}]...[\text{CAT N}]\right\rangle\right] \Rightarrow \left[\text{COMPS}\left\langle\begin{bmatrix} \text{COORD} & + \\ \text{CLUSTER} & \left\langle[\text{CAT 1}]...[\text{CAT N}]\right\rangle \end{bmatrix}\right\rangle\right]$$

This approach is motivated by non clausal conjunctions (*as well as, ainsi que*) which are possible in ACC but could not conjoin tensed VPs:

(79) a. John gave a book to Mary as well as a magazine to Sue

b. *John gave a book to Mary as well as gave a magazine to Sue

c. Paul offrira un disque à Marie ainsi qu'un livre à Jean.
(**Abeille:Godard:1996**) 'Paul will.offer a record to Mary as well as a
book to Jean'

Another argument is the placement of correlative conjunctions: the first conjunction in (a) must be postverbal; this shows that ACC does not include the first verb.

(80) a. Jean a donné et un livre à Marie et un magazine à Sue.
'Jean has given both a book to Marie and a magazine to Sue' Paul
compte offrir et un disque à Marie et un livre à Jean. (**Mouret:06**)
Paul is.planning.to offer and a record to Marie and a book to Jean

b. *Paul compte et offrir un disque à Marie et un livre à Jean.
'Jean is.planning and to.offer a record to Marie and a book to Jean'

Another argument is negation placement, which is a case of constituent negation (**Mouret:06**):

(81) a. Paul offrira un disque à Marie et (non) pas un livre à Jean. 'Paul will
offer a record to Marie and not a book to Jean'

b. Paul gave a record to Mary and not a book to Bill.

c. * Paul gave a record to Mary and not gave a book to Bill

A syntactic and non-elliptical account of RNR is harder to maintain given that this phenomenon does not seem to be sensitive to syntactic structure as (82) shows. See **bresnan74 wexlercull** Grosu (1981: 45), and **mccawley** and Sabbagh (2007: 382,ft.30) for more data and discussion.[6]

(82) a. I know a man who SELLS and you know a person who BUYS [pictures
of Elvis Presley].

b. John wonders when Bob Dylan WROTE and Mary wants to know when
he RECORDED [his great song about the death of Emmet Till].

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[6]**steedman85**; **gapsteed**; **steedmanbook** and **dowty88** claim that RNR is bounded, nonetheless. For example, **dowty88** argues that *an idea that, and a robot which [can solve this problem]* is evidence for islands in RNR. But as **phil** points out, this oddness is explained by semantic factors: it is impossible to semantically contrast *that* (which is semantically vacuous) with *which*. **steedmanbook** argues that RNR exhibits islands effects by claiming that *I hope that I will meet the woman WHO WROTE and you expect to interview the consortium THAT PUBLISHED* [*that novel about the secret life of legumes*] is ungrammatical. In our experience, informants do not systematically share this judgment.

    c. Politicians WIN WHEN THEY DEFEND and LOSE WHEN THEY ATTACK [the right of a woman to an abortion].

    d. Lucy CLAIMED that – but COULDN'T SAY exactly when – [the strike would take place].

    e. I found a box IN which and Andrea found a blanket UNDER which [a cat could sleep peacefully for hours without being noticed].

Another source of evidence against syntactic and non-elliptical accounts of RNR comes from RNR that involves lexical structure, as (83) illustrates

(83)   a. Please list all publications of which you were the SOLE or CO-[author]. (**rodney2**).

    b. It is neither UN- nor OVERLY [patriotic] to tread that path.

    c. The EX- or CURRENT [smokers] had a higher blood pressure. (**chaveslp**)

    d. The NEURO- and COGNITIVE [sciences] are presently in a state of rapid development (…) [opinionator.blogs.nytimes.com/2011/12/25/the-future-of-moral-machines/?hp]

    e. Please list all publications of which you were the SOLE or CO-[author]. (**rodney2**).

    f. Are you talking about A NEW or about AN EX-[boyfriend]?

    g. Are you talking about A NEW or about AN EX-[boyfriend]?

Elliptical accounts of RNR are proposed by Beavers & Sag (2004), **Yatabe:04** Chaves (2014) and others. The rule in (84) illustrates the account adopted by Chaves (2014) and **aoi** in simplified format.[7]

(84)

$$rpe\text{-}cx \Rightarrow \begin{bmatrix} \text{PHON} & \boxed{L_1} \oplus \boxed{R_1} \oplus \boxed{R_2} \oplus \boxed{R_3} \\ \text{SYNSEM} & \boxed{0} \\ \\ \text{DTRS} & \left\langle \begin{bmatrix} \text{MP} & \boxed{L_1} \oplus \boxed{L_2} \left\langle \begin{bmatrix} \text{PHON} & \boxed{p_1} \\ \text{LID} & \boxed{1} \end{bmatrix},...,\begin{bmatrix} \text{PHON} & \boxed{p_n} \\ \text{LID} & \boxed{n} \end{bmatrix} \right\rangle \oplus \\ \\ \boxed{R_1} \oplus \boxed{R_2} \left\langle \begin{bmatrix} \text{PHON} & \boxed{p_1} \\ \text{LID} & \boxed{1} \end{bmatrix},...,\begin{bmatrix} \text{PHON} & \boxed{p_n} \\ \text{LID} & \boxed{n} \end{bmatrix} \right\rangle \oplus \boxed{R_3} \\ \\ \text{SYNSEM} & \boxed{0} \end{bmatrix} \right\rangle \end{bmatrix}$$

The account is illustrated below.

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[7]See Chaves (2014) for more details about how 'cumulative' RNR is modeled by this rule, i.e. cases like *Mia lost – and Fred spent – (a total of) $10.000*.

        Draft of 19th September 2019, 10:54
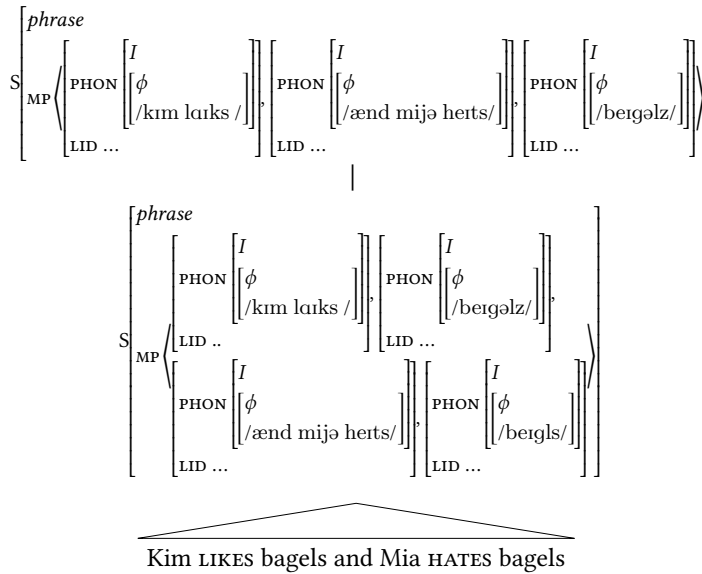
Figure 12: Analysis of *Kim likes, and Mia hates, bagels*

Note that this is a unary-branching rule, which means that it can in principle apply to any phrasal node, which allows the account to scale to non-coordinate RNR:

(85) a. It's interesting to compare the people who LIKE with the people who DISLIKE [the power of the big unions].
          (**hudson**)

   b. Anyone who MEETS really comes to LIKE [our sales people].
       (adapted from **williams**)

   c. Spies who learn WHEN can be more valuable than those able to learn WHERE [major troop movements are going to occur].

   d. Politicians who fought FOR may well snub those who have fought AGAINST [chimpanzee rights].
       (**postal94**)

   e. Those who voted AGAINST far outnumbered those who voted FOR [my father's motion].
       (**rodney2**)

   f. If there are people who OPPOSE then maybe there are also some people who actually SUPPORT [the hiring of unqualified workers].

(Chaves 2014)

In the example in Figure 12 the sub-list $\boxed{R_3}$ is resolved as the empty list, but this need not be so. When the latter sublist is not resolved as the empty we obtain discontinuous RNR cases like (86), where the RNRaised expression is followed by extra material.

(86) a. The blast UPENDED and NEARLY SLICED [an armored Chevrolet Suburban] in half.

　　b. During the War of 1982, American troops OCCUPIED and BURNED [the town] to the ground.

　　c. Please move from the exit rows if you are UNWILLING or UNABLE [to perform the necessary actions] without injury.

　　d. The troops that OCCUPIED ended up BURNING [the town] to the ground.

Finally, let us now turn our attention to Gapping, as in *Robin likes Sam and Tim – Sue*. There are elliptical accounts of Gapping (**chaves06**) as well as direct-interpretation accounts where the missing material is recovered from the preceding linguistic context (**mouret**; **Mouret:06**; **Abeille:Blbie:Mouret:14**; **sangheepark**); See Nykiel & Kim (2019), Chapter 20 of this volume. The latter is illustrated in Figure 13, in simplified format. Basically, the Question Under Discussion (QUD) of the first clause is $\lambda y.\lambda x.\exists e(like(x, y))$ which is information that shared across the clausal daughters as $\boxed{1}$. This allows the second conjunct to combine the two NPs with the verbal semantics, and recover the propositional meaning.

Like RNR, Gapping is not restricted to coordinate structures as (87) illustrates, and so the rule that derives REF is not specific to coordination. Thus, the rule that allows a gapped clause to follow a non-gapped clause is not specific to coordination. See **sangheepark** for more details and discussion.

(87) a. Robin speaks French better than Leslie – German.

　　b. My purpose here is not to resolve the crucial disagreement between two prominent theoreticians in a way that one would be declared true while the other one – false.

　　c. The keynote of their relationship was set when Victoria, already a reigning queen, had to propose to Albert, rather than he – to her.

　　d. The public remembers all that and usually recognizes us before we – them.
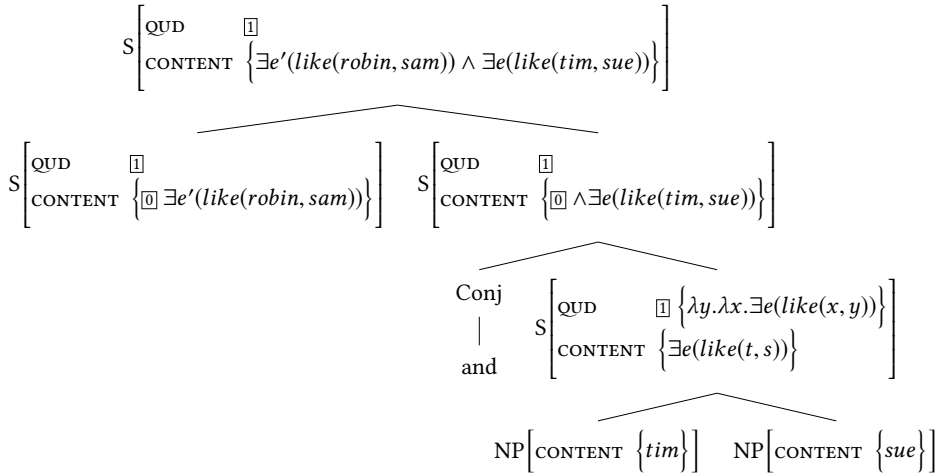　　　(**sangheepark**)

$$S\begin{bmatrix} \text{QUD} & \boxed{1} \\ \text{CONTENT} & \left\{\exists e'(like(robin, sam)) \wedge \exists e(like(tim, sue))\right\} \end{bmatrix}$$

$$S\begin{bmatrix} \text{QUD} & \boxed{1} \\ \text{CONTENT} & \left\{\boxed{0} \; \exists e'(like(robin, sam))\right\} \end{bmatrix} \quad S\begin{bmatrix} \text{QUD} & \boxed{1} \\ \text{CONTENT} & \left\{\boxed{0} \wedge \exists e(like(tim, sue))\right\} \end{bmatrix}$$

$$\text{Conj} \quad S\begin{bmatrix} \text{QUD} & \boxed{1} \; \left\{\lambda y.\lambda x.\exists e(like(x, y))\right\} \\ \text{CONTENT} & \left\{\exists e(like(t, s))\right\} \end{bmatrix}$$

$$| \\ \text{and}$$

$$\text{NP}\begin{bmatrix} \text{CONTENT} & \left\{tim\right\} \end{bmatrix} \quad \text{NP}\begin{bmatrix} \text{CONTENT} & \left\{sue\right\} \end{bmatrix}$$

Figure 13: Analysis of *Robin likes Sam and Tim – Sue* (abbreviated)

7 Conclusion

Conclusion here.

Acknowledgements

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